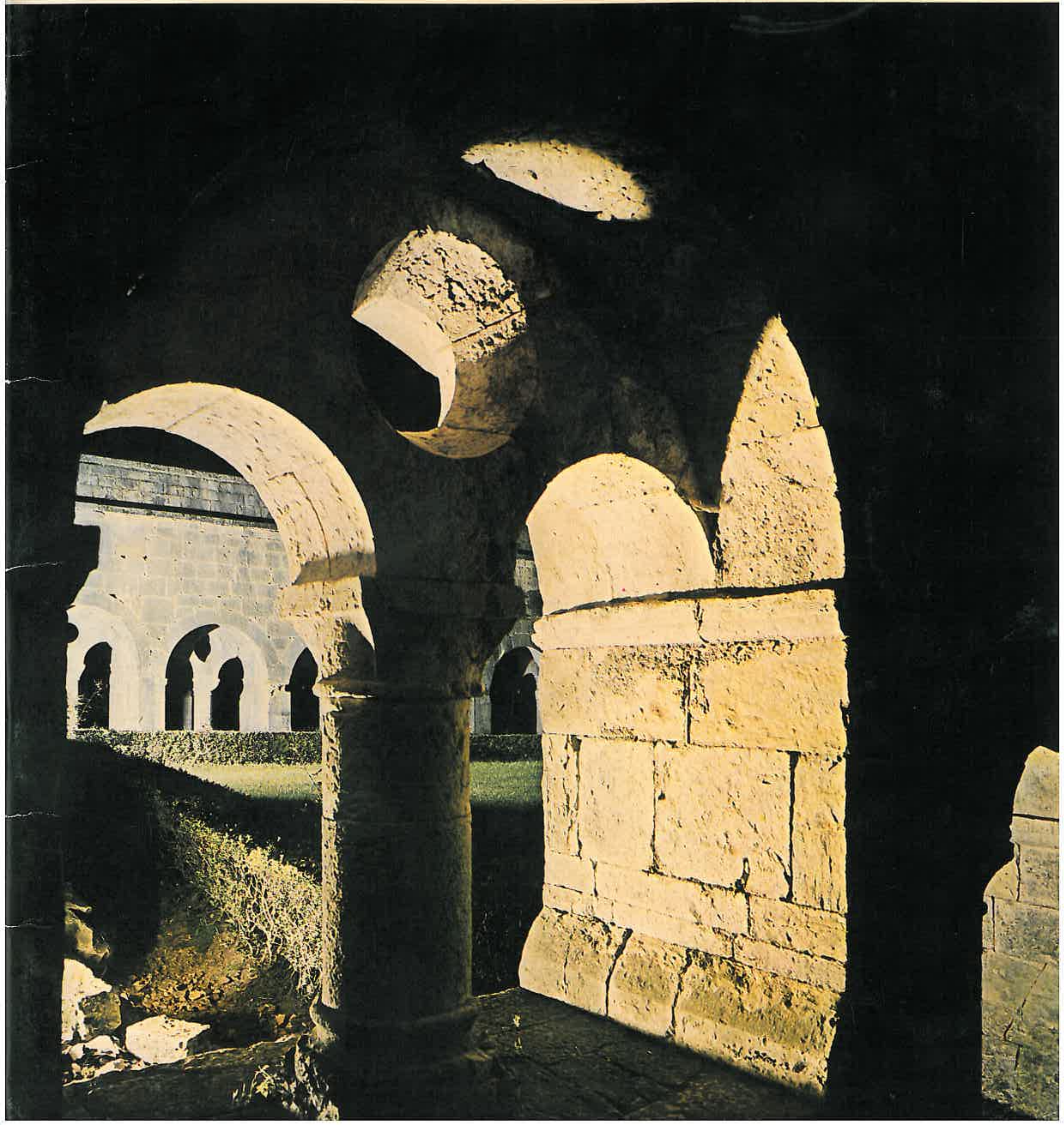
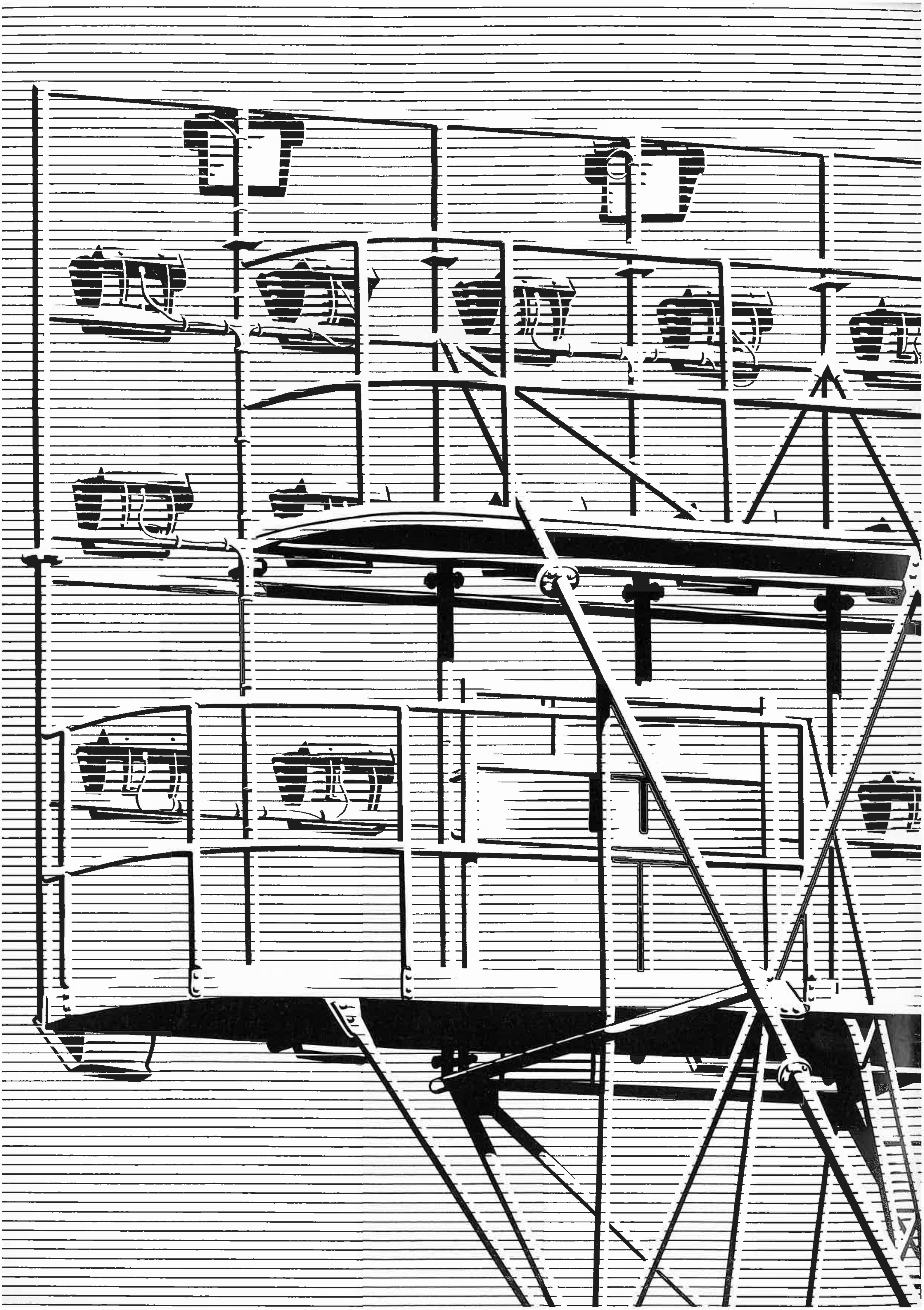
LIGHTING JOURNAL

a new fluorescent tube colour
aluminium lighting columns
the IES code 1973

number ten/spring 1973/published by THORN LIGHTING LIMITED





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Cover picture shows part of the dramatic floodlighting of Thoronet Abbey, described on page 20.

Published by Thorn Lighting Limited
(Atlas Mazda Ediswan lighting products)
Thorn House Upper Saint Martin's Lane
London WC2H 9ED. Printed by Martins Press
Limited London England

In the spring we begin to think of outdoor sports and lengthening evenings spent in the garden. It is therefore appropriate that this tenth issue of *Lighting Journal* should be concerned mainly with outdoor lighting and especially, since this is the first issue since Great Britain entered the European Community, that a number of the installations described should be located overseas.

Since the original use of the CSI and MBIL/H lamps to light football grounds (described in *Lighting Journal* no. 6) the fashion has spread rapidly and there are now no fewer than 18 installations of one or other type in the United Kingdom and four in Europe. These lamps are also being used in a number of unusual floodlighting applications.

Floodlighting first became news in this country in 1931 when the International Illumination Congress was held in London. In 1974 the CIE will again be meeting here and the Illuminating Engineering Society is organising a floodlighting competition to mark the occasion. In 1931 the majority of our city streets were lit by gas; filament lamps and carbon arcs were the only electrical illuminants available and fluorescents had not yet been invented. Today there is almost an embarrassment of choice, but it is unlikely that there will be any gas-lit floodlighting installations! It is interesting to speculate what further developments will have occurred by the time the CIE visits London for the third time, maybe 40 years or so hence.

The new issue of the IES Code is now on the shelves of most lighting engineers and contains some innovations, including more emphasis on the colour of light sources. A new fluorescent lamp colour, introduced by Thorn Lighting for domestic use, is aptly timed to coincide with the interest these changes are likely to create.

Road safety affects all of us, and the provision of aluminium lamp-posts which can reduce the amount of damage sustained by a vehicle striking them is a step in the right direction. The article describing the development of these columns is an interesting sequel to that on motorway lighting which appeared in *Lighting Journal* no. 6.

profile: R M Everett BSc

R M Everett is 45. His father, A G Everett, was an important figure in the lamp world: a link with such pioneers as Swan, Edison and Silvanus Thompson. Educated at Haileybury, he left in 1945 at the age of 18 to join the Royal Artillery, serving in Greece, Egypt and in Palestine at the time British troops were trying to keep the peace between Jews and Arabs and to put down illegal immigration. Demobbed in 1948 with the rank of captain, he entered Northampton Engineering College, passing out with a first class honours degree in engineering.

He joined Siemens Ediswan at Brimsdown as a graduate apprentice and worked on the development of valves, cathode-ray tubes and transistors for the entertainment industry. In 1957 he took charge of the manufacture of transistors in the AEI Tottenham factory and later was appointed works manager. When, in 1961, the bulk of the AEI electronics division was merged with Thorn Electrical Industries, he was made responsible for the development and manufacture of semiconductors for Thorn Radio Valves and Tubes. Three years later he went to Rochester to run the valve factory there, while retaining responsibility for the manufacture of transistors at Enfield. Eventually, he was responsible for all valve manufacture in the Thorn Group.

Then came a complete change. In 1967 he became manufacturing manager of all Thorn Lighting's lamp and tube factories and was subsequently appointed to the board. He is now responsible for all Thorn lamp factories in the United Kingdom and is taking increasing responsibility for overseas activities.

Mr. and Mrs. Everett have three children, two girls and a boy, and live in Welwyn, Herts. Both of them are keen gardeners and they grow orchids 'in a modest way'. Other diversions are ballet at Covent Garden, occasional visits to the opera, golf and listening to classical music.

dans cette édition

2 **PROFILE: R. M. Everett, B.Sc.**
Mr. Everett à 45 ans.
Démobilisé en 1948 avec le grade de capitaine, il entre au Collège d'Engineering de Northampton et en sort dans les premiers en 1952. Il rejoint Siemens Ediswan à Brimsdown et est chargé du développement des valves et tubes à luminescence cathodiques et des transistors pour l'industrie qui concerne le divertissement.
Il est chargé de la fabrication des transistors à l'usine AEI à Tottenham en 1957 et en 1960 est nommé Directeur de l'usine. Lorsqu'en 1961, l'ensemble de la Division Electronics AEI fusionne avec Thorn, il est chargé du développement et de la fabrication des semi-conducteurs pour Thorn Radio Valves and Tubes.
Début 1964, il va à Rochester pour y faire fonctionner l'usine de valves tandis qu'il conserve encore la responsabilité de la fabrication des transistors à Enfield. Vers 1967, il est responsable de toute la fabrication des valves à l'intérieur du Groupe Thorn, y compris celle de Sunderland.
A l'année 1967, il est devenu le Directeur de fabrication de toutes les usines de lampes et tubes appartenant à Thorn Lighting Ltd, dans le Royaume-Uni et lorsque le Conseil d'Administration fut reformé en 1970, il devient Administrateur de Thorn Lighting Ltd. (Il était déjà Administrateur de Lamp Presscaps.) Il est maintenant responsable de toutes les usines de lampes Thorn dans le Royaume-Uni et assume de plus en plus de responsabilités en ce qui concerne les activités d'Outre-Mer.

7 **CHOIX DE LA TIENTE CORRECTE D'UN TUBE FLUORESCENTE** *par* **G. V. McNeill, C.Eng., M.I.E.E., F.Illum.E.S., Directeur de la production des tubes fluorescents de Thorn Lighting Ltd.**
Depuis leur introduction il y a 30 ans, le nombre de couleurs des tubes fluorescents a graduellement augmenté et, maintenant, le choix d'un tube adéquat peut présenter quelques difficultés.
Thorn Lighting Ltd. a réalisé des tests sur un certain nombre d'années en utilisant l'appareil permettant de comparer les couleurs au soussol de Thorn House pour enregistrer les réactions des utilisateurs sur le plan domestique. Finalement ils peuvent affirmer sans crainte de contradiction que la majorité aimerait une couleur lumineuse "plus chaude" que le warm white mais elle n'a pas besoin d'être calquée sur la teinte de l'éclairage à incandescence. Une nouvelle teinte a été conçue qui établit un bon compromis entre l'efficacité de la lumière et le rendu de couleur et l'adjonction du terme "Home-lite" ainsi appelé simplifie le choix en donnant trois alternatives principales.

9 **QUATRE ANNEES DE PROGRES EN MATIERE D'ECLAIRAGE DE STADE** *par* **R. C. Aldworth, l'Ingénieur en Chef de l'éclairage de Thorn Lighting.**
L'édition d'automne du "Lighting Journal" de 1969, décrit la première application des lampes MBI pour l'éclairage d'un stade de football à l'intention de la télévision en couleur. Cela se passait au Molineux Park, à Wolverhampton, et a prémis d'obtenir une grande expérience précieuse.
Deux nouvelles combinaisons de lampes et luminaires furent mis au point par la suite. La première application fit intervenir une lampe de réflecteur, CSI PAR 64, de 1000 Watts, dans un projecteur OM, pour l'éclairage intensif à partir de pylônes élevés, montés dans des coins à West Ham en 1970 et fut suivie presque immédiatement par une installation d'éclairage latéral au Stade Arsenal utilisant des lampes "Linear" MBIL/H, de 1600 w, dans des luminaires ON 1600. Ces installations sont décrites dans le "Lighting Journal", No. 6, dans "Light and Lighting" et dans la publication BKS&TS Journal, de juin et juillet 1971.
Au cours de la même année, le BBC a publié une spécification relative à l'éclairage pour la télévision en couleur demandant un éclairage de 800 à 1400 Lux vers la caméra ; l'Union des Associations Européennes de Football a également diffusé une spécification relative a un éclairage de 150 à 800 Lux dans le plan horizontal et de 1500, réduit ultérieurement à 750, vers la caméra.
Depuis lors, on a réalisé un certain nombre d'installations tant à la Grande Bregagne qu'en Europe Continentale, et qui ont toutes atteintes les limites inférieures fixées par les spécifications mais pouvant, pour la plupart être complétées ultérieurement pour tous les besoins de la télévision en couleur. L'éclairage du stade de Wembley par 240 lampes MBIL/H de 1600w pour assurer un niveau de 1400 Lux dans le plan horizontal et de 1100 Lux vers la caméra constituait une réalisation judicieuse pour marquer l'adhésion de la Grande-Bretagne au Marché Commun.
L'éclairage amélioré profite non seulement aux entreprises de télévision mais aussi aux joueurs et aux spectateurs en permettant à ces derniers de percevoir des petits détails qui, autrement, pourraient passer inaperçus.
L'utilisation du nouveau matériel ne se limite pas aux éclairages pour applications sportives mais a déjà trouvé un certain nombre d'applications industrielles et décoratives.

14 **L'ECLAIRAGE EXTERIEUR ET LE CIE** *par* **J. D. Lovett, Directeur Commercial Technique sur le plan national de Thorn Lighting Ltd.**
Dans les toutes premières années après le guerre, l'éclairage extérieur était défendu en Grande Bretagne mais il devint courant dans les années 1960 lorsque Thorn lança les spectacles Son et Lumière dans ce Pays. Des installations d'éclairage extérieur permanentes sont maintenant une des particularités de toutes les grandes villes et on les trouve près des monuments architecturaux célèbres et de nombreux buildings commerciaux tels que des hôtels dans le Royaume-Uni.
On s'attend à ce que la seconde visite du CIE à Londres en 1974 suscite un nouvel enthousiasme pour l'art de l'éclairage extérieur et ceci devrait être encore plus encouragé par la concurrence qui est en train d'être organisée par l'IES.
Les principes de base de l'éclairage extérieur sont énoncés dans le Rapport technique de l'IES No 6, publié en 1964. Depuis des progrès se sont produits dans le domaine des sources lumineuses qui ont permis de réaliser un nouvel équipement donnant un contrôle de lumière plus précis à partir d'éléments très compacts qui doivent être créés. Avec la très vaste gamme de lampes et de projecteurs disponibles, n'importe quel résultat peut presque être obtenu en utilisant un équipement standard.

22 **ECLAIRAGE PAR PROJECTEUR DES PENTES DE SKI** *par* **Bernth Jansson, l'Ingénieur en Chef de l'éclairage de Thorn Belysning AB.**
Les plans de l'éclairage par projecteur de pistes de slalom doivent être conçus individuellement de façon à s'adapter aux conditions locales étant donné qu'un éclairage inapproprié pourrait provoquer de graves accidents. L'évaluation de l'installation par les skieurs avant son achèvement constitue un élément important de l'orientation finale des faisceaux de projecteur.
Thorn, de Suède, a assuré l'éclairage de la piste de slalom de Dundret, montagne située dans le Gällivare, dans le nord de la Suède, au moyen de groupes de six projecteurs M 25 Junior contenant des lampes Kolorlux MBF, de 400w, montées sur des colonnes de 10 m, le long de la piste. La ligne de colonnes change de côté à mi-distance de la pente, en raison d'un tournant de la piste. Des projecteurs à faisceaux étroits sont utilisés pour éclairer le côté éloigné de la piste alors que des projecteurs à faisceaux dispersifs sont utilisés pour éclairer les points voisins des poteaux. L'installation est constituée par 144 projecteurs, d'une charge totale de 61 kW et d'un rendement lumineux de 3.400.000 lumens. Les pentes supérieures sont éclairées à un niveau de 50 Lux et les pentes inférieures, plus raides à 60 Lux.
Le projet s'est révélé satisfaisant, dans son utilisation pratique, et a fait l'objet de l'approbation de la Féderation Internationale de Ski en vue de concours internationaux.

25 **MATS D'ECLAIRAGE EN ALUMINIUM** *par* **P. D. Gunnell, l'Inégnieur en chef des projects pour l'éclairage des rues de Thorn Lighting Ltd.**
L'éclairage des autoroutes pour faciliter le trafic de nuit a amené à considérer que les mâts d'éclairage étaient des risques d'accident. Des expériences réalisées par les Laboratoires de Recherches concernant le Trafic et la Route ont abouti à la fabrication de mâts ayant un poids léger à bases interchangables avec les mâts en béton ou en acier.
Conjointement avec la British Aluminium, Thorn Lighting a créé un modèle de mât en aluminium. L'acier e été considéré mais rejeté grâce aux statistiques américaines qui ont montré une réduction significative des dégâts provenant des accidents avec des mâts en aluminium comparativement à ceux en béton ou en acier.
Le cout initial des mâts en aluminium est plus élevé que celui des mâts en acier mais les frais d'entretien sont réduits puisqu'ils n'ont pas besion d'être peints. Leur poids étant environ un tiers de celui des mâts en acier, un équipement plus léger peut être utilisé pour les manipuler et les monter.
La collaboration de deux grandes compagnies réduit la proportion des couts de fabrication par rapport aux coûts d'exploitation. L'ébouche, le test et la fabrication des mâts prototypes ont été réalisés par Thorn Lighting et British Aluminium de telle sorte que les réclamations peuvent être entièrement justifiées et la sécurité des mâts en service peut être garantie.

29 **LE CODE IES 1973** *par* **Dr. A. M. Marsden, M.Sc., Ph.D., C.Eng., M.I.E.E., F.Illum.E.S., Directeur des Laboratoires de Recherche de Thorn Lighting.**
Le premier Code IES a été émis en 1941 à la suite d'une publication plus ancienne intitulée "Valeurs recommandées de niveau d'éclairement". Depuis lors, il a été révisé tous les cinq ou six ans pour être conforme à la pratique de l'éclairage courant et aux progrès dans la technologie des lampes et du bâtiment.
Avant la toute dernière révision, un questionnaire a été circularisé aux utilisateurs et à certaines autres grandes organisations. Les réponses ont montré que les recommandations limitant le niveau d'éclairement et la clarté de la lumière étaient, en général, acceptées et ont conseillé d'améliorer le code en ajoutant plus de renseignements sur la couleur, les méthodes de design d'éclairage, sur l'éclairage de sécurité et sur les effets de l'environnement.
Quatre principes généraux ont guidé le travail des compilateurs :

a) Le code doit être à la portée du profane.
b) Les rapports techniques de l'IES doivent être utilisés comme références.
c) La Première Partie traiterait des principes d'éclairage.
d) La Seconde Partie consisterait en caractéristiques sur les projets de modèles, avec des recommandations spécifiques faisant partie du tableau des valeurs de niveau d'éclairement.

Aucune importante augmentation dans les valeurs de niveau d'éclairement n'a été proposée, les nouvelles recommandations suivant largement la séquence préférée et acceptée par le CIE pour leur Guide d'Eclairage Intérieur. Le code ne cote plus maintenant de valeurs minimums mais utilise le terme "niveau d'éclairement service standard" indiquant une valeur moyenne au-dessus de la normale. La position de mesure est spécifiée et, dans les zones de circulation, on fait une recommandation spéciale.
De nouveaux renseignements sur l'éclairage par rapport à la chaleur, la ventilation et l'acoustique ainsi que sur les méthodes de design d'éclairage y sont inclus et il y a une section importante sur la couleur. Bien que la spécification du CIE concernant le rendu de couleur ne soit pas utilisée dans le code, elle figure dans l'appendice.
Le nouveau code est plus important que les précédents, il utilise la couleur et contient de nombreux schémas et diagrammes plus explicatifs. Puisque le but de ce code est d'encourager l'amélioration de l'éclairage, on espère qu'il sera largement utilisé.

in dieser ausgabe

2 KURZBIOGRAPHIE: R. M. Everett, B.Sc.
Ray Everett studierte auf dem Northampton Engineering College. Er bekam 1952 einen akademischen Grad höherer Ordnung im Ingenieurwesen.
Er wurde dann bei Siemens Ediswan als graduierter Lehrling angestellt und bei der Entwicklung von Röhren, Kathodenstrahlröhren und Transistoren für die Unterhaltungsindustrie tätig.
1957 wurde er für die Herstellung von Transistoren in der AEI-Fabrik in Tottenham verantwortlich und 1960 wurde er zum Betriebsleiter ernannt. Als der größte Teil der Abteilung für Elektronikkomponente von AEI 1961 mit Thorn verschmolzen wurde, übernahm er die Verantwortung für die Entwicklung und Herstellung von Halbleitern für Thorn Radio Valves and Tubes. Anfang 1964 ging er nach Rochester, um die dortige Ventilfabrik zu leiten, obgleich er immer noch die Verantwortung für die Herstellung von Transistoren in Enfield hatte. Schon 1967 war er für die gesamte Herstellung von Ventilen innerhalb der Thorn-Gruppe einschließlich Sunderland verantwortlich.
Im 1967 ist er Herstellungsleiter von allen zu Thorn Lighting Ltd. gehörenden Lampen- und Röhrenfabriken in Großbritannien gewesen und als der Vorstand 1970 neu gestaltet wurde, wurde er Direktor von Thorn Lighting Ltd. (er war schon Direktor von Lamp Presscaps). Er ist zur Zeit für alle Thorn-Lampenfabriken in Großbritannien verantwortlich, und seine Verantwortung für die Tätigkeit im Ausland nimmt zu. Er reist sehr viel und besuchte letztes Jahr Australien und Neuseeland. Er hat auch mehrere Reisen in die Staaten gemacht.
Herr und Frau Everett, haben drei Kinder, zwei Töchter und einen Sohn, und zogen nach Welwyn in Herts vor etwa fünf Jahren. Beide sind enthusiastische Gärtner, und sie züchten Orchideen "in kleinerem Umfange". Andere Abwechselungen sind das Ballett in Covent Garden, gelegentlich Operbesuche, Golf und gute Musik.

7 DIE WAHL DER RICHTIGEN LEUCHTSTOFF-LAMPENFARBE *von* **G. E. McNeill, C.Eng., M.I.E.E., F.Illum.E.S., Produktleiter für Leuchstofflampen bei Thorn Lighting.**
Seit der Einführung der Leuchtstofflampen vor 30 Jahren, hat sich die Zahl der Farben allmählich vermehrt.
Deswegen kann die Wahl einer geeigneten Röhre einige Schwierigkeiten aufweisen.
Einige Jahre lang hat Thorn Lighting Ltd. Untersuchungen mit dem "Farbvergleicher" im Keller vom Thorn House ausgeführt, um die Reaktionen von normalen Verbrauchern auszuwerten. Deswegen kann man behaupten, ohne daß einem wiedersprochen wird, daß die meisten eine "wärmere" Lichtfarbe als "warmes Weiß" hätten, aber die Farbe braucht nicht identisch mit Glühfadenbeleuchtung zu sein. Eine neue Lampenfarbe ist hergestellt worden, und sie stellt einen Ausgleich zwischen Leistung und Farbwiedergabe dar. Die neue "Home-Lite", wie man sie nennt, macht die Wahl einfacher, indem drei Hauptmöglichkeiten dargeboten werden.

9 VIER JAHRE DES FORTSCHRITTS IN DER BELEUCHTUNG VON STADIEN *von* **R. C. Aldworth. Oberingenieur für Beleuchtung bei Thorn Lighting.**
In der Herbstausgabe des Lighting Journal 1969 wurde die erste Anwendung von MBI Lampen zur Beleuchtung eines Fußballstadions für Farbfernsehübertragungen beschrieben. Diese Anlage befand sich im Molineux Park, Wolverhampton, und hat zu veilen wertvollen Erfahrungen geführt.
Später wurden zwei neue Lampen und Leuchtenkombinationen entwickelt. Die CSI PAR 64 1000 Watt Lichtfingerlampe in einer OM Flutleuchte wurde erstmals 1970 für Eckbeleuchtung von hohen Masten aus in West Ham benutzt. Kurz darauf folgte eine Anlage für Seitenbeleuchtung in Arsenal, bei der 1600 Watt Linear MBIL/H Lampen in ON 1600 Leuchten zur Anwendung gelangten. Diese Anlagen wurden in dem Lighting Journal Nr. 6, in Light and Lighting und dem BKS&TS Journal in den Juni und Juli Ausgaben 1971 beschrieben.
Im gleichen Jahre brachte die BBC eine Spezifikation für Farbfernsehbeleuchtung heraus, die eine Lichtleistung von 800 bis 1400 Lux in Richtung der Kamera vorschrieb, und auch die Union des Associations Européennes de Football veröffentlichte eine Norm, die 150 bis 800 Lux in der waagerechten Ebene und 1500 Lux, später auf 750 Lux reduziert, in Richtung der Kamera forderte.
Seither wurden verschiedene Anlagen sowohl in Großbritannien als auch auf dem Kontinent hergestellt, die alle den in den Normen festgesetzten unteren Grenzwerten entsprachen, doch für spätere Entwicklung geeignet waren, um den Farbfernseherfordernissen voll und ganz zu genügen. Die Beleuchtung des Wembley Stadions durch 240 1600 W MBIL/H Lampen mit Beleuchtungsstärken von 1400 Lux in der waagerechten Ebene und 1100 Lux in Richtung der Kamera war eine würdige Errungenschaft anläßlich Großbritanniens Eintritt in die EWG.
Verbesserte Beleuchtung ist nicht nur vom Standpunkt der Fernsehübertragung wichtig, sondern wird auch von den Spielern und Zuschauern begrüßt. Diese können feine Manöver besser verfolgen, die ihnen sonst vielleicht entgehen würden.
Die Anwendung der neuen Geräte ist keineswegs auf Sportbeleuchtung beschränkt. Sie werden vielmehr auch für verschiedene industrielle und dekorative Zwieke ververtet.

14 FASSADENBELEUCHTUNG UND DER CIE *von* **J. D. Lovett, Nationalverkaufsleiter für technische Produkte bei Thorn Lighting.**
In den ersten Nachkriegsjahren war die Fassadenbeleuchtung in Großbritannien verboten, aber sie setzte sich in den sechziger Jahren durch, als Thorn mit Son-et-Lumière-Aufführungen voranging. Heutzutag weisen alle größeren Städte permanente Fassadenbeleuchtungsanlagen auf, sowie die wichtigsten Baumonumente und auch viele anderen Gebäude, wie z.B. Hotels, in Großbritannien.
Das zweite Treffen des CIE in London in 1974 wird wohl erneuerten Enthusiasmus für die Kunst der Außenbeleuchtung erwecken, und der von der IES veranstaltete Wettbewerb wird erwartungsgemäß auch dazu beitragen.
Die Grundgesetze der Fassadenbeleuchtung wurden in dem Technischen Bericht der IES, Nr. 6 1954 festgesetzt. Seitdem gibt es neue Entwicklungen auf dem Gebiet der Lichtquellen, die die Konstruktion von neuen Anlagen mit verbesserter Regulung des Lichts aus sehr gedrungenen Gehäusen ermöglichen. Durch die enorme Auswahl der vorhandenen Lampen und Lichtwerfer kann praktisch jeder Effekt mit Standardgeräten erreicht werden.

22 FLUTBELEUCHTUNG FUR SKIHANGE *von* **Bernth Jansson, Oberingenieur für Beleuchtung bei Thorn Belysning AB.**
Die Flutbeleuchtung von Slalompisten muß individuell im Einklang mit den örtlichen Bedingungen gestaltet werden, da falsche Beleuchtung zu ernsten Unfällen führen kann. Sehr wichtig ist die Beurteilung der Flutleuchten durch die Skiläufer vor der endgültigen Fertigstellung der Anlage.
Svenska Thorn hat die Slalompiste am Dundret, einem Berg in Gällivare, Nordschweden, durch Gruppen von je sechs M 25 Junior Flutleuchten mit 400 W Kolorlux MBF Lampen auf 10 m hohen Pfählen entlang der Piste beleuchtet. Die Pfähle befinden sich zum Teil auf der einen und zum Teil auf der anderen Seite der Piste. Dies ist wegen einer Krümmung der Piste erforderlich. Engstrahlprojektoren dienen zur Beleuchtung der entfernten Pistenseite, während die Bereiche nahe an den Pfählen gestreutes Licht erhalten.
Die anlage umfaßt 144 Projektoren, die Gesamtlast beträgt 61 kW und der gesamte Lichtstrom 3 400 000 Lumen. Die Beleuchtungsstärke an den oberen Hängen beträgt 50 Lux und an den steileren unteren Hängen 60 Lux.
Die Anlage hat sich in der Praxis sehr bewährt und ist von der Fédération Internationelle de Ski für internationale Veranstaltungen zugelassen.

25 STRASSENBELEUCHTUNGSSAULEN AUS ALUMINIUM *von* **P. D. Gunnell, leitender Projektsingenieur für Strassenbeleuchtung bei Thorn Lighting.**
Die Beleuchtung von Autostraßen, um end Nachtverkehr zu fördern, hat dazu geführt, daß Beleuchtungssäulen jetzt als eine Gefahr für den Autoverkehr betrachtet werden. Aufgrund von Untersuchungen, die von dem Verkehrs- und Straßenforschungsinstitut ausgeführt worden sind, werden jetzt leichte Säulen mit abbrechbaren Sockeln als eine Alternative zu Säulen aus Beton oder Stahl hergestellt.
Gemeinsam mit British Aluminium hat Thorn Lighting eine Säule aus Aluminium entworfen. Stahl wurde auch als eine Möglichkeit untersucht, wurde aber nicht für geeignet gehalten und zwar aufgrund amerikanischer Daten, die eine äußerst bedeutende Verminderung von Verletzungen bei Unfällen in Zusammenhang mit Säulen aus Aluminium verglichen mit Unfällen in Zusammenhang mit Säulen aus Beton oder Stahl aufzeigen.
Die Anschaffungskosten sind zwar höher bei Aluminium als bei Stahlsäulen, aber die Wartungskosten sind niedriger, weil die Säulen nicht gestrichen werden müssen. Weil das Gewicht etwa ein Drittel von dem der Stahlsäulen ist, können sie mit leichteren Geräten gefördert und aufgestellt werden.
Die Forschungs- und Entwicklungskosten sind erheblich, und nicht alle Hersteller sind bereit, diese zu übernehmen, zumal, da die Konkurrenz auf dem Gebeit der Beleuchtungssäulen sehr intensiv ist. Die Zusammenarbeit von zwei großen Firmen mindert das Verhältnis zwischen den Entwicklungs- und Herstellungskosten. Die Konstruktion, das Prüfen und die Herstellung von Prototypsäulen wurden von Thorn Lighting und British Aluminium ausgeführt, so daß die Behauptungen nachgewiesen werden und die Zuverlässigkeit der Säulen bei der Verwendung gewährleisten können.

29 IES—NORMEN—1973 *von* **Dr. A. M. Marsden, M.Sc., Ph.D., C.Eng., M.I.E.E., F.Illum.E.S., Leiter des Forschungsinstituts bei Thorn Lighting.**
Die ersten IES-Normen erschienen 1941 nach einer früheren Veröffentlichung mit dem Titel "Recommended Values of Illumination." Seitdem sind sie alle fünf oder sechs Jahre neu bearbeitet worden, um Schritt mit dem neuesten Stand der Beleuchtungspraxis und mit Fortschritten in der Lampen- und Bautechnik halten zu können.
Vor der letzten Neubearbeitung wurde ein Fragebogen an Verbraucher und einige große Organisationen geschickt. Die Antworten haben gezeigt, daß die Beleuchtungs- und Blendungs-schutzempfehlungen im allgemeinen angenommen worden sind, und sie haben angedeutet, daß es möglich wäre, die Normen durch mehr Informationen hinsichtlich Farbe, Methoden der Beleuchtungstechnik, Notbeleuchtung und der Wirkung auf die Umwelt zu verbessern.
Die Arbeit der Kompilatoren wurde durch vier allgemeine Grundsätze geleitet:
(a) die Normen sollten auch für den Nichtfachmann verständlich sein,
(b) die Technischen Berichte der IES sollten als Bezugsquellen verwendet werden,
(c) der erste Teil sollte Beleuchtungsgrundsatze umfassen,
(d) der zweite Teil sollte aus Konstruktionsinformationen bestehen, mit konkreten Empfehlungen als Teil der Beleuchtungstabellenwerte.
Es wurde keine allgemeine Erweiterng der Beleuchlungswerte vorgeschlagen, und die neuen Empfehungen sind nach der bevorzugten von dem CIE für seinen Innenbeleuchtungsführer angenommenen Reihenfolge gemacht worden. Die Normen geben jetzt keine Mindestwerte an, verwenden aber den Begriff der "normale Arbeitsbeleuchtung," der einen Durchschnittswert für die in Frage kommende Fläche ist. Die Meßstelle wird angegeben, und eine Skalarempfehlung wird für Verkehrsgebiete gemacht.
Neue Informationen über Beleuchtung in bezug auf Heizung, Lüftung und Akustik und über die Methoden der Beleuchtungstechnik werden aufgenommen, und es gibt einen vergrößerten Teil über Farbe. Obgleich die CIE-Vorschrift für Farbwiedergabe in den Normen nicht gebraucht wird, wird sie in einem Anhang kurz dargestellt.
Die neuen Normen sind umfangreicher als ihre Vorgänger, gebrauchen Farbe und enthalten viel mehr erläuternde Bilder und Abbildungen. Weil es der Zweck der Normen ist, verbesserte Beleuchtung zu fördern, werden sie hoffentlich viel gebraucht werden.

en esta edición

2 **PERFIL BIOGRAFICO: R. M. Everett, B.Sc.** Ray Everett e ingresó en el Colegio de Ingeniería de Northampton, de donde salió con matrícula de honor en Ingeniería en 1952.
Ingresó en Siemens Ediswan en Brimsdown como aprendiz universitario y se encargó del perfeccionamiento de válvulas y tubos de rayos catódicos, así como transistores para la industria de los espectáculos.
Se hizo cargo de la fabricación de transistores en la fábrica de Tottenham de la AEI en 1957 y en 1960 fue nombrado Gerente de Talleres. Cuando la mayor parte de la división electrónica de AEI se fusionó con Thorn, en 1961, asumió responsabilidad por el perfeccionamiento y fabricación de semiconductores para Thorn Radio Valves and Tubes. A principios de 1964 fue a Rochester para dirigir la fábrica de válvulas de dicha localidad, conservando aún así la responsabilidad por la fabricación de transistores en Enfield. En 1967 se hizo cargo de toda la fabricación de válvulas del Grupo Thorn, incluyendo la de Sunderland.
Fue nombrado Gerente de Fabricación de todas las fábricas de lámparas y tubos pertenecientes a Thorn Lighting Ltd., del Reino Unido, y cuando se volvió a reconstituir la Junta Directiva en 1970, fue nombrado Director de Thorn Lighting Ltd. (Ya era entonces Director de Lamp Presscaps). En la actualidad es responsable de todas las fábricas de lámparas de Thorn en el Reino Unido y cada vez toma mayor responsabilidad de las actividades de ultramar.

7 **SELECCION DE COLOR EXACTO DEL TUBO** *por* **G. V. McNeill, C.Eng., M.I.E.E., F.Illum.E.S., Director Ejecutivo de Productos para tubos fluorescentes en Thorn Lighting Ltd.**
Desde su introducción hace 30 años, ha aumentado progresivamente el número de colores de los tubos fluorescentes. Por consiguiente, la selección de un tubo apropiado puede plantear algunas dificultades. Thorn Lighting Ltd. ha realizado pruebas durante varios años utilizando el "comparador de color" en el sótano de Thorn House para evaluar las reacciones de los usuarios particulares. Como resultado, pueden decir sin miedo de contradicción que la mayoría de las personas preferirían un color "más cálido" que el "blanco cálido", pero no necesita ser un color muy semejante al del alumbrado con lámpara de filamento. Se ha producido un nuevo color de lámpara que ofrece una solución intermedia entre la eficacia y la reproducción del color y la introducción de "Home-Lite", como se llama, simplifica la selección, proporcionando tres alternativas principales.

9 **CUATRO ANOS DE PROGRESSO EN LA ILUMINACION DE ESTADIOS** *por* **R. C. Aldworth, ingeniero superior de iluminación en la industria Thorn Lighting.**
En la edición de otoño de la Revista sobre iluminación de 1969 se describía el empleo por vez primera de bombillas MBI para la iluminación de un estadio de fútbol para televisión en color. Este era el Molineux Park, Wolverhampton, y de él pudieron conseguirse muchos detalles útiles.
Posteriormente se llegó a dos nuevas combinaciones de luces y dispositivos. La luz de reflector de gas inerte de 1000 vatios CSI PAR 64 en un proyector OM se utilizó en un principio para el alumbrado en vértice desde torres altas en West Ham en 1970 e inmediatamente se procedió a una instalación de iluminación lateral en Arsenal utilizando lámparas Linear MBIL/H de 1600 vatios en proyectores ON 1600. El detalle de estas instalaciones se dió en la Revista sobre iluminación No. 6, en "Light and Lighting" y la revista BKS & TS de Junio y Julio de 1971.
En el mismo año la BBC publicó una especificación sobre iluminación para televisión en color en que se pedían 800-1400 lux hacia la cámara y la Union des Associations Européennes de Football también publicó una especificación en que se exigían 150-800 lux en el plano horizontal y 1500 lux, posteriormente reducidos a 750, en la dirección de la cámara.
Desde entonces se ha levantado un cierto número de instalaciones en Gran Bretaña y en Europa, todas las cuales sobrepasaban los límites inferiores determinados por las especificaciones, pero con la mayoría contando con la posibilidad de ampliación de manera a satisfacer a todos los requisitos de la televisión en color. La iluminación del estadio de Wembley mediante 240 lámparas MBIL/H de 1600 vatios con una iluminancia de 1400 lux y 1100 lux en la dirección de la cámara ha sido una proeza adecuada para realzar le entrada de Gran Bretaña en el Mercado Común.
La mejor iluminación no sólo resulta en beneficio de los técnicos de televisión sino que redunda en bien de jugadores y espectadores permitiendo que estos últimos lleguen a seguir momentos del juego que de otro modo pasarían desapercibidos.
El uso del nuevo equipo no se limita a iluminaciones deportivas, sino que ya se ha adoptado para cierto número de aplicaciones industriales y decorativas, habiéndose incluso utilizado.

14 **EL ALUMBRADO CON FOCOS Y LA CIE** *por* **J. D. Lovett, el Gerente de Ventas técnico nacional de Thorn Lighting Ltd.**
En los primeros años después de la guerra, se prohibió la iluminación con focos en la Gran Bretaña, pero quedó bien establecida en el decenio de los años 60, cuando Thorn fue la Organización Precursora de los espectáculos "Son et Lumière" en este país. Las instalaciones permanentes de iluminación con focos constituyen actualmente una característica de todas las grandes ciudades y se encuentran en la mayoría de los monumentos arquitectónicos importantes, así como en numerosos edificios comerciales tales como hoteles, en el Reino Unido.
Se espera que la segunda visita de la CIE a Londres en 1974 reavive el entusiasmo por el arte de la iluminación exterior, lo cual se estimulará aún más mediante el concurso que está organizando la IES (Sociedad de Ingenieros de Iluminación).
Los principios fundamentales de la iluminación con focos se establecieron en el informe técnico de la IES núm. 6, publicado en 1964. Desde entonces, se han producido perfeccionamientos en las fuentes luminosas que han permitido diseñar nuevo equipo que ofrece un control más preciso de la iluminación a partir de cajas de dimensiones muy reducidas. Con la amplia gama de lámparas y proyectores disponible se puede conseguir casi cualquier efecto utilizando equipo normal.

22 **ILUMINACION DE PISTAS DE ESQUIACION** *por* **Bernth Jansson, el ingeniero de iluminación en Jefe de Thorn Belysning AB.**
Las instalaciones de proyectores para pistas de slalom deben concebirse individualmente de manera a adaptarse a las condiciones locales ya que una iluminación inadecuada puede tener como consecuencia accidentes graves. La valoración por parte de los esquiadores es un elemento importante de la decisión final sobre el equipo de iluminación antes de proceder a su instalación definitiva.
Thorn, Suecia, ha llevado a cabo la iluminación de la pista de slalom de Dundret, montaña de Gällivare en el Norte del país utilizando grupos de seis proyectores M 25 Junior dotados de lámparas Kolorlux MBF de 400 vatios instalados en columnas de 10 metros a lo largo de la pista. La línea de columnas pasa de un lado al otro en la mitad del descenso debido a una curva del la pista. Para el lado más alejado se utilizan proyectores de haz concentrado y para los puntos cercanos a los postes se utilizan tipos de dispersión.
La instalación se compone de 144 proyectores, con una carga total de 61 kilovatios y una energía de iluminación total de 3.400.000 lumens. La intensidad de iluminación de la sección superior de la pendiente es de 50 lux y para las pendientes más bahas pero más fuertes de 60 lux.

25 **COLUMNAS DE ILUMINACION DE ALUMINIO** *por* **P. D. Gunnell, el Ingeniero Jefe de Proyectos para el alumbrado callejero en Thorn Lighting Ltd.**
El alumbrado de las autopistas para fomentar el tráfico nocturno ha dado lugar a que se estudien las columnas de alumbrado como un peligro en caso de accidente. Los experimentos realizados por el Laboratorio de Investigación sobre Tráfico y Carreteras han dado por resultado la fabricación de columnas ligeras con bases rompibles a manera de alternativa de las columnas de hormigóno acero.
En asociación con British Aluminium, Thorn Lighting ha producido un diseño de columnas de aluminoi. Se consideró la utilización del acero pero se rechazó basándose en las estadísticas norteamericanas que demostraron una reducción muy importante en las heridas resultantes de los accidentes contra columnas de aluminio en vez de las hechas de hormigón o acero.
El coste inicial del aluminio es mayor que el de las columnas de acero, pero los gastos de mantenimiento se reducen, ya que no necesitan pintarse. Debido a que su peso es aproximadamente la tercera parte que el de las columnas de acero, se puede usar equipo más ligero para su manipulación e instalación.
El coste de investigación y perfeccionamiento es elevado y no todos los fabricantes están dispuestos a sufrirlo porque la industria de columnas de alumbrado es sumamente competitiva. La colaboración de dos grandes Compañías reduce la relación entre los gastos de perfeccionamiento y los de fabricación. Thorn Lighting y British Aluminium efectuaron el diseño, comprobación y fabricación de las columnas prototipo, de manera que pudieran demostrarse completamente las afirmaciones que se hacían y garantizarse la confiabilidad de las columnas en servicio.

29 **EL CODIGO IES (ILLUMINATING ENGINEERING SOCIETY) 1973** *por* **Dr. A. M. Marsden, M.Sc., Ph.D., C.Eng., M.I.E.E., F.Illum.E.S., el Gerente de los Laboratorios Thorn de Investigación sobre el alumbrado.**
El primer Código IES se publicó en 1941, como continuación a otra publicación anterior titulada "Valores Recomendados de Iluminación". Desde entonces se ha revisado cada cinco o seis años para mantenerlo al día en relación con la práctica actual de iluminación y los progresos realizados en la tecnología sobre construcción y lámparas.
Antes de hacerse la última revisión, se distribuyó un cuestionario a los usuarios y a otras grandes organizaciones. Las respuestas demostraron que las recomendaciones para la limitación del des lumbramiento y la iluminancia se aceptaban en general y sugerían que el Código podía mejorarse añadiendo más información sobre el color en los métodos de diseño del alumbrado, sobre el alumbrado de urgencia y sobre su efecto en el medio ambiente.
Los editores se guiaron en su labor por los cuatro principios generales siguientes:

(a) Que el Código fuese comprensible para personas no especializadas.
(b) Que los informes técnico IES se utilizasen como referencia
(c) Que la Parte I tratase de los principios del alumbrado.
(d) Que la Parte II se compusiera de los datos sobre diseño, con recomendaciones concretas que formasen parte de la tabla de valores de iluminancia.

No se ha propuesto ningún aumento general de importancia en los valores de iluminancia y las nuevas recomendaciones siguen en gran parte la secuencia preferida aceptada por el CIE para la Guía del Alumbrado de Interiores. En el código ya no se indican valores mínimos, pero se emplea la expresión "iluminación de servicio normal" que denota un valor medio sobre la superficie pertinente. Se especifica la posición de medida y se hace una recomendación escalar para las zonas de tránsito.
Se incluye nueva información sobre el alumbrado en relación con la calefacción, ventilación y acústica y sobre los métodos de diseño de alumbrado, así como una sección ampliada sobre color. Aunque no se incluye en el Código la especificación CIE de la reproducción de color, se reseña en un apéndice.
El nuevo Código es más amplio que los anteriores, utilizando el color e incluyendo muchas más ilustraciones y diagramas explicativos. Como su propósito consiste en estimular un alumbrado mejor, se espera que se utilice ampliamente.

nel questa edizione

2 PROFILO R. M. Everett, B.Sc.
Ray Everett è iscritto al Northamption Engineering College, conseguendo, a pieni voti, la laurea in ingegneria nel 1952.
E' entrato a far parte della Siemens Ediswan a Brimsdown dove si è occupato dello sviluppo delle valvole, dei tubi a raggi catodici e dei transistors.
Nel 1957 ha cominciato ad interessarsi alla produzione dei transistors nella fabbrica della AEI a Tottenham e nel 1960 è diventato Direttore di Fabbrica. Nel 1961, quando l'intera divisione elettronica della AEI è stata assorbita dalla Thorn, è diventato il responsabile dello sviluppo e della produzione dei semi-conduttori della Thorn Radio Valves and Tubes.
All'inizio del 1964 si è trasferito a Rochester per dirigere la locale fabbrica di valvole pur mantenendo la responsabilità della produzione dei transistors a Enfield.
Dal 1967 egli è responsabile della produzione di tutte le valvole del Gruppo Thorn inclusa quella che viene effettuata a Sunderland.
Verso la metà del 1967 A. J. Ford gli ha chiesto di diventare Responsabile di Produzione delle lampade incandescenti e fluorescenti prodotte in tutti gli stabilimenti della Thorn Lighting Ltd., in Inghilterra, e quando nel 1970 il Consiglio di Amministrazione fu cambiato egli è diventato Direttore della Thorn Lighting Ltd. (A quell 'epoca era già Diretore della Lamp Presscaps). Attualmente è anche responsabile delle attività estere della Thorn.

7 LA SCELTA DI UNA ESATTA TONALITA DI LUCE NELLE LAMPADE TUBOLARI FLUORESCENTI, G. V. McNeill, C.Eng., M.I.E.E., F.Illum.E.S., Direttore di Fabbrica per le lampade fluorescenti della Thorn Lighting.
Dalla prima apparizione sul mercato delle lampade tubolari fluorescenti, che è avvenuto circa 30 anni fa, il numero delle loro tonalità è andato gradualmente aumentando. Pertanto non esiste alcuna difficoltà nella giusta scelta della tonalità adatta per un certo problema specifico.
La Thorn Lighting ha condotto una serie di esperimenti già da anni impiegando il "comparatore di colore" in laboratorio ed esaminando le reazioni degli utilizzatori.
Il risultato è che questi ultimi sono in grado, senza tema di contraddizione, di stabilire se una determinata tonalità di luce è più o meno calda rispetto al confronto con una lampade ad incandescenza. E' stata messa a punto una nuova tonalità che rappresenta un giusto compromesso tra una buona resa luminosa ed una buona resa cromatica; tale tonalità, chiamata "luce domestica" semplifica la scelta dando tre possibili alternative.

9 QUATTRO ANNI DI PROGRESSO NEI CRITERI DI ILLUMINAZIONE DEGLI STADI SPORTIVI. R. C. Aldworth. dirigente tecnico del settore illuminazione della Thorn Lighting.
Nell' autune 1969, Lighting Journal ha descritto l'uso, effettuato per la prima volta, delle lampade MBI per illuminare un campo sportivo, durante la ripresa televisiva di un incontro di calcio. Quanto detto è avvenuto al Molineux Park di Wolverhampton; in tale circostanza è stata acquisita una notevole esperienza.
Successivamente, vennero elaborati due nuove lampade e due nuovi sistemi di installazione. La lampada CSI PAR 64, di 1000 watt venne usata per la prima volta a West Ham, nel 1970, per l'illuminazione d'angolo, da piloni di grande altezza. Quasi immediatamente, sul campo dell'Arsenal, venne usata la lampada Linear MBIL/H, di 1600 watt, con montaggio tipo ON 1600, per l'illuminazione laterale. Le installazioni in oggetto sono state descritte nell'edizione No. 6 di Lighting Journal, e nelle pubblicazioni Light and Lighting e BKS & TS del giugno e luglio 1971.
Lo stesso anno, la BBC, per le riprese televisive a colori, ha prescritto 800-1400 lux in direzione della macchina da presa e la Union des Associations Européennes de Football, a sua volta, ha prescritto 150-800 lux sul piano orizzontale e 1500 lux, in seguito ridotti a 750, in direzione della macchina da presa.
Da tale epoca, sono state effettuate parecchie installazioni in Gran Bretagna ed in Europa, tutte conformi ai limiti inferiori figuranti nelle prescrizioni però, per la maggioranza, con predisposizione al successivo adeguamento alle specifiche imposte per la ripresa televisiva a colori. Il sistema usato allo stadio di Wembley, che impiega 240 lampade MBIL/H di 1600 watt, con illuminazione orizzontale di 1400 lux e con 1100 lux in direzione della macchina da presa, rappresenta un successo tecnico inteso come celebrazione dell'entrata della Gran Bretagna nel Mercato Comune.
Il miglioramento dei criteri di illuminazione non rappresenta puramente un vantaggio per i tecnici della ripresa televisiva, ma contribuisce parimenti a fornire miglior visibilità per i calciatori permettendo, in pari tempo, che il pubblico possa seguire con maggior facilità lo svolgersi dell'incontro, notando i passaggi di speciale rilievo che, diversamente, rimarrebbero inosservati.
Quest'apparecchiatura non viene usata esclusivamente sui campi sportivi; essa ha già trovato molteplici applicazioni di carattere industriale o puramente decorativo.

14 ILLUMINAZIONE A PROIEZONE ED IL CIE, J. D. Lovett, il direttore nazionale tecnico-commerciale della Thorn Lighting Ltd.
Negli anni immediatamente successivi alla guerra l'illuminazione a proiezione fu vietata in Inghilterra ma si affermò in pieno in questo paese nel '60 quando la Thorn realizzò i primi impianti Suoni e Luce. Impianti fissi di illuminazione rappresentano oggi una caratteristica di molte grandi città e sono stati realizzati per mettere in evidenza non solo monumenti importanti dal punto di vista architettonico ma anche molti edifici commerciali ed alberghi.
Il secondo congresso del CIE a Londra, previsto per il 1974, è particolarmente atteso per rinverdire l'entusiasmo scaturito dal fascino della illuminazione esterna e c'è da pensare che ci si troverà di fronte a qualcosa di spettacolare proprio grazie alla particolare competizione sostenuta calla IES.
I principi di base dell'illuminazione a proiezione sono stati puntualizzati nel Rapporto Tecnico No. 6 della IES pubblicato nel 1964. Da allora sono state messe a punto nuove sorgenti luminose che hanno consentito l'impiego di proiettori di forma più decisamente compatta e con un più efficace controllo del fascio luminoso.
Con queste nuove apparecchiature praticamente si può ottenere qualsiasi effetto nella illuminazione a proiezione.

22 ILLUMINAZIONE PER PROIEZIONE DELLE PISTE DA SCI. Bernth Jannson. il Tecnico Responsabile del Settore Illuminazione della Thorn Belysning AB.
L'illuminazione per proiezione delle piste di slalom deve venire impostata individualmente, basandola sulle condizioni locali, poiché un'illuminazione insufficiente può dar adito a seri incidenti. Il parere degli sciatori costituisce una parte importante per i criteri di sistemazione definitivi degli impianti di illuminazione, prima che l'installazione venga ultimata.
La Thorn, Svezia, ha illuminato la pista da slalom a Dundret, una montagna della regione di Gällivare, nella Svezia del Nord, mediante un gruppo di sei proiettori M 25 Junior che alloggiavano lampade Kolorlux MBF 400w, sistemate su piloni di 10 metri, disposti sui fianchi della pista. La linea dei piloni cambia posto verso metà della pista per via di una curva esistente nella pista stessa. Per illuminare il lato opposto della pista si usano proiettori a fascio ristretto, mentre si usano tipi a dispersione per le zone situate accanto ai pali.
L'installazione consiste di 144 proiettori, con un carico totale di 61 kW e con un potere illuminante complessivo di 3.400.000 lumen. Le chine superiori vengono illuminate con un'intensità di 50 lux mentre le chine inferiori, più ripide, vengono illuminate con un'intensità di 60 lux.
Questo progetto si è provato adatto all'uso pratico ed è stato approvato dalla Fédération Internationelle de Ski, per gli eventi internazionali.

25 PARACARRI LUMINOSI IN ALLUMINIO. P. D. Gunnell, l'Ingegnere Capo dei progeti per l'illuminazione stradale della Thorn Lighting Ltd.
L'illuminazione delle autostrade per agevolare il traffico automobilistico notturno ha portato alla constatazione che i paracarri luminosi possono rappresentare un ostacolo accidentale pericoloso. Esperimenti condotti al riguardo dal Laboratorio Ricerche del Traffico e della Strada hanno portato alla conclusione che risulta decisamente più sicura l'installazione di paracarri leggeri, non rigidi alla base come invece è il caso di quelli in acciaio.
In accordo con la British Aluminium, la Thorn Lighting ha prodotto un paracarro di alluminio. A tale riguardo fu anche presa in considerazione l'idea di produrlo in acciaio ma fu abbandonata in quanto dalle risultanze delle statistiche americane è stata trovata una sensibile riduzione degli incidenti con l'impiego di paracarri in alluminio rispetto a quelli in cemento o acciaio.
I costi inizialì dell'alluminio sono maggiori di quelli in acciaio, ma quelli di manutenzione sono decisamente più ridotti in quanto non devono essere periodicamente riverniciati. In virtù del loro minor peso, pari a circa un terzo di quelli in acciaio, si possono impiegare attrezzature più leggere per provvedere alla loro installazione.
Il costo della ricerca e dello sviluppo sono risultati alti e non tutti i fabbricanti sono preparati a tale situazione giacchè l'attuale produzione è estremamente competitiva. La collaborazione in atto tra due grosse società riduce il rapporto tra i costi di sviluppo e quelli di produzione. La Thorn Lighting e la British Aluminium hanno provveduto alla progettazione, alle prove ed alla produzione di paracarri prototipi i quali possono dare sicuro affidamento grazie alla perfetta collaborazione delle due Società.

29 IL CODICE IES 1973, Dr. A. M. Marsden, M.Sc., Ph.D., C.Eng., M.I.E.E., F.Illum.E.S., il Direttore del Laboratorio Ricerche della Thorn Lighting.
Il primo codice IES fu pubblicato nel 1941, dopo una precedente memoria, intitolata "Valori di Illuminamento Raccomandati". Da quell'epoca questo codice è stato rivisto ogni 5 o 6 anni in relazione alla dinamica della tecnologia ed alle esigenze della pratica d'illuminazione.
Prima dell'ultima revisione è stata condotta un'inchiesta sotto forma di questionario tra gli utenti. Le risposte hanno messo in evidenza che i valori raccomandati e i criteri della riduzione dell'abbagliamento sono generalmente accettati, tuttavia si è sentita la necessità di avere ulteriori informazioni sulla tonalità di luce, sui criteri di progettazione, suggerimenti sull'illuminazione di emergenza e sugli eventuali effetti dell'ambiente circostante.
I principi generali che hanno guidato gli studi dei ricercatori sono stati fondamentalmente 4:
(1) il codice fosse di facile comprensione da parte degli utilizzatori
(2) i rapporti tecnici dell'IES fossero gli elementi di base cui fare riferimento
3) la I parte dovesse trattare i principi generali della illuminazione
(4) la II parte dovesse contenere schemi e con tavole contenenti i valori di illuminamento raccomandati.
Si può affermare che questi ultimi non hanno subito alcuna modifica in aumento e che risultano, in ultima analisi, quelli proposti dal CIE nella "Guida per la illuminazione di interni".
Il Codice non raccomanda valori minimi, ma esplicita valori standard consigliati su di una superficie piuttosto estesa. Vengono forniti criteri di misura di tali valori. Sono inoltre suggeriti anche i valori di illuminamento per gli impianti di illuminazione abbinati al condizionamento ed all'acustica nonchè i criteri di scelta sulle tonalità di luce più idonee al problema specifico.
Su quest'ultimo punto non si è fatto ricorso al metodo di valutazione sulla resa dei colori proposto dalla CIE anche se quest'ultimo viene riportato in appendice.
Il nuovo codice si presenta in una veste più voluminosa dei precedenti con un ricco corredo di fotografie e diagrammi. E' auspicabile che gli interessati si servano dello stesso con una certa frequenza dal momento che tale codice si propone, in ultima analisi, di promuovere una illuminazione più razionale che serva a creare favorevoli condizioni di benessere per gli operatori.

a new fluorescent tube colour

by G V McNeill CEng MIEE FIllumES

Since fluorescent lighting was introduced three decades ago, the range has grown to more than 20 different colours, with half this total in the 'near-white' category. Seen side by side in a random array this is pretty impressive but it has made it increasingly difficult to ensure that the best tube colour is chosen to match a given lighting need. This article offers advice on selecting the most suitable tube colour for different interiors and takes into account the steady progress made in the Thorn laboratories and factories to produce tubes with both better colour quality and higher lumen output. For example, since 1953 the 'natural' tube has been improved in performance to give more than twice as much dark red light while average light output has been increased by 40%. Add to this a 50% life increase and a price reduction in the United Kingdom of one-third and the progress achieved over the past 20 years becomes readily apparent.

The Thorn lighting laboratories at Enfield carry out extensive colorimetry testing of tube colours, including continuous checking of production samples; this is co-ordinated with life-testing and checking lumens and performance throughout life. The resultant reports are used to compile published performance data which is reviewed quarterly; this comprehensive data on spectral power distribution and chromaticity co-ordinates is freely available to any customer. Experience has shown, however, that the data published in accordance with colour specification methods is often misleading to people who do not have a specialist knowledge of the subject. For example, the added ultra-violet component in 'artificial daylight' which gives accurate colour matching to BS.950 requirements does not reveal itself in the published 8 band percentage luminance data. The selection of tube colours is further confused by the fact that the colour rendering of a fluorescent tube is not necessarily obvious from its colour appearance. For example, an ordinary warm white and a de luxe warm white tube match almost perfectly, but the latter is far richer at the red end of the spectrum so that objects seen under its light appear warmer in tone; in particular, the human face looks a good deal healthier. To this must be added the fact that tubes of high luminous efficacy are bound to have less accurate colour rendering properties than those of lower light output.

The most effective method of tube colour selection is to carry out full-scale colour comparison experiments which assess the human reaction to interiors lit with alternative tube colours.

Fifteen years ago two identical room settings were built side by side in the basement of Thorn House in London to enable the full range of near-white tube colours to be compared in any combination. An important feature of the control switching system is that it can be electronically dimmed to set the room illuminance at the lux value which will be used by the customer. This factor can noticeably affect a person's choice of tube colour because of the psychological change in colour preference which takes place when the room illuminance is varied. Most people prefer a warm colour appearance and low illuminance for domestic or decorative interiors where a feeling of relaxation is desired, whereas a cool bright white appearance with fairly high illuminance gives a feeling of invigoration which is more conducive to a working outlook. This is shown in Figure 1 from which

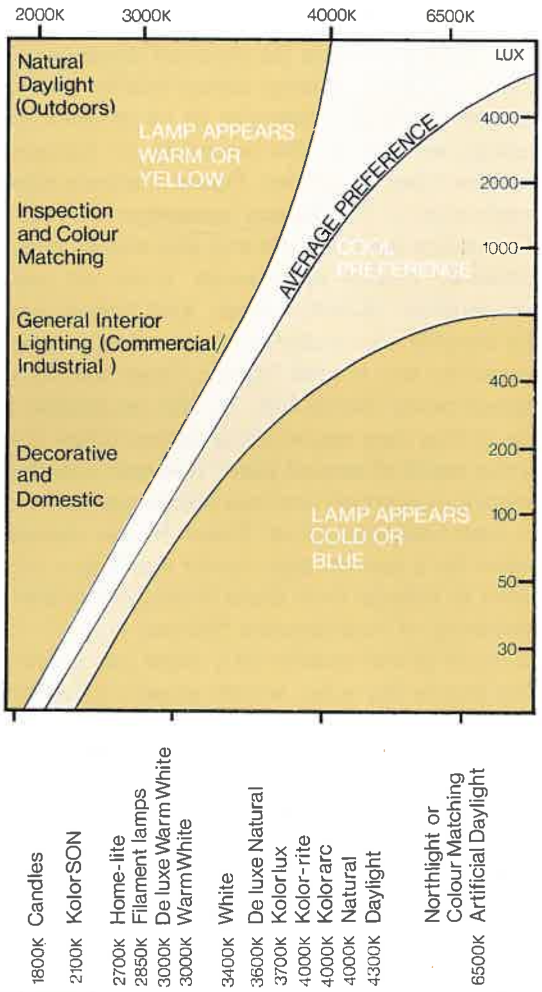


Figure 1

G V McNeill is Product Executive, Fluorescent Tubes, with Thorn Lighting it will be seen that, for industrial and commercial interiors with illuminance in the 300—1000 lux range, tubes of 3500—4000K will be generally acceptable, while in the far lower illuminances found in domestic situations lamps of a lower colour temperature and a warmer appearance are likely to be chosen.

Colour rendering groups

The 1973 IES Code (as reported elsewhere in this issue) recognises the importance of lamp colour quality and contains specific 'colour rendering group' references to 14 different lamp colour and efficacy ratings as part of the schedule of recommendations for lighting various types of interior. Figure 2 shows how the eight CRG ratings applicable to fluorescent tubes can be met by the Thorn range of near-white tube colours and also shows fairly simply the relationship between colour appearance (cool or warm), correlated colour temperature (Kelvin value), and colour rendering quality.

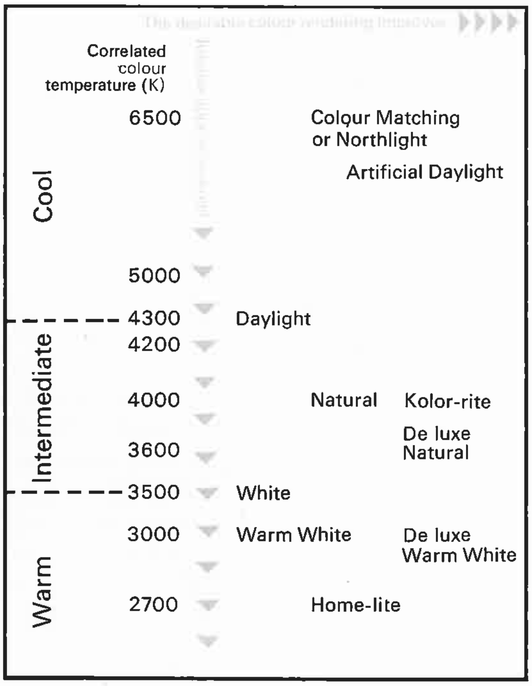
To simplify the problem of choosing or specifying a suitable tube colour for any normal interior, Thorn has now introduced a new tube colour called 'Home-lite'. To add yet another tube in order to simplify the choice may sound like a contradictory statement, but 'Home-lite' is the result of several years' research into the real needs of domestic lighting customers and into the acceptability of existing tube colours. In test comparisons at Thorn House domestic users have usually asked for a warmer tube colour than warm white. The most important point to emerge from these findings was that a close match with the rendering of incandescent filament lamps in the home did not matter as much as the creation of a warm overall atmosphere within a room. The Home-lite tube, which gives a balanced compromise between lumen output efficacy and acceptable colour rendering at low values of illuminance, is the result of allowing for this factor.

Three general purpose colours

With the introduction of Home-lite the choice of general purpose tube colours can be narrowed to three:

1) General and industrial high efficacy—White
2) General and commercial good colour—Natural
3) Domestic and decorative general purpose—Home-lite

For more specialised applications it may still be necessary to select a lamp with specific colour-rendering properties. If a lamp is required to have even better colour rendering than the natural tube but a slightly warmer appearance—to light, for example, a food store—the de luxe natural is the correct choice. The Kolor-rite tube, with a cooler appearance and very good colour rendering properties, is recommended by the Department of Health for lighting hospital wards where the observation of very small changes in a patient's complexion may be a matter of life or death; it is also recommended for lighting picture galleries and is used by a number of portrait painters. Northlight or artificial daylight lamps are essential where really accurate colour matching is required. But for most purposes the rationalisation suggested above is more than adequate, and may do something to solve a problem which has been described in America as 'So What and the Seven Whites'.



COLOUR RENDERING GROUPS
(BASED ON IES CODE)

CRG 'A' Colour Matching or Northlight. (commercial accuracy) Artificial Daylight (for critical colour matching)
CRG 'B' Kolor-rite (for hospitals)
CRG 'C' De luxe Natural (for food displays)
CRG 'D' Natural (Cool White De luxe)
CRG 'E' Daylight (Cool White)
CRG 'H' Home-lite (for social interiors)
CRG 'I' De luxe Warm White
CRG 'L' White, Warm White

Figure 2

four years' progress in stadium lighting

by R C Aldworth

In *Lighting Journal* no. 3 in the autumn of 1969, an article appeared on the floodlighting installation at Molineux Park, home of Wolverhampton Wanderers Football Club. Then the demands of colour television were just beginning to be felt and 224 1000W MBI lamps in 24in diameter M 25 floodlights were used to provide horizontal illuminance of 700 lux. The experience gained on this project gave added impetus to the lamp, fittings and control gear research programme that was already established. This led to the development of two new lamp and fitting combinations: the 1000W CSI PAR64 lamp and OM 1000 floodlight for corner tower installations and the 1600W linear MBIL/H lamp and ON 1600 fitting for side lighting.

The first installations of this equipment went in during the close season of 1970. West Ham's is a CSI system providing 1600 lux on the horizontal plane and 860 lux in a plane at right angles to the camera; Arsenal's MBIL/H side lighting gives 880 lux in both planes. Details of the development of equipment and of these installations were fully reported in *Lighting Journal* no. 6 published in the spring of 1971 and also in *Light & Lighting* and the *British Kinematography, Sound and Television Journal* in June and July 1971. The same issue of *Light & Lighting* also included the latest BBC specification for

R. C. Aldworth is Senior Lighting Engineer of Thorn Lighting.

Tottenham Hotspur's White Hart Lane ground is lit by CSI lamps on corner towers. Spurs won 6-0 on the night this installation was switched on.

colour television lighting calling for 800-1400 lux towards the camera. The Union des Associations Européenes de Football (UEFA) also issued its specification in June 1971, which called for 150 lux to 800 lux plus in the horizontal plane for spectator viewing and 1500 lux (subsequently amended to 750 lux) towards the camera for television and cinema requirements. Details were circulated to all First Division clubs by the Football Association.

If 1971 was the year for lighting specifications, it was a quiet year for new installations, due mainly to the Ibrox Park disaster which focussed the attention of the clubs on ground safety rather than the shortcomings of their floodlighting systems. Nevertheless, 1971 saw the completion of a CSI installation on the main pitch of Mansfield Town Football Club, providing a horizontal illuminance of 300 lux, and a side lighting installation at Southampton Football Club giving 850 lux in the horizontal plane. The Mansfield Town project was of particular interest as it also included lighting for the practice pitch using 16 1600W MBIL fittings to provide 120 lux. These installations clearly demonstrated that both the CSI and the MBIL/H systems could provide an economical solution for high or low illumination according to the club's needs.

Preferred system

The past year has seen the establishment of CSI and MBIL/H lamps and fittings as the preferred floodlighting system at many football grounds, both in the UK and in Europe, and it seems that the majority of clubs are basing their requirements on the UEFA standards for spectator viewing. Matches from grounds with installations giving horizontal illuminance of 400-800 lux from corner towers or side lighting have been successfully televised in colour, but only a limited use of telephoto lenses is possible.

All the CSI installations using existing towers are capable of being supplemented at a later date to meet the full colour television requirements but, in view of the love-hate relationship which exists between the worlds of football and television, it is difficult to predict at this stage whether the leading clubs will upgrade their installations in the future.

A major project which set out from the start to satisfy colour television requirements was at Wembley Stadium. Here 240 1600W MBIL/H fittings have been installed on the existing stub towers on the stand roof to give a horizontal illuminance of 1400 lux and 1100 lux towards the camera.

Table 1 lists UK and European clubs where CSI and MBIL/H equipment have been installed to date. To this must be added a large number of small grounds where from 8 to 16 MBIL/H fittings have been installed to provide low cost horizontal illuminance standards. In one respect, it is unfortunate that the demands for higher illuminance have emanated from the television authorities and associations such as UEFA, as this leads to the assumption that only these bodies can benefit from the improved lighting. Nothing could be further from the truth: increases in illuminance, if achieved by good quality low glare installations, are of considerable benefit to both players and spectators. There is a lot of truth in the old saying "What the eye doesn't see, the heart doesn't grieve over"; a spectator watching a game under inadequate lighting will be aware that 22 men, a referee and two linesmen are involved in a game of football. With any luck the number of goals scored will be apparent. But with increased illuminance and quality, the spectator's appreciation of the finer detail of play is enhanced and, with it, his enjoyment of the sport.

As matches are invariably better supported in the evening than in

TABLE 1

CSI Installations

Football Clubs	*Horiz. Ill. Lux*	*Total Load kW*
*West Ham United	1600	400
*Derby County	880	240
*Tottenham Hotspur	870	220
*Celtic	790	270
Huddersfield	600	190
Amiens (France)	600	180
Bordeaux (France)	580	150
Gien (France)	440	105
Liegé (Belgium)	420	135
*Manchester City	400	120
*Leicester City	400	120
Mansfield Town	300	90
Colchester	200	60
Wrexham	200	60
Grimsby Town	200	60

MBIL/H Installations

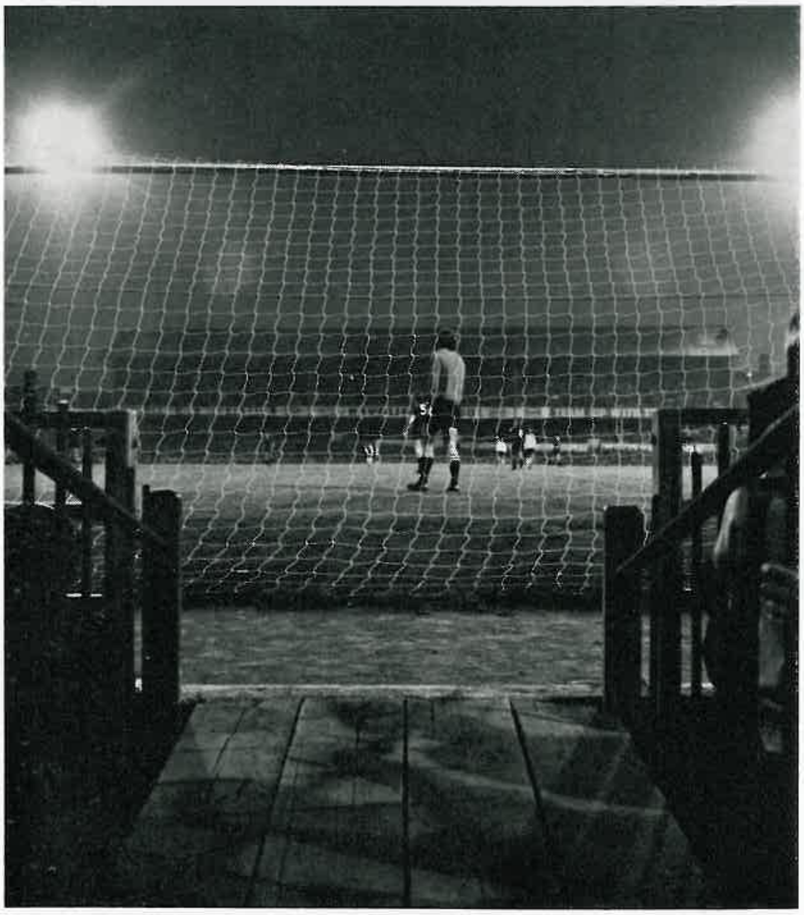
*Wembley Stadium	1400	435
*Arsenal	880	200
*Southampton	850	200
*Luton Town	800	200
*Airdrie	775	170
Morton	580	130
East Fife	350	80

*Games from these grounds have been televised in colour.

The new lighting at Wembley Stadium was first switched on for the Fanfare for Europe match marking Britain's entry into the European Community.

The stadium of Liègeios RFC in Belgium is lit by a four-tower CSI installation which proves ideal also for cycling and other sports.

Each of the eight 30m towers at Luton Town carries twelve 1600W MBIL/H lamps in Atlas floodlight fittings.

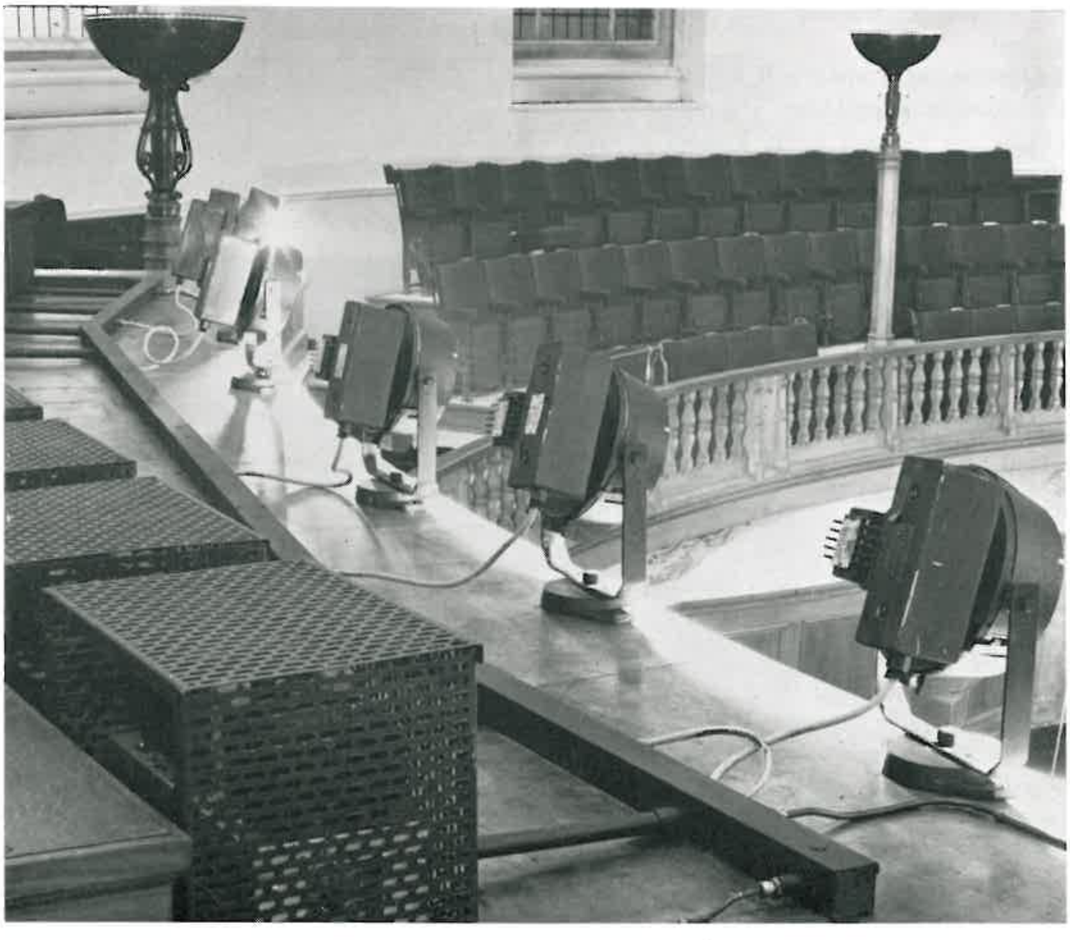


The whole length of the pitch is clearly seen in this view through the goalmouth at Derby County where almost 200 CSI lamps are installed.

daytime, improved lighting could help reverse the trend of dwindling gates at many football clubs—always assuming the football to be worth watching!

In different fields

The application of this new floodlighting equipment is not limited to sports lighting. The 3000-hour lamp life of the 1600W MBIL/H makes it a viable proposition for all forms of industrial and commercial area lighting. The OM 1600 fitting can now also be used with the 750W MBIL/H lamp (5000-hour life) and reflector attachments are available to give wide angle distribution for short range floodlighting. The compact, lightweight CSI lamps and fittings have been used for building floodlighting and their use for decorative floodlighting is described on another page of this issue. Other possible applications include underwater lighting of swimming pools and lighting for filming and television of other sports events. One of the first indoor uses of this lamp to be recorded is in the Assembly Hall at Church House, Westminster, where a permanent installation of CSI to enable proceedings to be filmed and televised for the news media has been installed. In quite a different field, the CSI lamp is being used by motorway police on mobile generators to provide lighting to aid rescue work at crashes and in other emergencies.
In four years, the CSI and MBIL/H floodlighting systems have moved from the early prototype stage to being standard and readily available equipment, which can meet the most exacting requirements of modern floodlighting.



CSI PAR 64 lamps mounted in the gallery of the Assembly Hall at Church House, Westminster.

floodlighting and the CIE

by J D Lovett

J D Lovett is National Technical Sales Manager of Thorn Lighting.

The illumination of public buildings either by lighting their windows or outlining their main architectural features by means of rows of small lamps is of considerable antiquity. St. Peter's in Rome was so illuminated as long ago as the eighteenth century: hundreds of oil-lamps were fixed to the external ribs of the dome and were lit by gunpowder trains fired simultaneously from several places. The technique has persisted in a modified form to the present day although it is now less likely to result in an unforeseen conflagration. The use of white or coloured festoon lighting can often be seen in public parks or gardens and very often on the façades of public houses or hotels.

Floodlighting, that is the dramatic lighting of buildings by means of lamps in projectors mounted on or near them so that they are seen against the background of the night, was not really possible before the invention of the electric lamp. Like so many other lighting techniques, it seems to have originated in America, and, although it was used in a few European exhibitions after the First World War, and notably at the British Empire Exhibition at Wembley in 1925, it did not really catch on in this country until 1931. In that year the CIE Congress was held in London, and a great many famous buildings were floodlit for the occasion. Many of these installations would now be considered very primitive but the idea fired the public imagination and both the Silver Jubilee of George V and the coronation of George VI were made the occasion for floodlighting public and private buildings all over the land.

In the austere years immediately following World War II, floodlighting, except on rare and special occasions, was forbidden. The majority of permanent installations put in before the war were, indeed, in no state to be used without extensive repair and renovation. One of the few exceptions to the general austerity was the annual floodlighting

The importance of directional lighting on a rather flat facade is clearly shown in this picture of Buckingham Palace floodlit for the Queen's Silver Wedding. The scheme incorporated 54 Atlas Haline 1500W floods.

of the Field of Remembrance outside Westminster Abbey by long-range projectors mounted on the tower of Middlesex Guildhall. However, with the relaxation of lighting restrictions in 1950 both floodlighting and decorative lighting were revived and the festive lighting of shopping streets for Christmas was under way by the end of the decade. The beginning of the '60s was the period of the first Son et Lumière shows. Originating in France at the Palais de Versailles and the châteaux of the Loire, these rapidly became popular in Britain and the Thorn Theatre Lighting Division did much pioneer work in this direction, especially in the use of three- or four-coloured fluorescent dimming systems and in the perfection of visual and sound effects automatically controlled by a tape.

National competition in 1974

Permanent floodlighting of important or historic buildings in large cities is now well established. In London, Trafalgar Square, St. Paul's Cathedral, Somerset House and a number of large commercial buildings as well as County Hall and the fountains and island in St. James's Park are now illuminated nightly. The floodlighting of great national monuments such as Canterbury Cathedral or Windsor Castle, although reserved for special occasions, no longer relies on temporary installations and many town halls, public gardens, hotels and other buildings are regularly floodlit all the year round.
A further boost is likely to be given to the floodlighting of public buildings on the occasion of the next London meeting of the CIE in 1974. A national competition is being arranged by the IES and is likely to attract considerable popular interest, and, it is hoped, lead to a number of interesting and unusual installations up and down the country.
The basic principles of floodlighting are well established and were set out in the IES Technical Report no. 6 published in 1964. It is of some interest that all but one of the writers of that report, although then working for different companies, are now with Thorn Lighting—the exception was already working for Thorn. The only major development in the art since this report was published is in the production of several new light sources, giving more accurate light control and a higher light output with better colour-rendering properties than the lamps previously available. A revised edition of this report is at present in preparation.

Major development of light sources

The major development in the last ten years has undoubtedly been in the field of light sources. In the 1930s only filament lamps, high-pressure mercury and low-pressure sodium were available in the standard range of lamps although there were some neon lamps operating at high voltage: these were started with a Tesla coil specially designed for floodlighting. Except for the availability of fluorescent lamps, the situation was virtually unchanged when the lighting restrictions were first relaxed, but in the last decade tungsten-halogen lamps, MBF and MBIF and SON, and linear and compact-source metal halide lamps have become available.
A consequence of these developments is that permanent floodlighting equipment, formerly rather bulky, can now be much reduced in size and very powerful lamps are housed in extremely compact projectors. The equipment designed to house CSI sealed beam and linear metal halide lamps for football floodlighting is already being used for other floodlighting and the Haline range of projectors for tungsten-halogen lamps is also well established. Another very handy lighting tool is the

1 | 2
3 | 4

Floodlighting installations by Thorn Lighting at
1) Park Street, Woodstock, Oxfordshire.
2) Margate Town Hall.
3) Avonen Park, Preston.
4) County Hall, London.

The schemes are described on the following pages.

150W PAR lamp which was used very effectively in the floodlighting of Coventry Cathedral described in the previous issue of *Lighting Journal.*

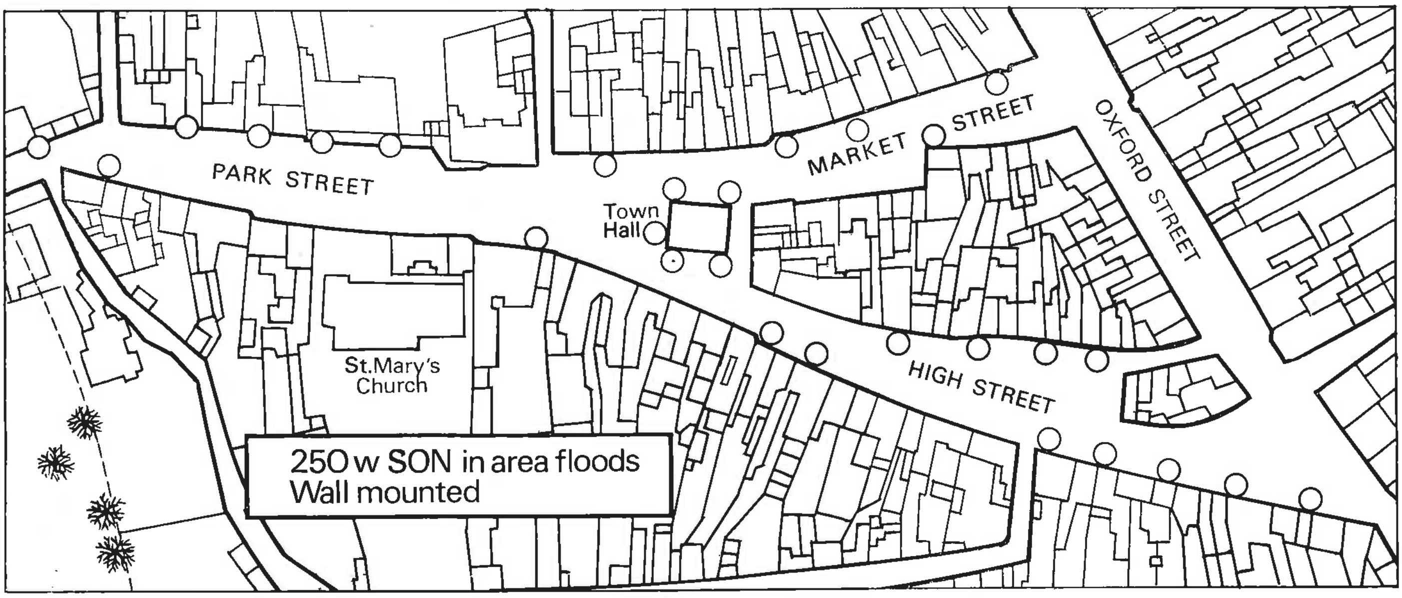
The size, type and number of lamps needed for a floodlighting installation will vary with the effect required, the positions in which equipment will be mounted, the amount of other lighting in the vicinity and the material of which the building or object to be floodlighted is constructed. A very impressive effect can be produced with a small installation when lighting a building in the heart of the country, while to obtain the same prominence in a city square may require several kilowatts of lighting. Similarly, far less light is needed on a clean white stone building than on one which is encrusted with the grime of centuries. Projectors cannot always be mounted in the most convenient place, but recourse seldom has to be made to specially designed equipment, since there is a very wide range of standard floodlighting lanterns available. Sometimes the whole of a building does not lend itself to floodlighting, but a feature such as a tower or even a rebated upper storey may be picked out to good effect. The possibilities of floodlighting to improve the amenities of towns and cities are almost limitless, and the most charming or impressive effects need not necessarily be the most expensive.

The following paragraphs describe the installations illustrated in colour on pages 16 and 17 and on the cover. They range from the very elaborate scheme designed for County Hall, headquarters of the Greater London Council, to that of the small but elegant Town Hall at Margate. The importance of environmental lighting is seen in the lighting scheme at Woodstock and the charm of garden lighting in the Preston installation. In all cases but one a plan of the installation is included. A permanent installation will be put in this summer at Thoronet Abbey and it is hoped to give details of this in a subsequent issue of *Lighting Journal.*

Park Street, Woodstock

When Woodstock Corporation decided to provide better lighting in those streets of the borough for which they were responsible, they asked Oxfordshire County Council to design a scheme which would enhance the beauty of their ancient town as well as providing better seeing conditions. The resultant scheme, which embraces High Street and Market Street as well as Park Street (pictured on page 16), has aroused considerable local interest as well as that of the Council for the Preservation of Rural England and the Royal Fine Arts Commission. The light from the SON lamps blends well with the warm Cotswold stone and the painting of the fittings to match their

One of the Atlas area floods on the corner of the Town Hall at Woodstock.
The location of the lights is shown on the plan.

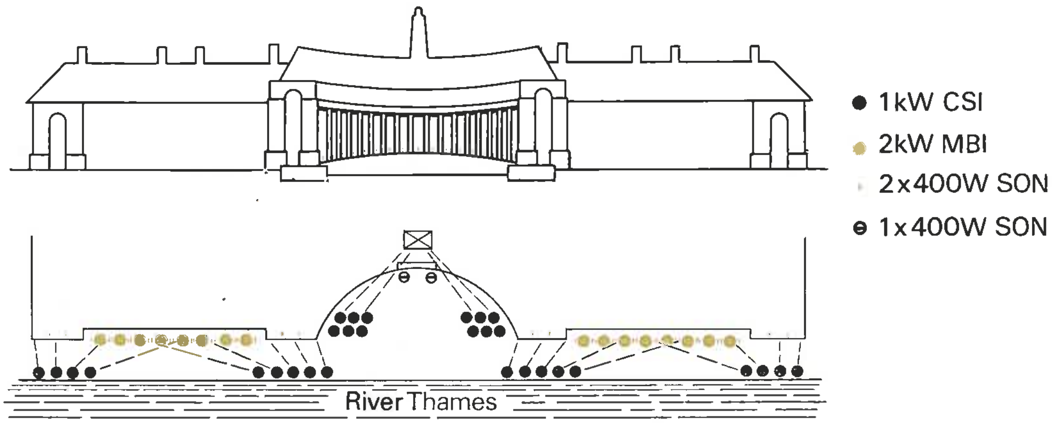


backgrounds has made them completely inconspicuous by daylight, while the street is now better lit than it was formerly by a conventional tungsten filament installation.

With the active co-operation of the residents, the scheme was achieved without lampposts by mounting 28 250W SON lamps in Atlas OAS area floodlights at an average height of 8m on the front of houses. A staggered layout was used but where the carriageway and footpath was in excess of 30m it was necessary to mount fittings opposite one another. Wiring is in MICC cable and control gear and time switches are housed in the gear boxes at the backs of the fittings.

The scheme was designed by the Director of Planning and Highways for Oxfordshire County Council and carried out by the Southern Electricity Board.

Sketch plan of County Hall to show arrangement of projectors



County Hall, London

Because London's County Hall is very close to the river, mounting floodlighting equipment at a reasonable distance from the façade presented a number of difficulties. Conventional projectors on the river wall would have been very unsightly; furthermore, except in two places, the wall is too low to avoid glare to people on the river walk.

The use of the very compact CSI lamps was an elegant solution, and it was even possible to mount them on the dolphin lamp standards which are an important feature of the river walk. Thirty-one lamps in OM 1000 housings are mounted on the two raised sections of the river wall, on the edge of the terrace wall in front of the central colonnade, and in pairs on four of the dolphin lamp standards. Their function is to cast a glancing light across the main façade and the faces of the columns and to light the central flèche and the chimney stacks which are important architectural features of the building.

The rest of the installation consists of high-pressure SON/T and metal halide (MBI) lamps used individually and in combination lighting the recesses in the pavilions flanking the central colonnade and at the ends of the building. They also light the areas between the columns of the colonnade and the two flanking walls continuing the line of the central terrace. Where used in combination the floodlights are arranged in sets of three, a projector housing two 1kW MBI lamps being flanked by two each containing two 400W SON/T lamps with clear cylindrical outers. The total loading is approximately 140kW.

The lighting and electrical installation designs were prepared by members of the Electrical Services Division of the Greater London Council's former Department of Mechanical and Electrical Engineering under its director, Mr C. A. Belcher, CEng, FIEE, in collaboration with the staff of the architects to the council.

The diagram explains the general lighting scheme at County Hall. CSI lamps mounted on the dolphin lamp standards and on the river wall provide the highlights.

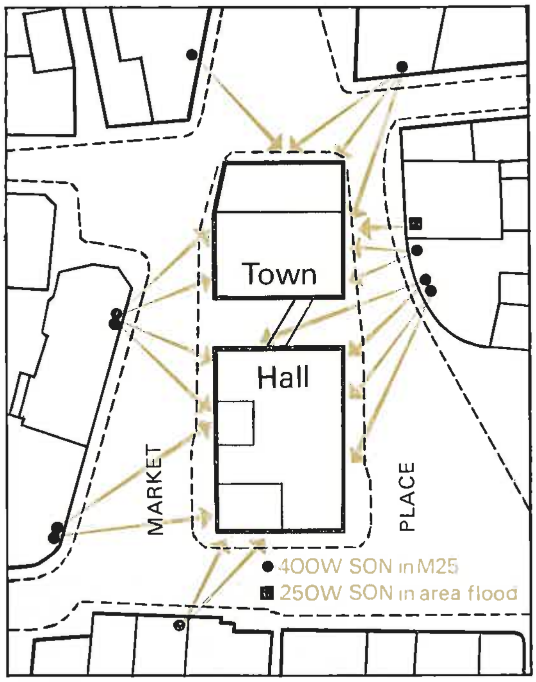
Margate Town Hall

Main floodlighting of the old town hall at Margate is by nine 400W SON lamps mounted in Atlas M 25 projectors and a 250W SON area flood fixed to the walls of buildings surrounding the Market Place. Extra lighting on the clock-tower and the cupola supporting the weather-vane is provided by ten 150W Atlas Mini-floods with green and gold Color-ray lamps, while an 80W mercury lamp housed in a well-glass fitting lights the inside of each of these features.

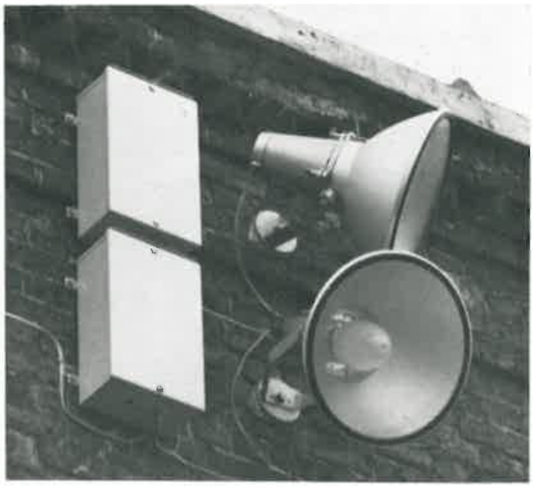
Average illumination on the walls of the building is 50 lux and the total load is 6.06kW. The projectors are individually controlled by time switches mounted in the gear-boxes.

A remarkable feature of this installation is that although the original quotation was not made until 5 December 1972 all lamps and equipment were installed and working in time to mark the entry of Britain into the Common Market on 1 January 1973.

The scheme was designed and executed by Margate Public Lighting Section under the direction of Mr George E. Sewell, CEng, MICE, FIMuE, MRTPI, Borough Surveyor and Director of Technical Services to Margate Corporation.



The plan above shows the location of Atlas M 25 projectors on buildings surrounding the Town Hall. Two, each containing a 400W SON lamp, are seen with their control-gear boxes.



Thoronet Abbey

The dramatic floodlighting effects at Thoronet Abbey, shown on the cover and on the page opposite, were obtained by 400W Kolorlux lamps mounted in Atlas OAR 400 area floodlights. A single CSI lamp in an Atlas OM 1000 housing was used to pick out the bell tower.

Thoronet is one of the oldest Cistercian abbeys in France, having been founded in 1146 under the patronage of the Compte de Provence. It is visited annually by thousands of tourists and is maintained by the French Government.

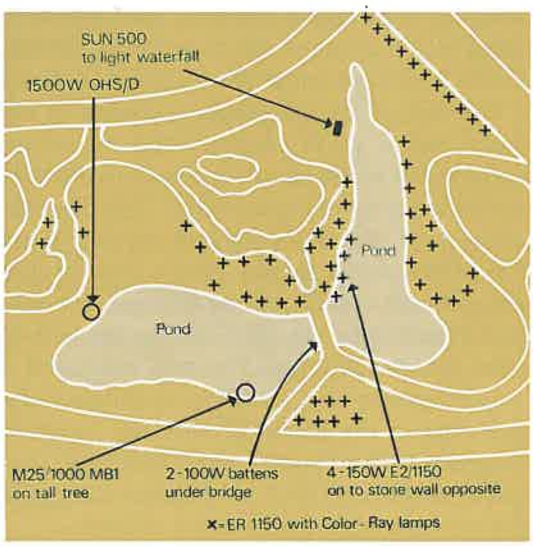
Very dramatic effects were achieved by simple means, as may be seen from the photograph opposite, where a single area flood was used to illuminate the West Front of the ancient church. The cloister shown on the cover was lit by three floodlights, each lighting a different wall of the quadrangle; one of these housed a 400W SON lamp. Two projectors housing SON lamps were also used to light the inside of the church.

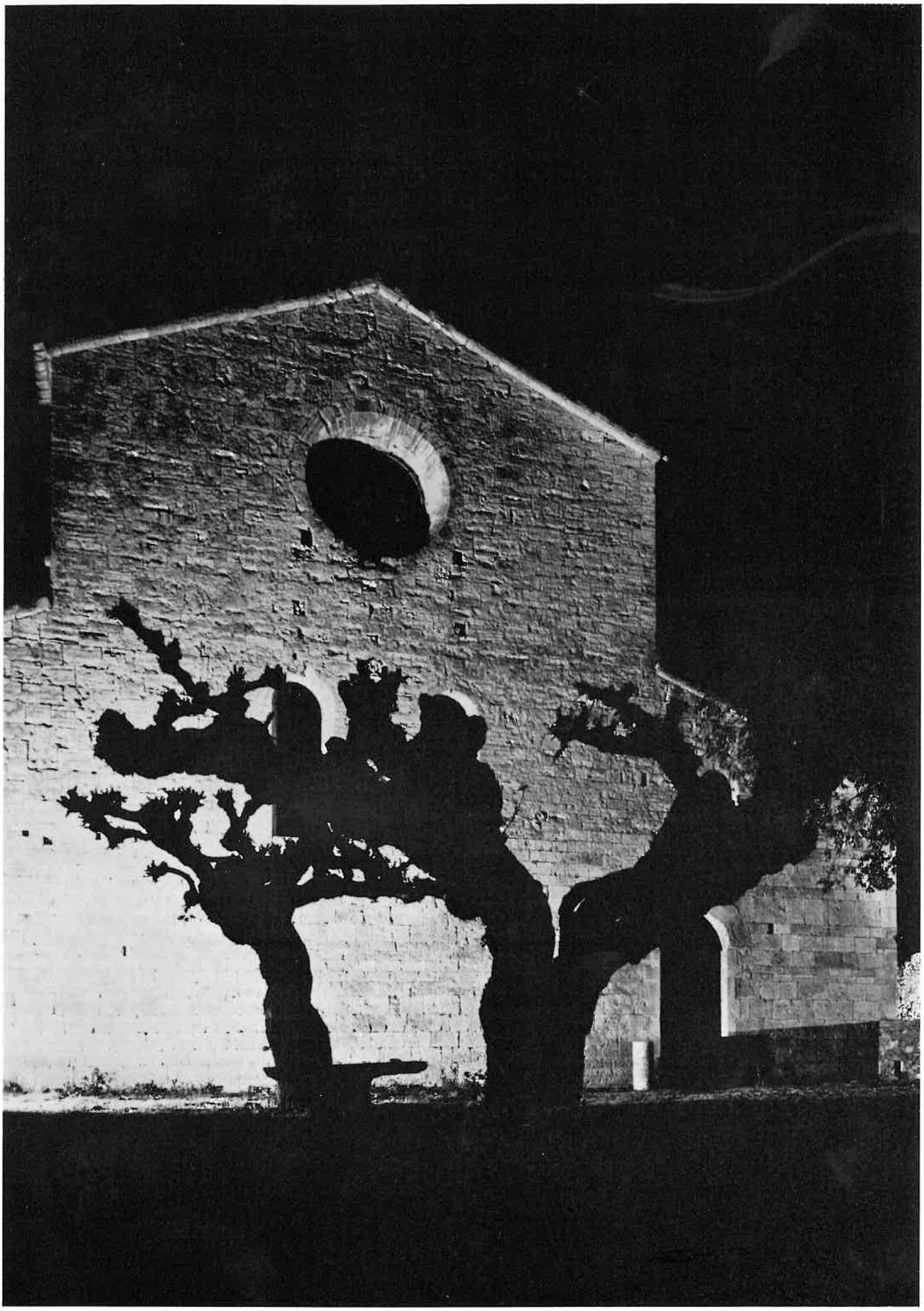
Rock Gardens, Avonen Park, Preston

The greater part of the installation consisted of 150W Color-ray lamps in ER 1150 housings, each of which was provided with a long flexible lead and a soil-spike so that it could be moved if necessary. The positions shown on the plan are only approximate. The front face, rear or undersides of bushes had to be lit with the appropriate colour; some fittings had to be hidden behind rocks or angled to avoid direct glare to onlookers and this had to be done on site after night had fallen.

A tall tree was picked out by a 1kW MBI lamp in a M 25 projector and a SUN 500 was used to flood the waterfall from the other side of the pond. Two 100W lamps on batten holders were used under the bridge.

The total load in the park was 24kW; that in the area shown on the plan approximately 12kW.





The slalom track at Dundret in Sweden, lit by Kolorlux lamps in M 25 fittings. Each of the 24 columns carries four narrow-beam and two dispersive fittings.

Lighting ski slopes

by Bernth Jansson

To us in England who associate skiing with the sunny slopes of the Swiss or Austrian Alps, the idea of lighting them seems a little bizarre. But the slopes described in this article are not in the Alps, they are in the far north of Sweden, indeed within the Arctic Circle. Here it is dark for the greater part of the time during the winter and, without lighting, skiers would be unable to exploit the otherwise perfect conditions available.

Lighted ski-slopes are indeed to be found in other areas, such as Canada and the USA, where their use can thus be extended well into the night; but slopes which are used for the greater part of the time under artificial light are less common, since men do not live so far north there as in the Scandinavian countries. So for the Swedes modern lighting has extended their enjoyment of winter sports to a very marked degree. There are ski slopes and ski jumps in Scotland; perhaps there too the use of lighting might well allow their use in the short days of mid-winter.

The article which follows is written by the Chief Lighting Engineer for Thorn Belysning AB who designed the schemes he describes: his command of English is as remarkable as his engineering skill and puts most of us, who speak only our own language and that often imperfectly, to shame. (*EDITOR*).

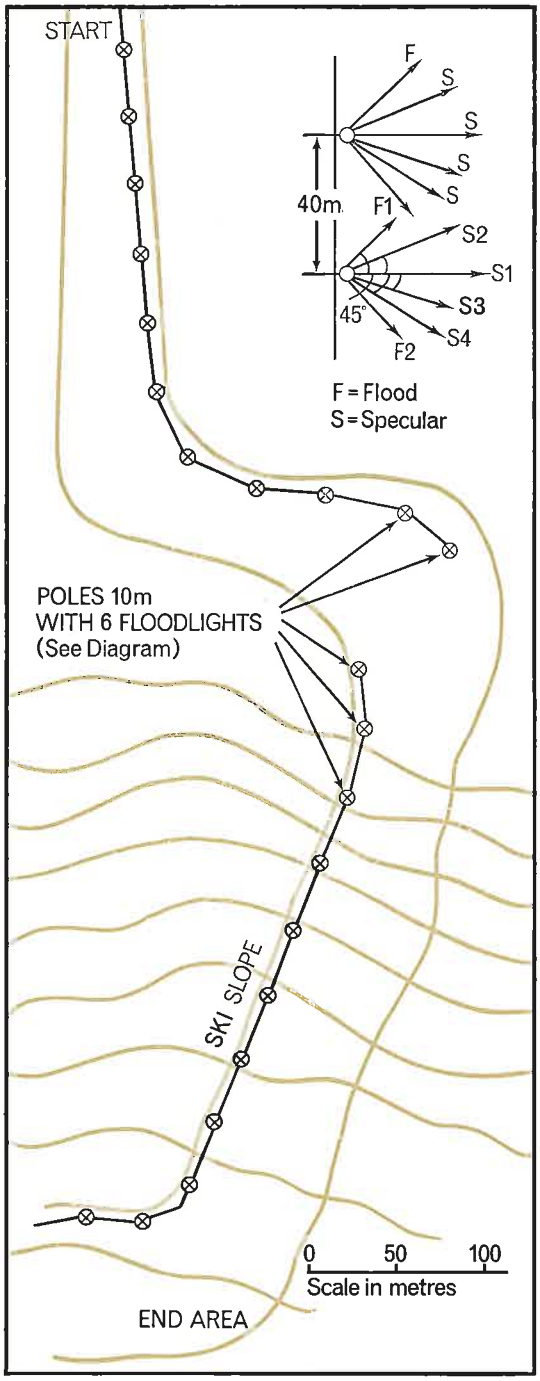
Floodlighting layouts for slalom tracks must be individually suited to each project and properly adapted to the character of the slope. The work must start with a study of a detailed topographical map showing altitude curves. Then the slope should be inspected, preferably while it is covered with snow, so as to obtain the most accurate information about the track in use. When the fittings have been mounted they must be individually set, fitting by fitting, pre-preferably while skiers use the track and report their observations in order to obtain a realistic appraisal of the ideal light distribution. It is important to bear in mind that skiers tear down at great speeds and inadequate or unsuitable light can lead to serious accidents on the slalom tracks.

Thorn, Sweden, has projected and supplied a floodlighting installation for the slalom track on Dundret, a mountain at Gällivare in northern Sweden. This track is about 1000m long and has an average width of 60m. Two thirds of this strip is lit during the dark evenings of the season for the convenience of the skiers.

The installation comprises M 25 Junior fittings equipped with Kolorlux (MBF) 400W lamps. The columns are 10m high and each column carries 6 fittings (4 narrow beam and 2 dispersive fittings). The dispersive fittings light the area close to the columns while the narrow beam fittings light the far side of the track. In this way it has been possible to light a 40m wide track. Average illumination of the topmost 400m of track is about 50 lux and for the remainder approximately 65 lux. There are 24 columns along the track placed on the right side of the upper and on the left side of the lower part. This arrangement is explained by a sharp turn to the left at the top and another to the right further down. The spacing (distance between the columns) is 40m and the fittings light up an area about 15m uphill and 25m downhill from the column.

On each column there is a gear box of galvanised sheet steel, housing ballasts and capacitors. The fittings are individually fused to prevent a short circuit in one cutting out all the others on the column concerned.

When the lighting installation was projected, fears were expressed that the skiers would be blinded by light directed uphill. However, when the fittings were set up and various directions of light were determined, practical tests proved that this fear was unfounded.



Plan of slalom course at Dundret

On the contrary it proved necessary to direct some light uphill in order to bring "life" to the surface of the slope. This reveals irregularities of the ground surface that the skiers have to notice and be prepared for in order to manoeuvre safely down the track.
The fittings of each column are set in such a way that one narrow beam (S_1) is directed at right angles straight across the track towards a point about 35m from the column; one narrow beam (S_2) is directed 20-25° uphill in relation to S_1 towards a spot 25m from the column. The two other narrow beam fittings (S_3 and S_4) are directed 15° and 30° respectively downhill towards spots about 30m from the column.
Of the two dispersive fittings one (F_1) points about 45° uphill and the other one (F_2) about 45° downhill. This arrangement produces a fairly even illumination with certain shadow effects, an advantage as these vary and increase the visibility of the track surface.
In all, the installation comprises 144 M 25 Junior fittings. The load is 61kW, the total light output is 3,400,000 lumens. The installation has been in use for one season and according to the general opinion of interviewed skiers the lighting is very good. The track has been approved by FIS (Fédération Internationelle de Ski) for international events.

Lighting ski jumps

Another extremely interesting installation has just been completed close-by near Kiruna. This is the lighting of two ski jumps at Malmstabackarna. Here the highest illumination is needed at the jumping-off point and furthermore there must be absolutely no glare to distract the jumpers as they approach the end of the run.

The approach slopes are lit by 500W and 1000W tungsten-halogen lamps in Thorn Haline floodlights mounted on 4 m posts at 20m intervals on either side of the run. In the jumping area three 23m posts carry two, three and four ON 1600 floodlights, each housing a 1600 MBIL lamp. The recovery area is lit by 1000W Haline floolights on 10m posts.

The average horizontal illuminance on the approach and recovery areas is from 250–300 lux and in the jumping area it approaches 500 lux, 40 % higher than the recommended value. The colour of the MBIL/H lamps blend excellently with that of the tungsten-halogens.

The ski jump at Malmstabakarna, Kiruna

aluminium lighting columns

by P D Gunnell

Introduction

The ever increasing volume of traffic on our roads and motorways has led to many more of them being lit to increase safety margins and thus to encourage night-time use. It has already been established that good lighting saves lives and this has been borne out by a recent survey which concludes that 30% of night-time accidents could be prevented by the installation of street lighting. However, lighting columns themselves are a potential accident hazard. Experiments carried out in recent years by the Transport and Road Research Laboratory have resulted in the manufacture of light-weight columns with breakaway bases; and these are now becoming available as an alternative to the very much heavier concrete and tubular steel lighting columns commonly used.

This article describes the background to the development of Group A columns to meet the demand for a safe, durable and more economic column to BS. 3989.

Prototype steel columns with breakaway bases were first produced by Thorn, but it was decided that further safety factors could be embodied by the use of aluminium. Such columns are already commonplace on the continent and in America so that there is plenty of information available on economics, safety aspects and field experience.

Against the background of work done by the TRRL and others, Thorn Lighting, in association with the British Aluminium Company, has utilized the energy absorbing characteristics of aluminium to design lighting columns that will minimise injury to the occupants of a vehicle on impact.

Safety factors

In 1969 there were 5446 injury accidents involving vehicles hitting lighting columns. In 1970 the figure rose to 6100 causing 330 deaths.

Mounting lighting columns away from the kerb's edge has been advocated to give drivers a chance to regain control or stop safely without colliding with a column. In several countries it is the practice to move all street furniture away from the kerb edge leaving an obstacle-free area termed 'forgiving roadside'. However, since it is not possible to follow this practice in many situations and, because it leads to excessive and unsightly bracket outreaches to achieve light over the roadway, it has been made mandatory in America that on routes subject to government loan use must be made of lightweight aluminium breakaway designs. The design incorporates a base-mounting arrangement which fractures upon impact and allows the pole to fall. No secondary accident caused by falling or fallen poles is reported, and the New Jersey State Highway Department reports that in some 3000 cases of vehicle collisions with these aluminium columns over the past seven years, not a single fatality has occurred.

P D Gunnell is Manager, Outdoor Lighting Division, Thorn Lighting

Experiments carried out by the TRRL bore out these American reports and proved conclusively that under impact conditions the greatest damage was sustained by vehicles in collision with concrete lighting columns, with less damage from tubular steel and tapered sheet steel columns. Following these tests a column with a frangible joint was developed which sheared on impact at the base mounting.

Economics

The initial cost of aluminium columns is greater than that of steel or concrete but is more than offset by savings in installation and maintenance costs and higher recovery value. Experience has shown that these lower costs have more than compensated for the marginally higher purchase price shown in the table of annual costs of aluminium and galvanised steel columns. Since aluminium columns weigh approximately a third of the steel type an additional saving in cost, not shown in the table, would apply to initial installation and replacement of damaged columns, as lighter equipment can be used for handling them. Moreover, the current scrap value for aluminium is approximately £11 for a 12m column compared with £2 for steel. A concealed cost, not usually considered, is the obstruction to traffic when repainting steel columns. Painting costs can be assessed by assuming a service life of ten years for galvanised steel columns and painting every five years (three coats) after the first ten-year period. Four painting operations would thus be required during the steel column life of 30 years. Concentration on reduction of capital outlay often leads to paint or other protection for steel columns being added as an after-thought and results in heavy maintenance charges. These are frequently met by a different authority from that responsible for the capital outlay.

Corrosion and protection

It has been estimated that in the United Kingdom the cost of corrosion is £1365 million a year and that a saving of £310 million could be achieved by better use of materials and manufacturing techniques and the more fruitful direction of research and development. The figure includes the cost of preventing corrosion, the expense in plant and labour for maintenance and the over-design of equipment to allow for the effects of corrosion.

New British Standard specifications are now being prepared to cover all types of lighting columns and these impose more stringent requirements on materials. Knowledge and experience of corrosion phenomena collated by many authorities for different materials and finishes are likely to lead to a greater use of aluminium. Since steel columns are often stored in the open and later painted without adequate surface preparation, there is often insufficient control and inspection of painting to ensure that the specified treatment is applied. A common problem in column maintenance is the lack of shelter when columns are being painted, important when it is realised that the weather in Britain is suitable for the application of paint for only about half the year. This difficulty is eliminated by the use of aluminium.

Aluminium does not require protection from normal atmospheres due to the presence of a thin but hard and adherent natural oxide film on the surface of the metal, which immediately reforms if damaged so that superficial weathering in no way affects the structural integrity of the column. In normal situations this is self-stifling, resulting in the formation of a protective patina, which in mild atmospheres merely dulls the surface although in severe environments it can become rough to the touch. Weathering

	Galvanised steel	*Aluminium*
Average cost per 12m column with bracket	£50	£68
Maintenance cost-painting (3 coats every 5 years after initial 10-year period) based on 30-year economic life	£36	—
	£86	£68
Less salvage value	£ 2	£11
	£84	£57
Annual cost per column over 30-years' life	£2.80	£ 1.90

*The Price of Steel Columns is based on the design requirements of DOE Technical Memo. BE4/72 to which all columns qualifying for a grant must now comply.

Table of annual costs of steel and aluminium columns is completed in a relatively short time after which, as shown by the graph, no significant action takes place. Aluminium can be adversely affected by damp concrete and some soils, but as specified in BS. 3989 this is prevented by the application by the column manufacturer of a thick protective bituminous or other suitable compound to the base.

Design development and test

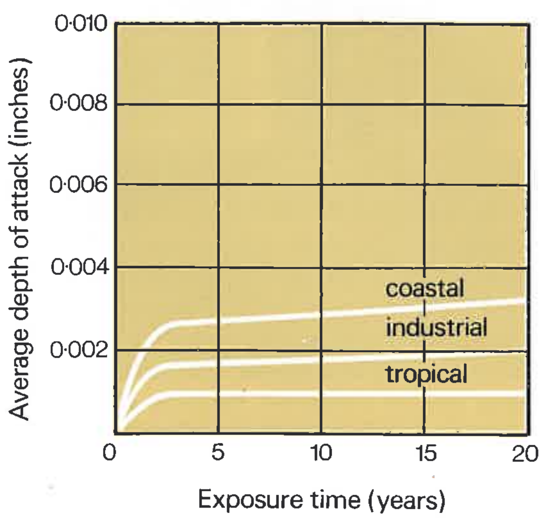
It is often difficult to introduce new products and techniques because of the conservatism of the user. Claims made for a new product may prove too optimistic owing to insufficient development and this can cause problems. Moreover, the lighting column industry is highly competitive and few suppliers are willing to finance the development work for a new design in aluminium which will require the services of structural engineering consultants, manufacture of costly prototypes and the heavy expense of a complete structural test programme. The development work for the columns illustrated in this article was carried out jointly between Thorn Lighting and the British Aluminium Company. Thorn manufactured the prototypes and carried out load tests and British Aluminium provided the structural consulting engineering facilities and design calculations together with the specialist strain gauge stress survey.

The first aluminium columns were made up from straight lengths of tubing followed by the tapered octagonal shape which is now widely used. Other methods of manufacture include the joining together of decreasing sizes of extruded tube to give a tapered effect and of the continuous tapering of drawn tube.

In the Thorn columns for 10m and 12m mounting height designs based on the use of tube, extruded sections and sheet material were considered. After a lengthy series of tests on prototypes, a column formed from alloy sheet into an octagonal section profile of constant taper was evolved. Alloy NS4 to BS. 1470 was chosen because it is particularly resistant to corrosion.

Although the basic column material is as stated above, full use has been made of other forms of durable aluminium so that the complete unit incorporates a number of drawn, extruded and cast components, resulting in a straightforward functional and uniformly corrosion-resistant product.

Once the basic octagonal section design of the column had been decided on, further proving tests were carried out on a number of 12m and 10m units. The criteria used were as stipulated in BS 3989 : 1966, Aluminium Street Lighting Columns, and employed the limiting stresses specified in CP 118 : 1969 The Structural Use of Aluminium. The columns, when tested, fully met all the requirements of the standard.



Average depth of pitting on test panel of NS4 alloy

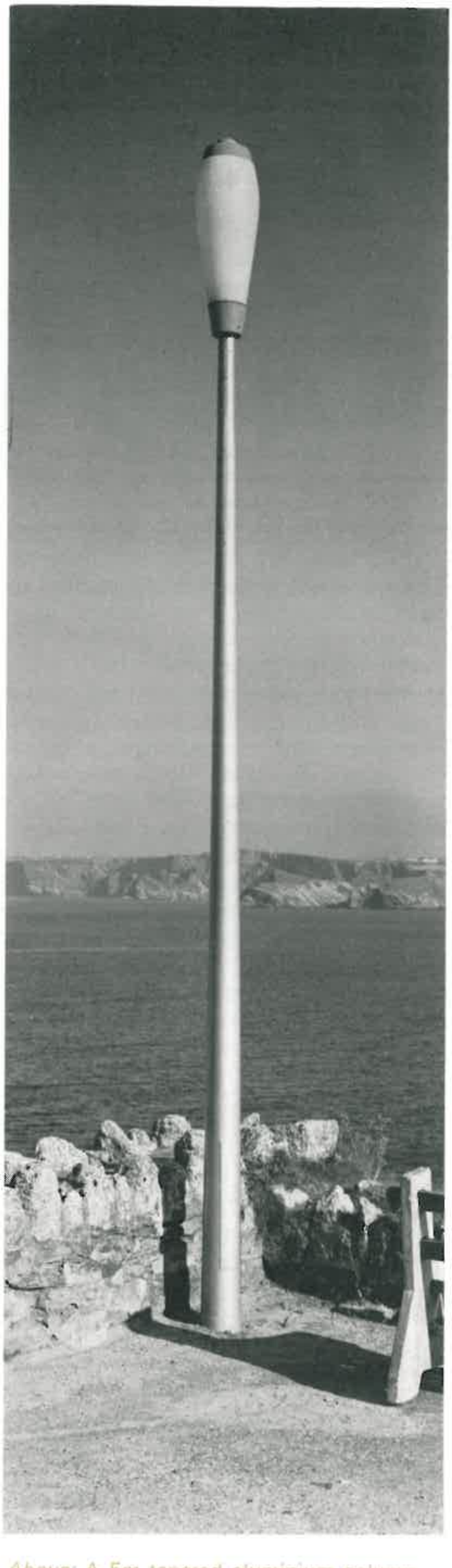
Close-up of a 14-year-old aluminium column before during and after cleaning with soap and water. Note bitumen coating above ground level and potential corrosive water traps around base.

Particular attention was given to the design of the joint between shaft and bracket arm. The final form of this design gives an extremely strong joint while allowing single outreach brackets to be located in any one of four directions and double outreach arms in two directions.

Conclusion

Concrete lighting columns, although they need little or no maintenance and are inexpensive to manufacture, constitute a serious accident hazard. Steel columns are better but they present maintenance problems since they require repainting every five years and are liable to corrosion. The use of aluminium columns greatly reduces the likelihood of a fatal accident caused by impact and their negligible maintenance costs more than compensate for a rather higher capital outlay.

Good design of the columns and close attention to details such as the joints between columns and bracket arms have resulted in a column which will pass the most rigorous tests. The collaboration of Thorn Lighting and the British Aluminium Company has produced a product which will meet all the requirements of lighting engineers and Government departments.



Above: A 5m tapered aluminium column in a coastal location. *Left:* A 10m aluminium column with 2m bracket for Group A lighting.

the IES Code 1973

by A M Marsden MSc PhD CEng MIEE FIllumES

In 1936 the IES issued its Recommended Values of Illumination and in 1941 the first IES Code. Revised editions of the code have appeared every five or six years since, the 1973 edition replacing that issued in 1968. Why does a code have such a short life? The general answer is change: in the early years of the code's history, an increase in fundamental knowledge about light and vision; in the post-war years, a change in the sheer quantity of light that people expected and its economic realisation through the new fluorescent lamp; in the late fifties, the possibility of expressing in quantitative terms both discomfort glare and the integration of electric light with daylight; more recently, advances in filament and discharge lamp technology, an appreciation of several new quality aspects of lighting and the integration of lighting with heating.

Questionnaire circulated

The 1973 code panel had to start its work by examining the short-comings of the 1968 edition, and, although users were already strongly represented on the panel, it was decided to obtain the views of a larger group by circulating a questionnaire. More than 100 copies were returned by users representing a wide variety of occupations (consultants, contractors, lighting engineers, works engineers, etc) and several replies came through the Engineering Equipment Users' Association from large organisations such as the CEGB, Unilever and ICI.

The survey showed that the code was used extensively, its illuminance recommendations widely followed, but its glare recommendations far less so. Despite this difference in the use made of the illuminance and glare recommendations, opinions on the general suitability of both of them were both about 4 to 1 in favour. Of the dissenters, more felt that illuminance values should be increased rather than decreased and more felt that glare control should be relaxed rather than tightened.

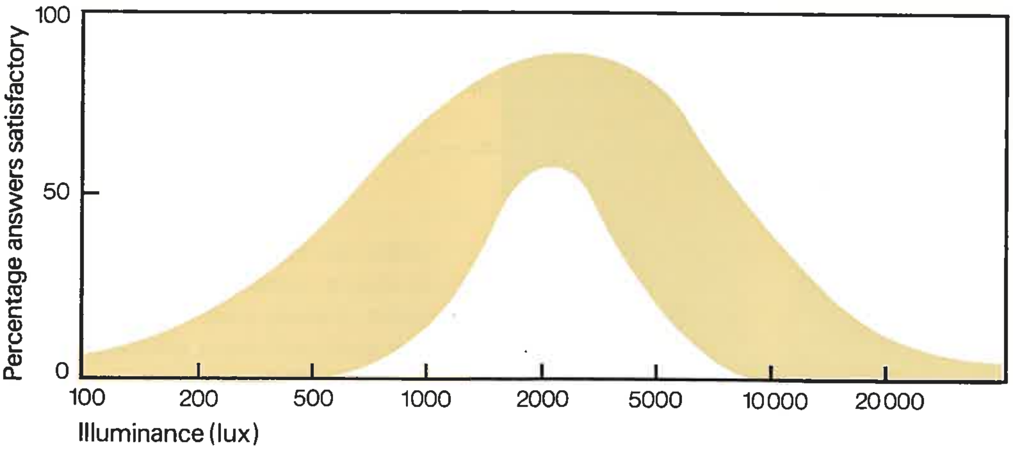
Users were invited to suggest what additional information would be welcome in the new code, and several specific topics which the panel was already considering were listed. The suggestions aggregated to the equivalent of the American IES Lighting Handbook, but the most popular demands were for more guidance on colour appearance and colour rendering, on lighting design methods, on emergency lighting and on matters environmental (windows, heating, noise, etc).

Armed with the outcome of the opinion poll, the panel set to work, having established four general principles with regard to content:

a) With the possible exception of any appendices, the new code would be intelligible to the non-specialist, a more extensive use being made of line diagrams to illustrate principles.

b) IES technical reports would be regarded as essential companion

Dr Marsden is manager of the Lighting Research and Development Laboratories of Thorn Lighting



The data from ten investigations provided the coloured area showing preferred illuminances for working interiors. This and the following diagrams are taken from the new IES Code.

documents, being used continuously as references for detail.
c) Part I would consist of a series of sections dealing with lighting principles, general recommendations being made at the end of each section.
d) Part II would consist of design data, with specific recommendations for particular interiors and activities incorporated in the body of the traditional table of illuminance values.

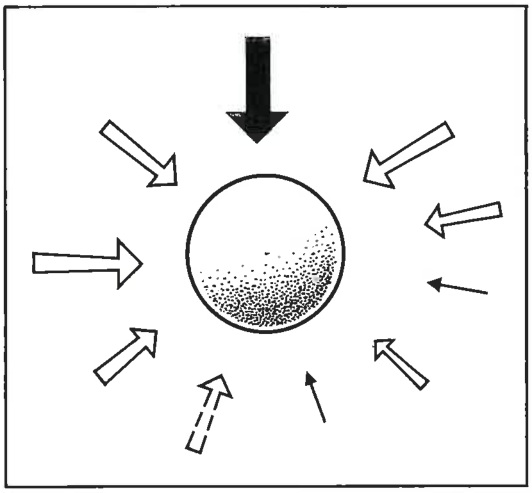
Quantity recommendations

Illuminance recommendations are the hottest potato any code panel has to handle. There are inevitably discussions with people who can comment through their experience on the existing recommendations for particular industries, which result in local changes being made relative to the whole schedule each time a new edition of the code is produced. But successive codes show that overall changes also take place in illuminance recommendations, and these have always tended to be in the upward direction, sometimes large and sometimes small. In this context it has to be remembered that lighting recommendations do not always lead lighting practice: sometimes they follow when practice is seen to be good.
In assessing the general situation about illuminance values the panel noted that a considerable amount of recent research into subjective preferences has shown that when people are given the opportunity to choose their working illuminance they inevitably select a higher value than is strictly necessary on performance grounds. It was noted also that it has become commonplace for new open plan offices to be provided with between two and three times the illuminance recommended in 1968. It was concluded that the time had come to recognise (and to state explicitly in the code) that preference as well as performance would be used as a basis for illuminance recommendations, even for some working situations. However, it was felt that the multi-thousand lux values shown up by experiments were unrealistically high to be applied immediately.

No large all-round increase

As far as overall changes were concerned, it was felt that in the light of users' reactions to the existing recommendations and the current ecological debate, no large all-round increase in illuminances could be justified. A decision had to be taken, however, as to whether or not the IES should use one of the preferred sequences of illuminance values recently accepted by the CIE for incorporation in its Interior Lighting Guide. It was felt that this should be done. Since several of the CIE values over 100 lux lay between the 1968 IES values, rounding-up or rounding-down was involved: more frequently than not there seemed more justification for the former.
At the same time it was felt that the practice of recommending an increase of illuminance for older workers should be discontinued.

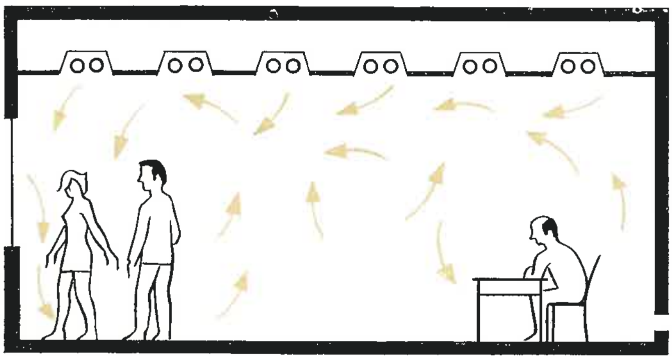
Even a doubling of illuminance at current levels produces very marginal improvements in performance. The panel was conscious that there are serious social implications in requiring special environmental features wherever older people are employed.
It was also decided to drop the word 'minimum' from the description of recommended values. Although this is denied in the text of the 1968 code, the word minimum is liable to be taken as implying that at no point in time should any part of the area being lit be illuminated with fewer lux than is recommended, otherwise disaster will strike. The new code would quote a 'standard service illuminance'—the average value to be provided over the relevant area, averaged over the maintenance period, and this should be recommended as representing good current practice with no suggestion that it is either an optimum or an essential minimum. Two other innovations would be introduced: first, the position of measurement of illuminance would be specified for each entry in the schedule and, secondly, for the lighting of circulation areas a scalar illuminance value would be specified rather than the illuminance on a hypothetical working plane.

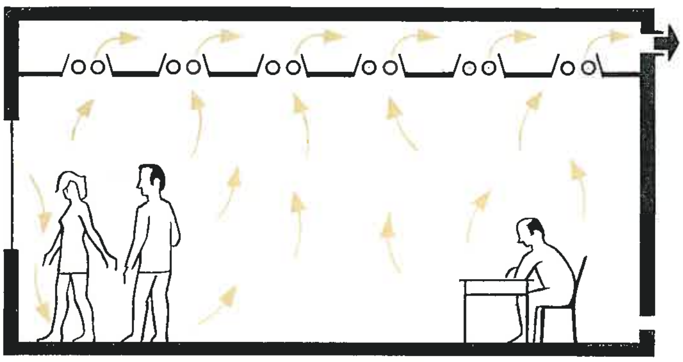


Scalar illumination takes account of light falling on an object from all directions (IES Code p.11)

Quality recommendations

When it came to the subject of quality recommendations, the panel was faced with the embarrassment of Appendix 3 in the 1968 code, where developments were reported in interior lighting design, including vector/scalar and luminance ratios. It had been hoped that these would be made the subject of experiment in lighting practice to enable appropriate recommendations to be made in future codes. Regrettably, very little activity had taken place on these two topics and the panel was therefore unable to translate most of the notions in this 1968 appendix into 1973 recommendations.
More bite was to be introduced into the general recommendations about the distribution of illuminance and the reflectances for the bounding surfaces of working interiors. An appendix on directional effects in lighting would be prepared. Glare recommendations would continue to be given in the general schedule, with some local adjustments up or down from the 1968 values as a result of discussions with knowledgeable users.

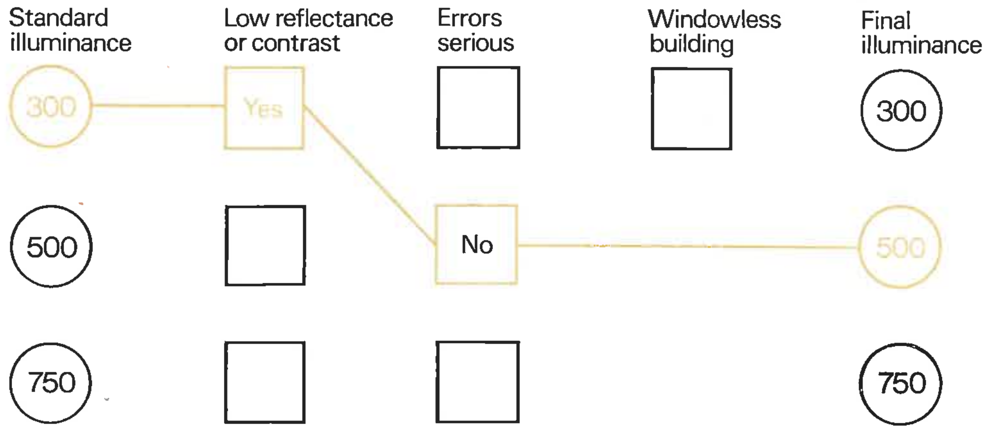




On the left is shown the random circulation of air in a typical office; the effect of extracting air through the luminaires is shown on the right. (IES code p.36)

New information

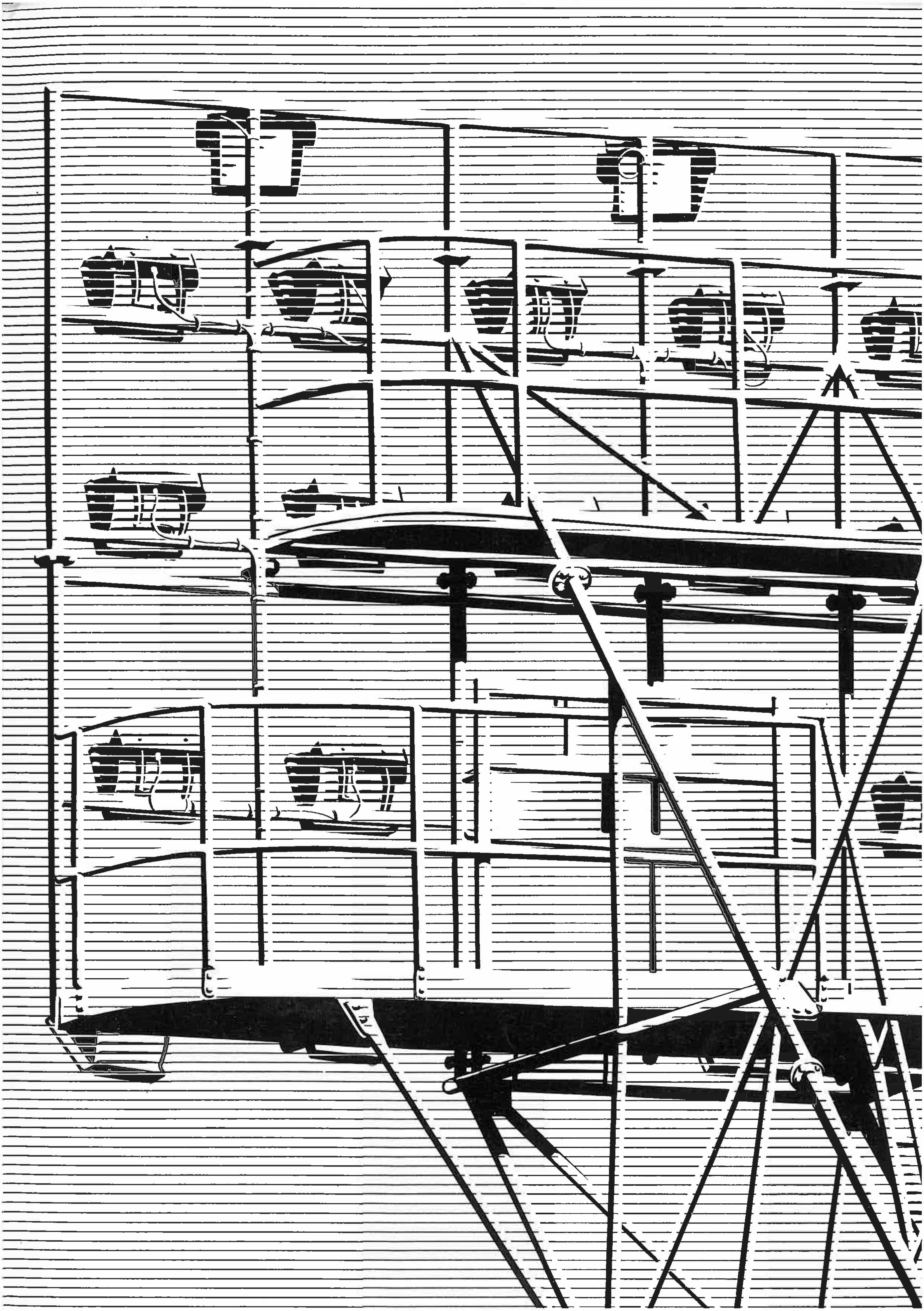
What of the requests from users for additional information to be incorporated in the new code? It will be found that Part I (Design Principles) contains two new sections: one on lighting in relation to heating, ventilating and acoustics; the other a check list for electric lighting design. The designer will find the latter is supported by two appendices: one on illuminance and luminance calculations, the other on lighting design methods. Emergency lighting design receives three pages of attention in 1973 compared with half a page in 1968. The subject of colour looms large. Not only is the section on the principles of colour dramatically expanded from 1968, but the lamp



The recommended standard illuminance may have to be increased due to low reflection contrasts within the task. The 'flow diagram' shown above allows for this. The full 'flow chart' appears on p.48 of the Code.

data in Part II of the new code gives far more information on colour rendering properties. Also, the general schedule for electric lighting lists possible lamps for the different applications in the schedule with regard to their suitability in colour appearance and colour rendering terms. Although rejecting the CIE specification of colour rendering for use in its recommendations, the new code gives an outline of this system in an appendix. A further appendix is devoted to contrast rendering, introducing the reader to the concept of CRF (contrast rendering factor), a term which must ultimately fiud its way into code illuminance recommendations when adequate supporting data is available.

The new code has some 30% more pages than its predecessor, which is hardly surprising considering the amount of additional material it contains and the more extensive use of explanatory diagrams. The artwork and the use of colour has resulted in the 1973 Code being the most attractive edition so far produced. Since the purpose of the code is to encourage improved lighting, it only remains to hope that the 1973 edition will also be the most widely used.



THORN LIGHTING LIMITED

A member of the Thorn Group

HEAD OFFICE AND SHOWROOM

Thorn House, Upper Saint Martin's Lane,
London WC2H 9ED
Telephone: 01-836 2444
Telex: Thorn London 24184/5

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ZONE ONE

North East Region

Headquarters and Order Office:
Thorn House, 3 Ring Road,
Lower Wortley, Leeds LS12 16J
Telephone: 0532-636321
Telex: Thornlite Leeds 55110

North West Region

Headquarters and Order Office:
Thorn House, 2 Claytonbrook Road,
Clayton, Manchester M11 1BP
Telephone: 061-223 1322
Telex: Thornlite Manchester 668642

Scotland

Headquarters and Order Office:
Thorn House, Lawmoor Street,
Glasgow G5 0TT
Telephone: 041-429 6222
Telex: Thornlite Glasgow 77630

ZONE TWO

Midland Region

Headquarters and Order Office:

Thorn House, Aston Church Road,
Saltley Trading Estate, Saltley, Birmingham 8
Telephone: 021-327 1535
Telex: Thornlite Birmingham 33235

South West Region

Headquarters and Order Office:
Thorn House, Penarth Road,
Cardiff CF1 7YP
Telephone: 0222 44200
Telex: Thornlite Cardiff 49334

Northern Ireland

Headquarters and Order Office:
10 Severn Street, Belfast BT4 1FB
Telephone: 0232-56004/5, 51477/9
Telex: Thornlite Belfast 74695

ZONE THREE

London Region

Headquarters and Order Office:
Victoria Trading Estate, Victoria Way,
Charlton, London SE7
Telephone: 01-858 3281
Telex: Thornlite Charlton 89617 1

Eastern Region

Headquarters and Order Office:
Angel Road Works,
402 Angel Road, Edmonton N18
Telephone: 01-807 3050
Telex: Thornlite Edmonton 23157

South East Region

Headquarters and Order Office:
Thorn Industrial Estate,
Homesdale Road, Bromley, Kent BR1 2QP
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Order Offices:

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GOVERNMENT SALES UNIT

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OVERSEAS COMPANIES

Australia

Thorn Lighting Industries (Pty) Ltd
Maldon Street, PO Box 74
Broadmeadows, Victoria 3047

Austria

Thorn Electrical Industries GmbH
1010 Wien, Rosenbursenstrasse 8

Canada

Thorn Lighting Canada Ltd
2763 Thamesgate Drive, Malton, Ontario

Denmark

Thorn Electric A/S
Fabriksparken 4, 2600 Glostrup

Eire

Thorn Lighting Limited
41 Ushers Quay, Dublin 8

France

Thorn Electrique
83 Rue Pierre Demours, Paris 17eme

Germany

Thorn Licht Beleuchtungsges mbH
2000 Hamburg 61, Borsteler Chaussee 287

Italy

Società Industriale Vicentina Illuminazione SpA
Casella Postale 604, 36100 Vicenza

New Zealand

Thorn Electrical Industries (NZ) Ltd
PO Box 15150, New Lynn, Auckland 7

Norway

Norske Thorn A/S
Postbox 7065, Oslo 3

South Africa

Thorn Lighting (SA) Ltd
PO Box 43075, Industria, Transvaal

Sweden

Thorn Belysning AB
Box 20075, 161 20, Bromma 20