THE MAGAZINE OF

LIGHT

INSTITUTE EDITION
NO. 1 1947

GENERAL ELECTRIC
LAMP DEPARTMENT

The Lamp Department of the General Electric Company wishes it were possible for everyone interested in the progress of sound lighting practice to make a personal visit to the new Lighting Institute at Nela Park, Cleveland. No printed matter can impart the inspiration and thrill of effective lighting demonstration experienced by the guest who actually sees the Institute in operation. However, whether you have made or plan to make a personal visit to the Institute or not, the Lamp Department believes not only that you will enjoy a leisurely review of the new Institute as you first turn these pages, but that you will also find this edition of value as a reference for some time to come. » » »

COVER ILLUSTRATION and the one above are night views of the new General Electric Lighting Institute with pool fountain in operation. Underwater colored lights creating interesting variations, are synchronized with the cycle of the fountain.

THE MAGAZINE OF

LIGHT

Vol. XVI 1947 No. 1

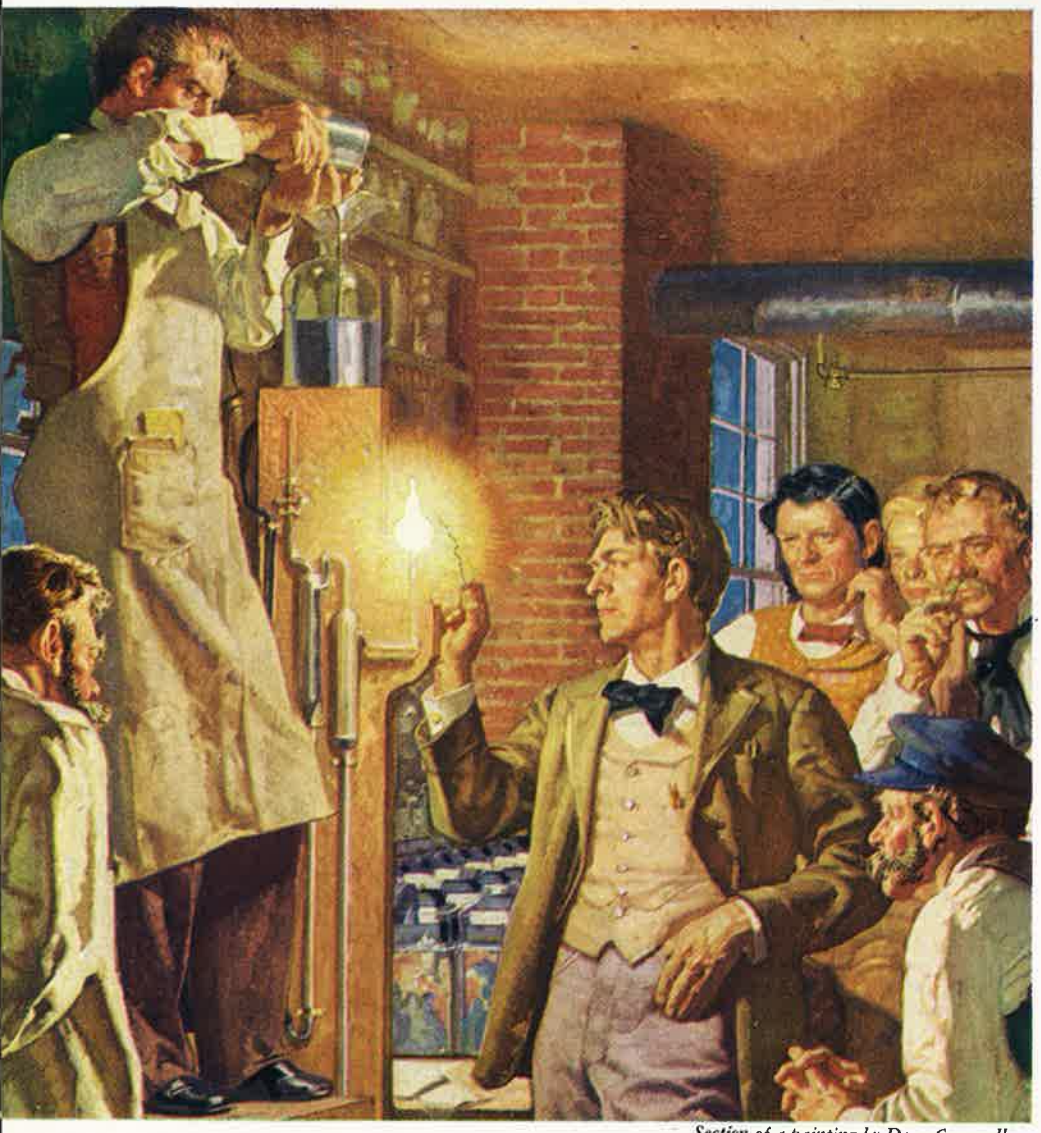
Publication date: June 16, 1947

CONTENTS

Published by the Lamp Department of the General Electric Company at Nela Park, Cleveland, Ohio in the interest of the progress of sound lighting practice. Distribution through General Electric Lamp Department District Sales Offices.

68 YEARS OF PROGRESS IN ELECTRIC LAMPS

....from Edison's Carbon Lamp of 1879 to the new G-E



Section of a painting by Dean Cornwell

LIGHTING THE FIRST practical incandescent lamp in Edison's laboratory in Menlo Park, New Jersey, on October 21, 1879.

THE age of great hopes, in which Thomas A. Edison was born and grew to manhood, provided an inspiring environment for men with inventive genius. Edison's life, and his outstanding achievements in several fields of science, speak for this period.

The possibility of an illuminant using electricity had been demonstrated with crude, short-lived "lamps" in laboratories before Edison's birth. Throughout his youth experimenters kept trying new things. Francis Brush, another Ohioan and Edison contemporary interested in electric lighting, produced his arc lamp in 1879.

When Edison announced the first practical incandescent lamp in October, 1879, the success of the invention was assured because he was working at the same time on a complete electrical system. The lamp alone was, of course, the triumphant end result, but its triumph was linked with several other inventions including the first generating station. What Edison had done was to organize the science the pioneers had accumulated into a system capable of using the phenomena of electricity to serve the public. It was not simply the gift of light, but light and power that was represented by the first practical incandescent lamp.

The invention came in Edison's 32nd year. So swift was the development of the vast electrical industry that well within the lifetime of

1879 — Edison carbon lamp

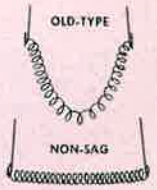
1905—GEM lamp

1911—Ductile tungsten filament

1912—Chemical getters

1913—Gas filled

1915—Tungsten filament Christmas tree



1915—Non-sag wire

ND LIGHTING

Lighting Institute

the inventor old institutions were recreated and new ones, previously unimagined, were born to carry on the promise and significance of the day. Today, although many exciting, awe-inspiring discoveries of science are in the public mind, the invention many people regard as the greatest is the Edison lamp.

In modern lighting there is something that touches deep springs of human response and there is a magic that is constantly new and inspiring. It is small wonder, therefore, that extensive as is the amount of knowledge compiled to date about electric lamps and lighting, we are always making new beginnings.

AERIAL VIEW of Nela Park, which was opened in 1913.


Order Sept. 20, 1880.
Lamps for S. S. Columbia
250 lamps, carbons
0".012 X 0".010 X 6"
Not over 7".75
With wooden base and felt strips
100 lamps
carbons 0".017 X 0".012 X 6"
Mount in sockets S.S. Columbia style
These lamps to be made after big test & when convenient

◄ ONE OF THE EARLIEST orders for lamps. Dated Sept. 20, 1880, it is for carbon lamps to be used on the S. S. Columbia. Edison's note at bottom states, "These lamps to be made after big test and when convenient."

The lamp of 1879 with an output of 1.4 lumens per watt was quickly improved, and in 1881 when the first installations of actual lighting systems were made the efficiency was 1.8. The demand for electric lamps put the emphasis for the next two decades upon the business of supplying as many of the original type carbon filament lamps as increasing factory space could make. The General Electric Company, the corporate entity called into existence by the lamp development, itself experienced a phenomenal growth. Its work was the making not only of lamps but equipment for the whole electrical system. Concurrent, too, was the birth and rise of schools of engineering and technology in which young men could be trained to carry on the great new work.

Soon after the turn of the century Dr. Whitney of General Electric discovered a method for metallizing filaments that doubled their efficiency to 4 lumens per watt. Lamps with these filaments were known as GEM lamps. This devel-

1919—Tipless lamp | *1925—Inside-frost* | *1925—Auto 2-filament (depressible beam)* | *1929 — S-1 sunlamp* | *1932—Bipost lamp* | *1932—Photo-flood* | *1933 — Mechanical base for large lamps* | *1933—Prefocus base (auto)*

1919—LIGHTING demonstration room built at Nela Park to show the importance of lighting in interior design.

1921 - 23 — NELA PARK INSTITUTE classes in lighting were first held in temporary quarters in Nela garage and on third floor of the lamp laboratory building. In 1923 an enlarged Institute was opened in the advertising building.

1926 — MINIATURE STREET DISPLAY, a fascinating demonstration which is well remembered by the thousands of people who visited the Nela Park Lighting Institute in its two locations between 1926 and World War II.

G. E. Instruments of Measurement

1917 — Footcandle meter

1934 — Visibility meter

1935 — Lightmeter

1937 — Brightness meter

1945 — Air sampler

opment recalled the thousands of experiments by Edison to produce a satisfactory filament for his first lamp. An indication of his ingenuity and willingness to trust simple things lies in his success in carbonizing cotton thread for early filaments. Then the inspiration to try bamboo filaments was suggested by a series of experiments beginning with fibers in a palm-leaf fan.

DUCTILE TUNGSTEN

Research directed by Dr. Coolidge of G. E. produced the ductile tungsten filament which in 1911 put the electric lamp at an efficiency of 7.8 lumens per watt, double the GEM lamp—more than five times the first lamp.

A hint of the great fluorescent period to come was Peter Cooper-Hewitt's invention of the first of the mercury vapor lamps in 1901.

Many fields of intensive specialization quickly developed in lighting. To learn what is basic to this field of knowledge the General Electric Company began its Institute Method of instruction 26 years ago at Nela Park. (See page 90.)

The idea of Nela Park itself was a consequence of the expansion of lamp development arising with the tungsten lamp and the imagination of two men of genius in business organization. The correct estimate of F. S. Terry and B. G. Tremaine about the future needs of G-E's lamp interests produced a headquarters institution that is a seat of learning as well as the nerve center of a business.

When the first World War had ended and the postwar expansion had started, "The University of Light" which Terry and Tremaine had built at Nela Park related its knowledge to the public need with the teaching and demonstration service offered to industry people at the Institute. The same period also ushered in many advances in lamp-making processes. The efficient ductile tungsten lamp of 1911 had been advanced another 40 per cent in efficiency by the introduction of inert gas into the bulb. This development made possible a higher operating temperature for filaments. It also introduced the name of Langmuir to the company of the great men who had contributed to the advancement of science through work on electric lamps.

TIPLESS

The gas-filled lamp with coiled filament dates from 1913. The next important developments chronologically were the tipless lamp of 1919 and the inside-frost lamp of 1925. These last two inventions, while differing from others previously mentioned in connection with efficiency, had vast importance. The lamp tip, created by early methods of exhaust-

1934—High pressure mercury

1934—Luminiline

1935—Lens end flashlight

1937—Prefocus flashlight

1937—Coiled-coil filament

1938—Fluorescent lamp

1938—Germicidal lamp

1938—Projector spot and flood lamps

1929 — TYPICAL INSTITUTE ACTIVITY at Nela Park was this meeting of the Sign Committee of the National Electric Light Association for the purpose of developing an industry promotion based on sound practice.

1933 — INSTITUTE TAKES OVER AN ENTIRE BUILDING. Photo shows how the lobby looked from 1933 until the building was completely remodeled in 1945 and 1946 to house the new Lighting Institute featured in succeeding pages.

1938 — FLUORESCENT lighting was introduced in store demonstration of the prewar Nela Park Lighting Institute.

ing lamp bulbs, was a breakage and handling hazard. Thus when an entirely new method of exhausting air through the stem of the lamp was invented the gain in the ease of handling and installing lamps added a new chapter to the widening applications of electric lighting.

INSIDE-FROST

The inside-frost invention by Pipkin, announced in 1925, advanced the usefulness of filament lamps in still another way. Growing efficiency had transformed the comparatively low brightness lamp of 1879 into a highly concentrated source by the middle twenties. Since many people used bare lamps indiscriminately a more diffuse bulb was needed. Outside coatings of various sorts had proved of limited value and they cut off too much light. It was a great boon to the whole science of illumination when Pipkin applied a method of acid etching the bulb interior that not only provided the diffuse pearl finish, but also a strong bulb.

Each new invention has also added new chapters in application techniques that have continually broadened the demand for the teaching services of the University of Light. The Institute Method, begun in 1921 with small classes of industry people, increased in influence all through the twenties. Thus the policy of sharing knowledge, which had been undertaken with books and bulletins alone in the teens, was actively supplemented by a regular schedule of courses begun in the early twenties.

The science, art and business of lighting took advantage of the breather of the early thirties to orient itself to the business of lighting-and-seeing. The fundamentals of application were restudied and rebuilt on case histories. The quantitative side of light was recast as a function of the qualitative needs in lighting. Public interest kept pace.

All through the thirties, the Better Light–Better Sight Movement was putting a strong emphasis on the refinements of lamp use. Comfort for the eye was the main objective, but beauty was combined with it. The Century of Progress in 1933 and 1934 in Chicago was distinguished for the beauty of its night appearance. The Texas Centennial at Dallas in 1936 provided another occasion to advance this trend.

KNOWLEDGE AND METHODS

The significance of the work of Ward Harrison, who had given illumination design its basic system of computation in 1920 came into its own with the appearance of the first easy-to-read light-meters in 1935. Likewise the pioneering research by Luckiesh in relating the complex psycho-physiological processes of see-

Science and Technology of Lighting

1910-1947 — PIONEERING engineering treatises in specific lighting fields.

▲ *1920—ROOM INDEX METHOD using coefficients of utilization to compute light. (Harrison-Anderson)*

1924—SCIENCE OF SEEING begins to influence lighting practice with launching of series of books by Luckiesh and Luckiesh & Moss.

1946 — GLARE RATING system of Harrison & Meaker.

1939—Heat lamp

1939-40—Sealed Beam auto and plane

1940—Differentially coiled projection

1940 — Photoflash with shredded foil

1941—360 BL lamp for fluorescent effects

1944-45—Circline and Slimline

ing to lighting comfort began to receive penetrating appreciative study at this time. By the 1930's, the accumulated knowledge in lamps and lighting had demonstrated the proportions of the idea of Nela Park, a University of Light, envisioned in 1910.

The Institute Method which had begun to influence lighting practice by personal contact, demonstrations, lectures in 1921 was being perfected in the thirties at Nela Park. A whole building was required in 1933 to house the Institute activities. Its work had begun in temporary space in a garage in 1921. Afterward, for several years it was located on the ground floor of the advertising building.

Mr. Edison's lamp by 1930 had gone through many transformations in creating its new world of progress. Even the tungsten filament which had multiplied the efficiency of the original lamp by more than five had itself been improved to double its 1907 output. At first the filament had been used uncoiled. Continuous effort to improve efficiency and to simplify lamp construction produced the coiled filament. During the thirties a technique for coiling coiled filaments was perfected so that, for example, 20 inches of straight tungsten wire was concentrated to 5/8-inch as a coiled-coil filament. Resulting efficiency gains in standard lamps were as high as 12½ per cent.

NEW INSTITUTE'S PREVIEW was attended by prominent citizens including state officials. Ward Harrison, Manager of the Engineering Division, welcomes Frank J. Lausche, who was Governor of the state of Ohio.

Another line of progress begun in the interest of greater safety on the highway for night driving had eventuated in the Sealed Beam lamp. A radically new type of lamp construction, this new lamp family, first introduced in 1939 is distinguished by the fact that it performs with nearly initial efficiency throughout its life. Important developments in this line have come since its first use in headlighting.

There is a saying that "all that is past is prologue." In the rapid recollection of the events highlighting the growth of the new world of electric illumination this seems especially true.

In 1936 the General Electric Company announced it had fluorescent lamps in the laboratory with efficiencies of an entirely new order. In 1938 the first fluorescent lamps became commercially available.

The New York and San Francisco World Fairs ushered in the Age of Fluorescent Lighting. It was a natural consequence of the colors available in fluorescent lamps that these great exhibitions were marvels of decoration by night. And here, too, the expression "architectural lighting" had its first chance to apply a linear, low brightness source toward the goals at which it had been aiming for many years.

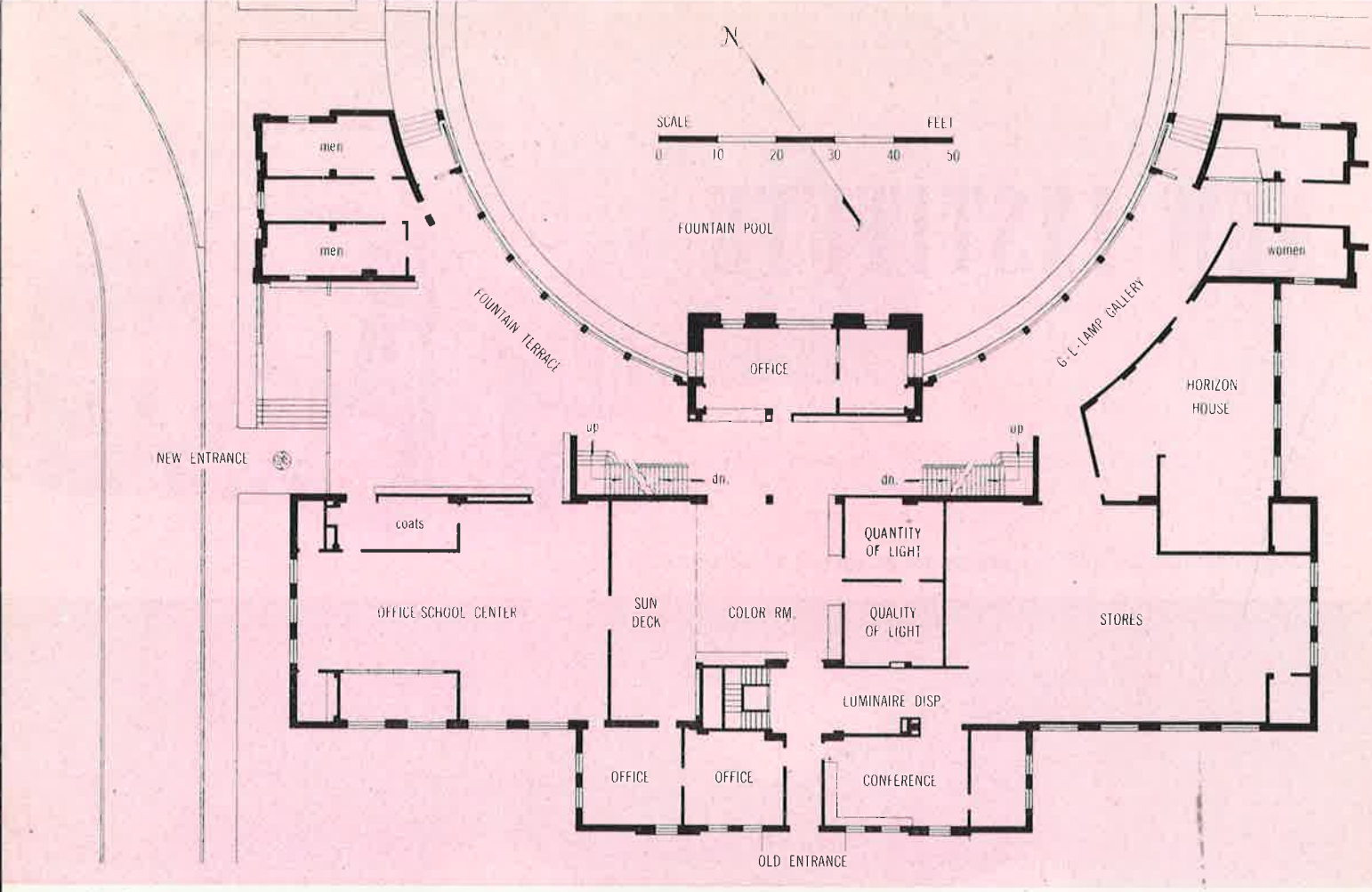
The second World War came while these World Fairs were operating. Progress in fluorescent lighting was turned at once to the job of lighting America's production plants to win the war. A magnificent record of improvement in industrial lighting was the result.

Today, in the second full year of peace, lighting returns to the development of the Fluorescent Age. The new Lighting Institute at Nela Park which is described in this publication is, by and large, a projection of this lighting development.

OFFICIAL UNVEILING of the new Institute by Mrs. Thomas A. Edison was on September 11, 1946. M. L. Sloan (left), G-E vice president and general manager of the Lamp Department, and C. E. Wilson, president of the General Electric Company, accompanied Mrs. Edison on a tour of the building. She stopped to compare a replica of Edison's first practical lamp, with the modern lamps in the Institute's Lamp Gallery.

NEW INSTITUTE

OPENING THE DOOR to a new epoch in lighting advancement.



PLAN OF THE FIRST FLOOR, indicating the new entrance at the northwest. The general circulation is from the Fountain Terrace to Registration Center and Lamp Gallery. Access to demonstration rooms is from these three areas.

DURING the past few decades there has been an amazing growth in the amount of artificial light used in this country—and in the variety of its application. In 1946 the people of the United States used 100 times as many unit hours of light as they did from all sources —gas, kerosene, candles, arcs, and incandescent lamps— only 40 years ago. This fact is the more striking when one considers that, after all, light was then as now one of the basic necessities. The phenomenal and continually accelerating growth could not have been sustained except as it responded to widespread human needs.

These needs are still far from satisfied.

By no means does the average *home* enjoy the full benefits in health and livability which today's lamps make possible.

The average *school* has far to go toward providing conditions most conducive to maximum mental and physical development of the students.

The average *office* has much to do lighting-wise to attain full benefits in efficiency of operation and pleasant surroundings.

Many a *factory* still lacks the advantages the war plants gained from fluorescent lighting in greater output of goods of higher quality with improved employee morale.

In the *store*, functional lighting has barely started to play the active sales role of which it is capable in the urgent task of moving a greatly expanded output of American industry.

Light can add extra hours for the enjoyment of more types of recreation.

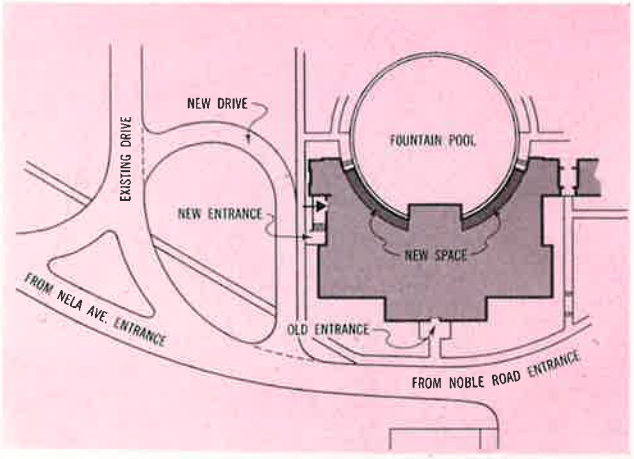
Many lives can be saved through more nearly adequate illumination of streets and highways, of railroads and airways, and with better motor car headlights.

The General Electric Lighting Institute is maintained to suggest ways in which these needs may more adequately be met, and thus to advance the service of light and related radiation to the health, efficiency and well being of mankind.

In planning the new Institute, one of the principal objectives was to create facilities for the demonstration of lighting principles, and to provide opportunity for the consumer and the industry to visualize better practice and actually to experience some of the resulting benefits. It was designed to present new developments in light sources, in materials and techniques of illumination; to promote understanding of visual requirements and a new appreciation of the potentialities of lighting in creating environments of greater comfort and beauty, of greater functional fitness.

In translating these objectives into the actual structure and fabric of the Institute, it was intended to give

FROM THE FOUNTAIN TERRACE looking toward the center of building. The panorama of the campus, pool and fountain become part of the space through the use of the large glass window. Here visitors assemble before starting conferences or tours of inspection.

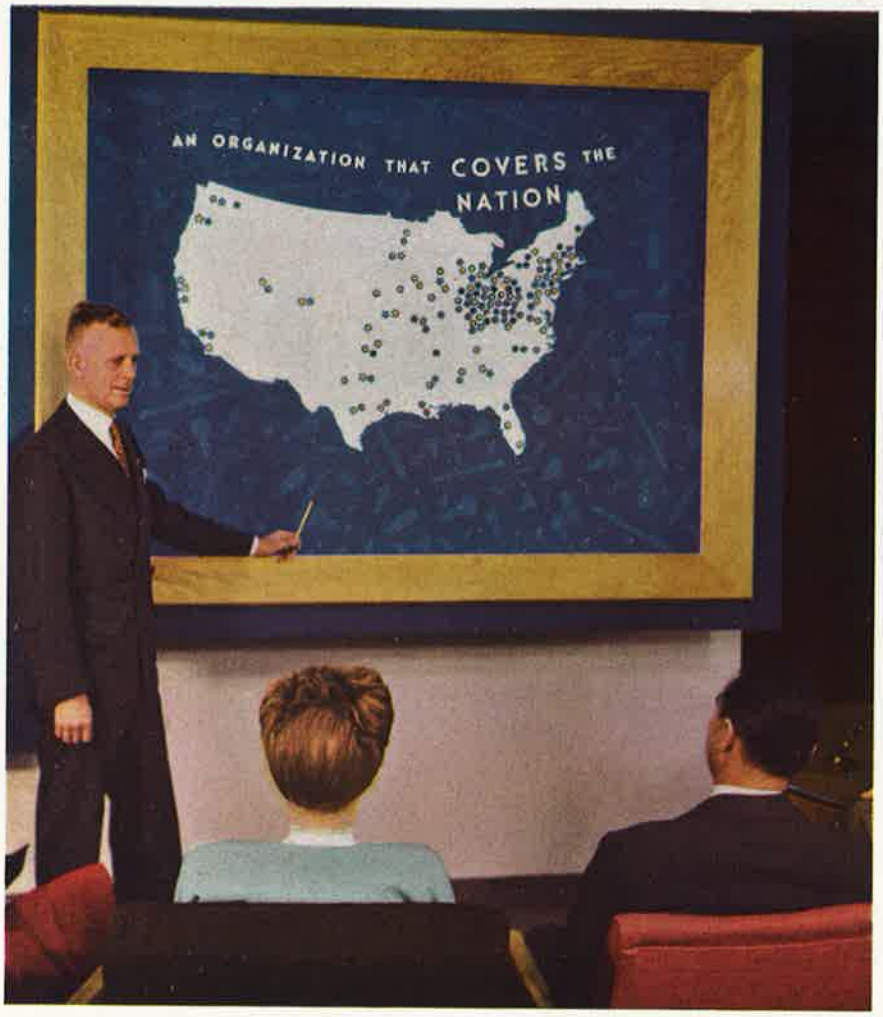


PLOT PLAN. The new entrance is approached through a new driveway which takes Institute bus and taxi traffic out of the main stream through Nela Park. Heavily shaded area shows new space added to the building.

emphasis to the integration of light—both natural and artificial—with the architecture, decoration and appointments. The responsibility for developing this plan was given to a design and building committee, consisting of C. M. Cutler, Chairman; W. D. Riddle, resident architect, and A. L. Reas, in charge of construction. The committee enlisted as architectural consultants, the firm of Ketchum, Gina & Sharp, of New York, and worked closely with L. C. Kent, operating head of the Institute. In addition, the committee had the collaboration of the many Engineering Division specialists in developing the several demonstrations and displays. The A. M. Higley Company was the general contractor and electrical work was done by the Grant Electric Company, both of Cleveland. M. L. Gormley was the decorating consultant for the section devoted to Horizon House.

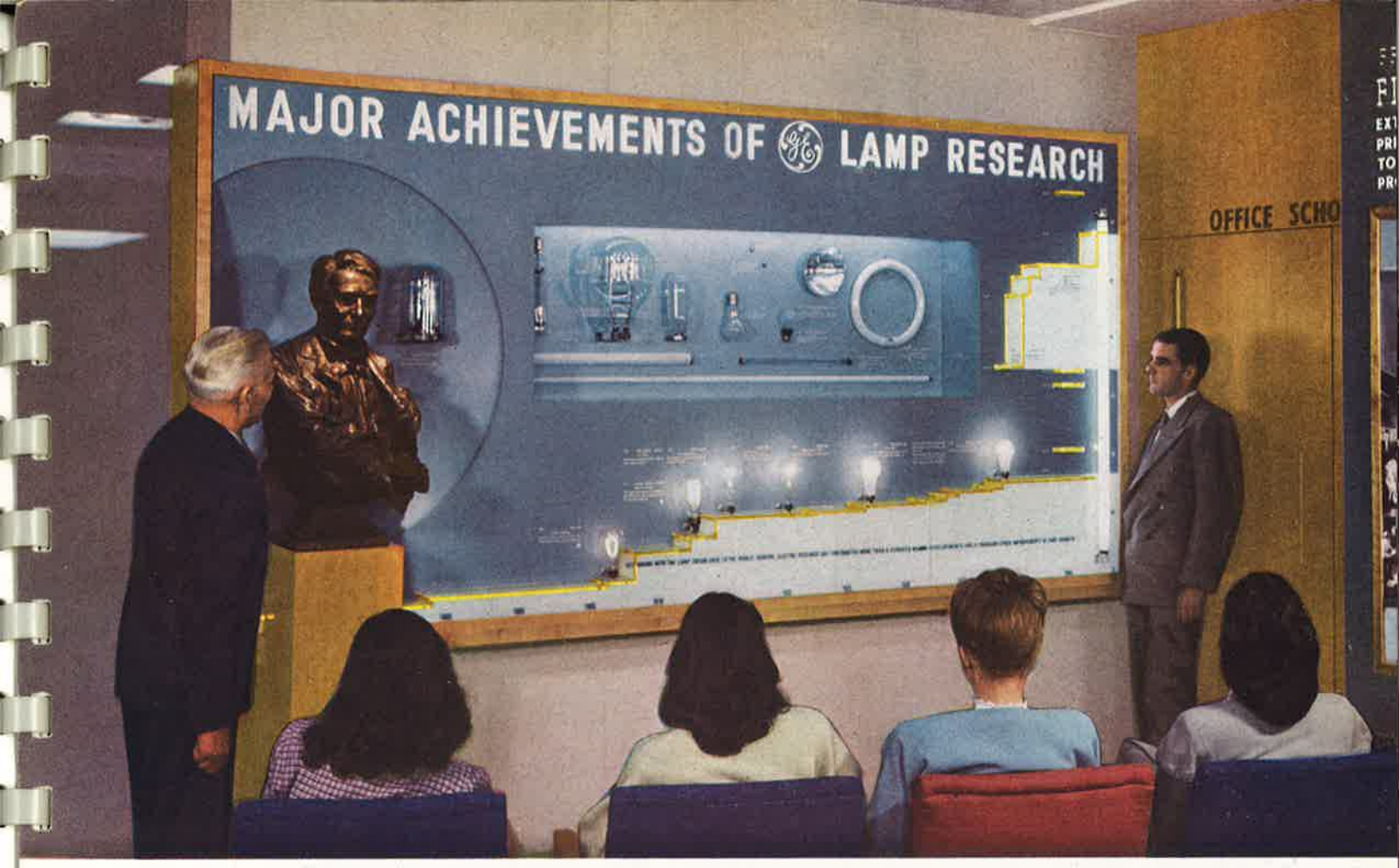
Considerations of circulation and basic structure of the existing building set the pattern for the physical layout. The new entrance on the northwest side, approached by a driveway restricted to Institute traffic, is designed to give the visitor a glimpse of the interior before he actually steps into the fountain terrace. This space, sweeping on past the reception center into the lamp gallery, serves as foyer and lounge.

From terrace and gallery the visitor has a vista of



◀ W. C. BROWN, assistant to the Manager of the Engineering Division, of which the Institute is a section, is showing some visitors the sales, manufacturing and service coverage of the Lamp Department. Map illustrates each location with lighted symbols.

WITH THE AID OF an animated display (below), L. C. Kent, head of the Institute, explains some of the steps in the manufacture of fluorescent lamps, starting with sand, chemicals and ending with the finished lamp ready for shipment. During the process of making the parts and assembling the completed lamp more than 500 tests are made to insure light source of highest quality.



RESEARCH AND DEVELOPMENT assure the user of light, greater and greater value from constant improvements in performance and efficiency and from new forms of light sources to meet new needs. Graphically depicted here is the advance made in the efficiency of light production from Edison's first filament lamp through numerous steps to today's Slimline fluorescent. Some of the most significant inventions in lamp structure are shown in the rectangular niche.

the Nela Park campus. The fountain and pool in the foreground become features of immediate interest. Or, looking out through the entrance side over the landscaped grounds of Nela Park, Lake Erie is seen in the distance. These views through large glass areas give a feeling of spaciousness within the building and are at the same time in keeping with the new outlook and unlimited horizon for lighting. Here the visitor may relax in comfort between conferences and classes.

The fountain terrace was designed to set the stage for introductions where visitors may mingle informally and meet company personnel. The incidental displays convey some idea of the aims and accomplishments of the Lamp Department and of its unequalled facilities and organization for serving users of light. One, for example, depicts the unique record of major contributions from General Electric research to new and better, more efficient light sources. Another portrays some of the processes and controls from raw material to finished lamps which have made it possible for this far-flung manufacturing organization to provide lamps of ever higher quality at lower and lower cost. A third shows the nation-wide facilities which accomplish prompt, efficient distribution. Here, too, are glimpses of laboratories where for decades systematic studies of light and vision have been pursued, resulting in a science of seeing which has permitted the development of a sound technology of lighting.

Various major areas are set aside for quick visual presentation of the essential elements and applicable techniques of lighting for a particular field. But their equipment is so comprehensive that they serve also as demonstration classrooms for more intensive training of specialists. In all of them a sufficient range of lighting and environmental conditions can be presented to enable the visitor to form valid judgments of his own. For that reason more illumination facilities are in evidence than would normally be employed in similar spaces.

Supplementing these areas, and right in the center of the Institute, are others devoted to the fundamental factors of quantity, quality and color of illumination. Here, as in the spaces devoted to the major fields of application, one finds just what it is that determines whether a lighting system is comfortable and satisfying.

Inasmuch as there was little opportunity for lighting equipment manufacturers to develop new luminaires during the war years it was necessary to design many new types for the Institute. Some were needed for light sources that came into being in that period. Others illustrate new techniques. The luminaires are planned primarily from the viewpoint of distribution

CIRCULATION SPACE AT THE REGISTRATION CENTER is lighted by coffers of several shapes. They suggest the greater interest achieved by variation in brightness and color pattern in the coffer while retaining pleasing color quality from the mixture at face-level. The coffers may be seen in color on opposite page in photo taken from another angle.

of light and of appearance. They are not intended necessarily to illustrate methods of construction or fabrication. The designs were incorporated in a brochure for lighting equipment manufacturers, who indicate that they have already placed some of them on the market and that others will be made available. (Luminaire brochure shown on page 88.)

The operation of the Institute is directed from the registration center which includes a general office and that of Mr. Kent, the operating head of the Institute. It is located in the front-center of the building between the fountain terrace and lamp gallery. From here stairways lead to lower floor spaces including a point of sale display room, industrial lighting demonstrations, the restaurant and night club area, light for photography, and applications of miniature lamps.

At either side of the registration center open stairways lead also to the auditorium on the second floor. From the center close contact may be maintained with all the activities taking place in the Institute. A visual signal system is incorporated to facilitate paging Nela Park people who may be in the Institute.

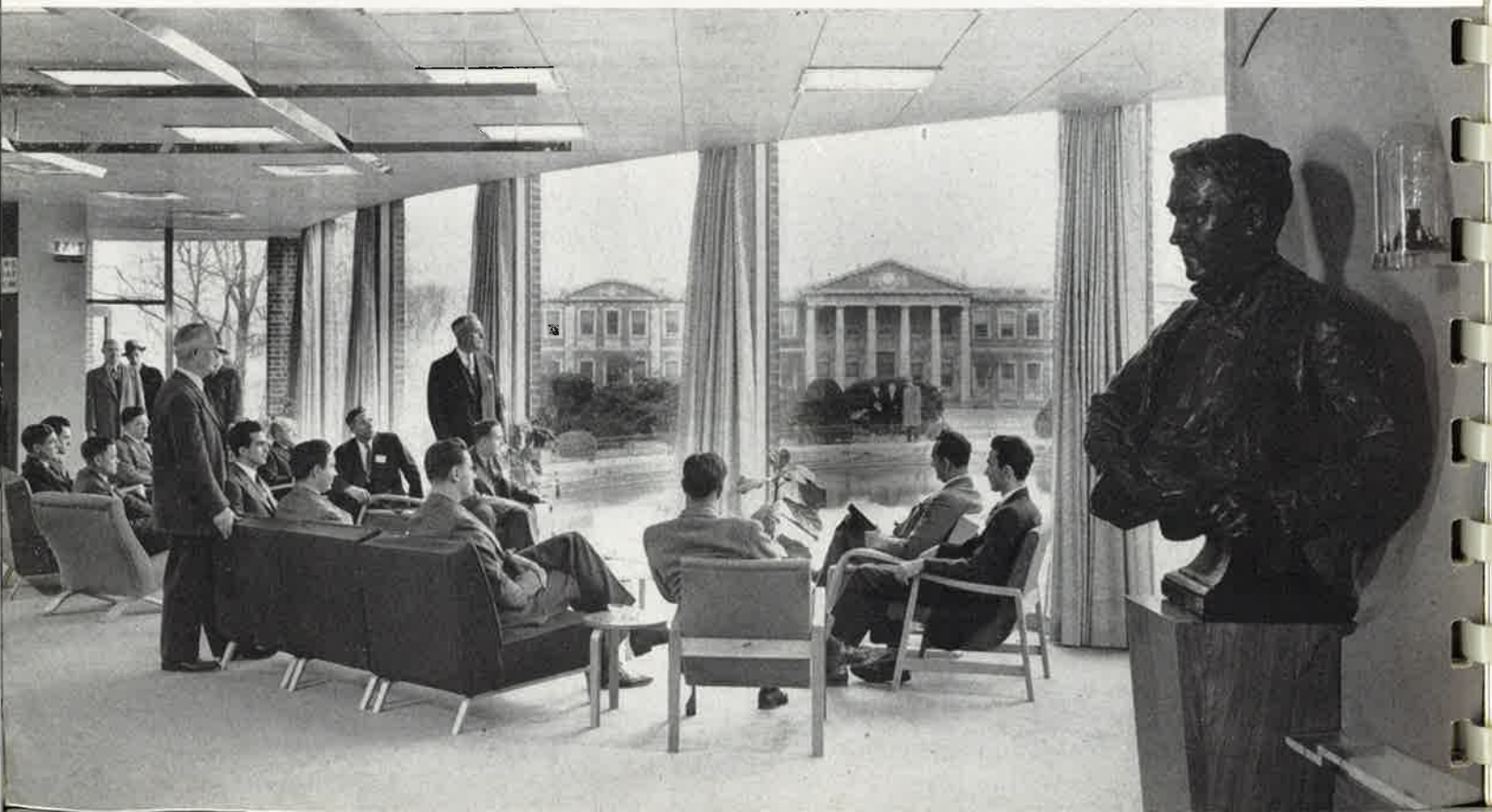
In addition to extended training courses and conferences, the Institute offers programs for people with a special interest as well as inspection tours for groups up to several hundred. It was therefore necessary to provide at least two means of access to each demonstration area, to handle the flow of people from one space to the next efficiently and with a minimum of confusion. In general, groups are divided into units determined by the size of the smallest demonstration area and programs are so arranged as to bring units together at scheduled intervals in the larger spaces. Thus it has become possible in practice to attain a high utilization of the facilities by several diverse groups.

The lighting art is never static. New lamps, new knowledge, new ideas are constantly being introduced. Therefore, another part of the planning took account, in the materials and construction of walls, screens and ceiling, of the need for flexibility, facilitating new arrangements of displays and demonstrations, changes in decoration, and introduction of new lighting techniques and equipment from time to time.

ARCHITECTURAL HANDLING OF THE STAIRWAYS was planned to give a feeling of unity and spaciousness and to invite the visitor from the main floor to the auditorium above or the ground floor below. Plaques of perforated metal shielding Circline lamps add decorative spots and provide illumination for stairs.

VIEW FROM the Fountain Terrace toward the central feature of the building. Architecturally, one of the problems was to blend acceptably into this Georgian structure a lighting center of thoroughly modern aspect whether viewed from within or from the outside.

VISITORS RELAX and enjoy the view over the pool and across the campus while waiting for a lighting school program to begin in another part of the Institute. ▼



SUN DECK

Sunshine hours drop off surprisingly during the winter and rainy months in most parts of the United States. A sunshine map of the country indicates for example that a section of the Northwest, and part of the Great Lakes region receive only 20 to 30 per cent of the sunshine possible during winter daylight hours.

Now, through the use of special lamps in proper combination, the various components of sunlight may be brought indoors where their effects may be enjoyed day or night, summer or winter, rain or shine, in any area.

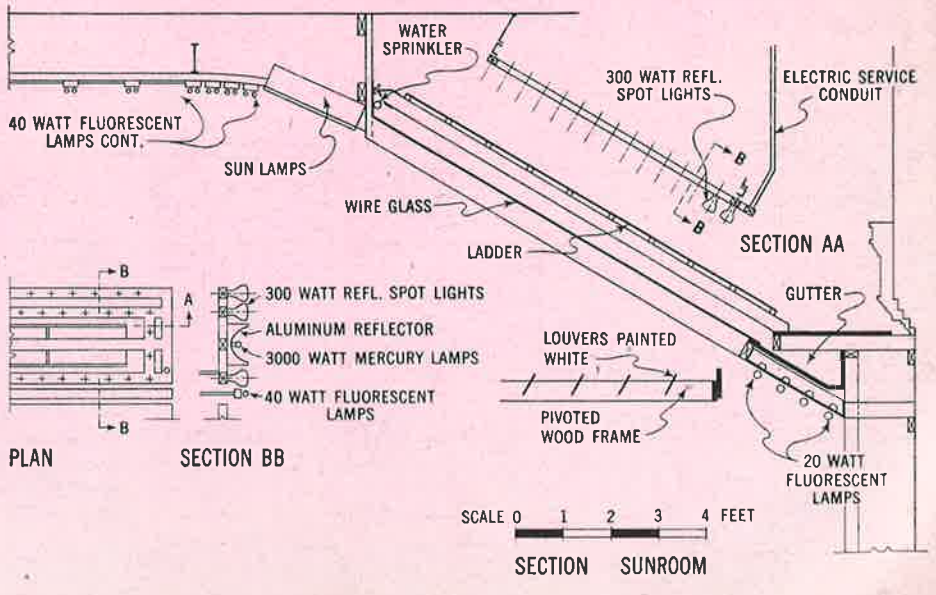
To demonstrate one way of "bringing the sun indoors," the sun deck was made a part of the new G-E Lighting Institute. First step in preparing to duplicate sunlight was an analysis of its components. Research showed that it contains light, infrared, and ultraviolet. Lamps in ceiling of the sun deck provide each of these components in correct proportion and distribution—4500 footcandles of light, and corresponding proportions of infrared and ultraviolet*.

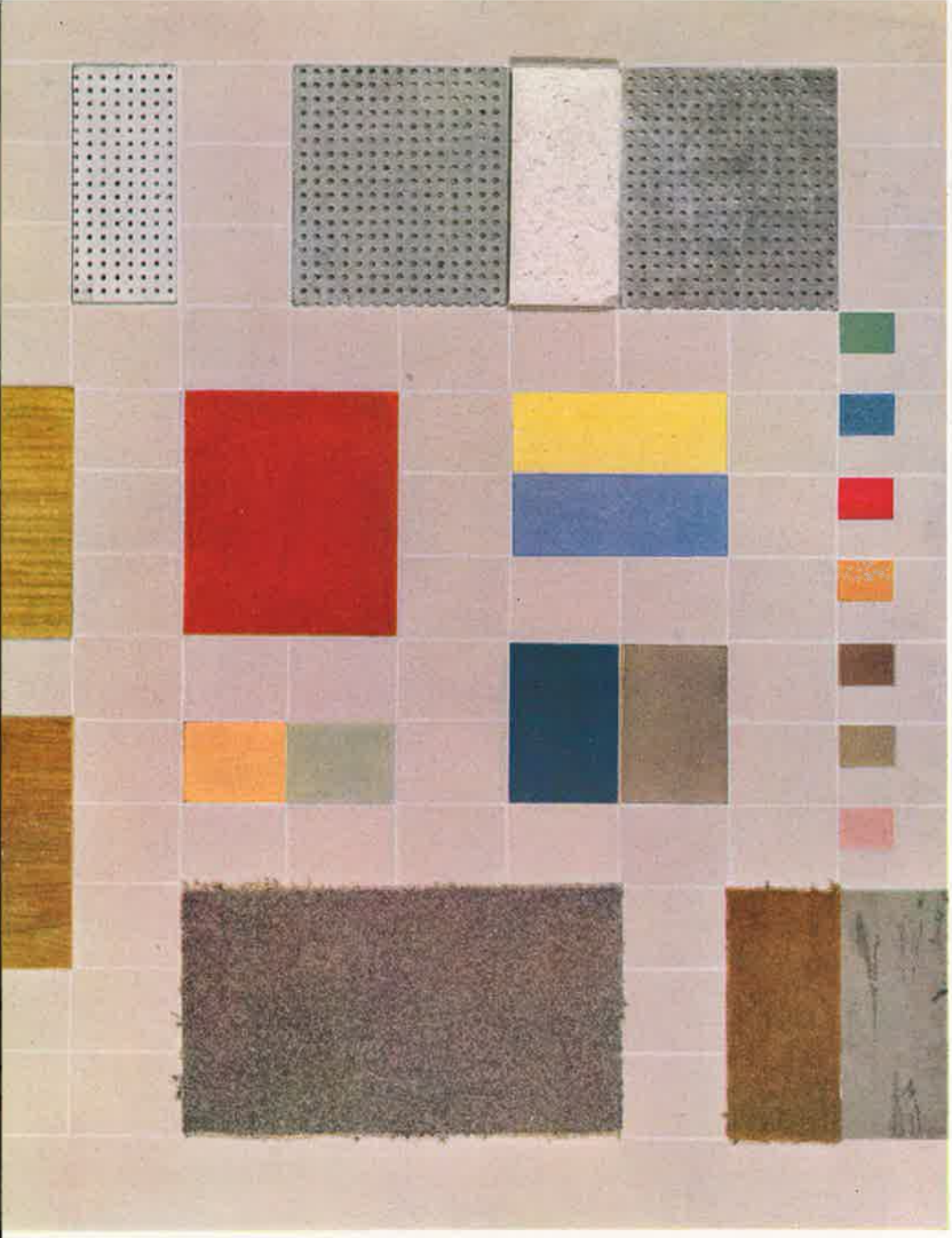
Fifteen minutes of exposure under the lamps in this Solarium should give the same erythema (reddening) effect as fifteen minutes of midsummer sun. It is not any more necessary to wear goggles in the Institute Sun Deck than it is in actual sunlight, since all wavelengths not found in sunlight are filtered out. In the sun deck ceiling is a glass skylight over which water flows constantly while the lamps are in operation. This provides an aesthetic and restful effect on the sun bathers below, but its fundamental purpose is to filter out certain "long" wavelength infrared not found in solar radiation.

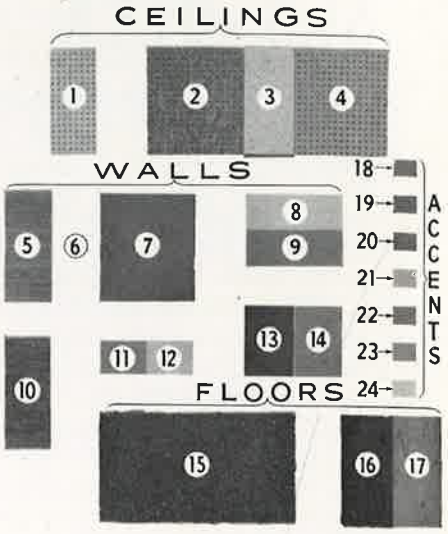
The wholesome aesthetic environment and comfortable relaxation afforded by this type of Solarium could well be adapted to Veterans' Hospitals or other places where groups of individuals wish to enjoy irradiation similar to that obtained from midsummer sun.

* *40 watts per square foot of radiant infrared; 2000 E-Vitons per square foot of erythemal ultraviolet.*

SUN DECK in the G. E. Institute. Lighting diagram below.

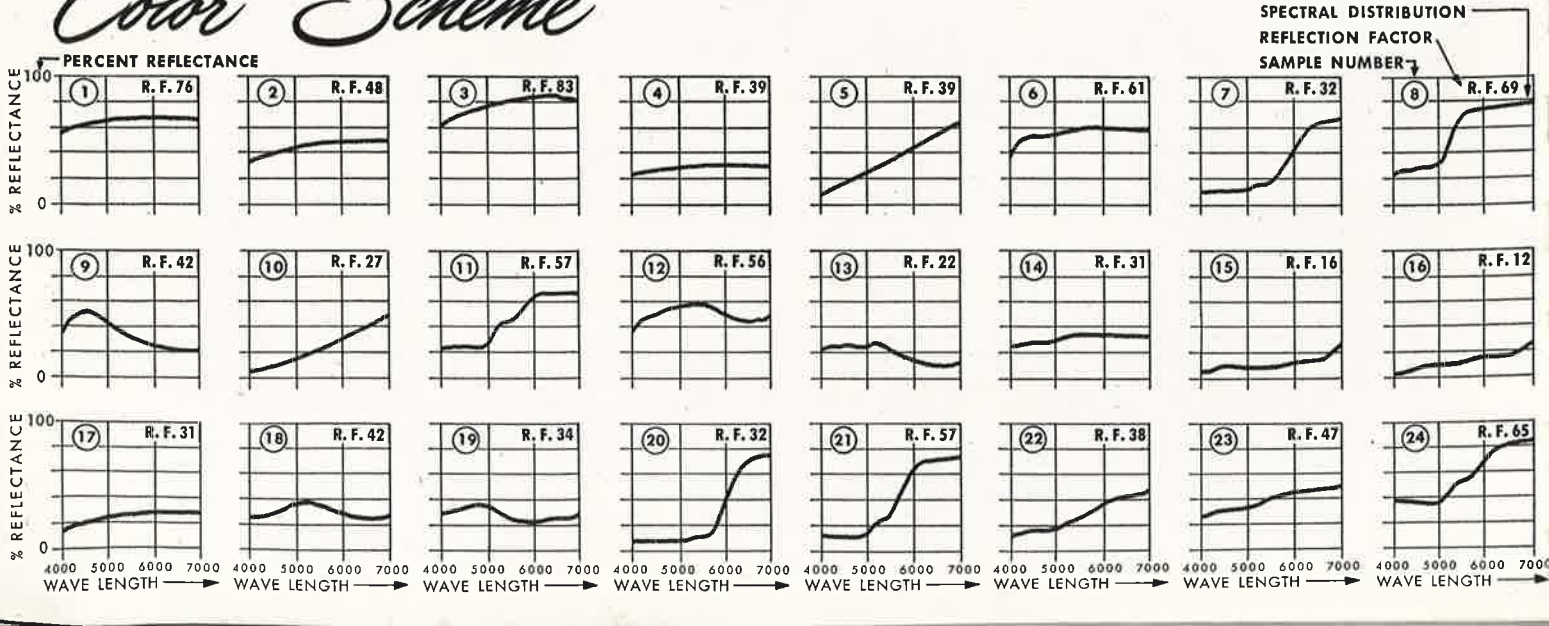






COLOR SAMPLES (left) used throughout most of the Institute. The color scheme came in for consideration in the initial stages of planning. In general, large areas are in grays or light tints, and accents are in more saturated values. All grays are mixed without using black to assure a live and vibrant quality. Finishes with sheen or spectacular character have been kept to a minimum to avoid distracting reflections of luminaires or window areas. The diagram (above) is the key showing the individual colors employed for ceilings, walls, floors, and accents. The spectral distribution and the reflection factor for each sample is given in the diagrams below. Circled numbers below identify samples as keyed above. The reflection factors given below are for 4500 fluorescent white.

Color Scheme



STORE LIGHTING

INSTITUTE STORE CENTER. Photo shows C. M. Cutler, head of the light-for-selling section of the Engineering Division, addressing a typical Institute lighting group.

TODAY it is recognized that aggressive merchandising must assume an increasingly important role in maintaining the American economy at a high level by selling a greatly increased output of farm and factory. Hence the importance of the Institute store facilities for demonstrating a selling aid that makes its own unique and potent contributions at the same time that it enables the merchant to utilize more effectively all the other appointments and components of a store.

In their modernization plans, most merchants give first place to relighting, realizing that *seeing is,* indeed, *the biggest thing in selling.* They have been learning that the more the customer sees, the more he buys. The more attractive the merchandise, the easier it is to find, and the more pleasant the store atmosphere, the greater the opportunity for profitable business and a loyal, growing clientele. The new store area affords opportunity actually to experience and to study lighting which performs definite merchandising functions resulting in more sales per unit of area and per salesperson.

The space presents environments typical of the high-ceilinged department store, of the more intimate specialty shop, of the corner drug store, and of the neighborhood grocery. Here are demonstrated the basic principles, tools and techniques of lighting that move merchandise — patterns of brightness and color that serve the three functions of *Attraction, Appraisal* and *Atmosphere*—the Three A's of Store Lighting.

Ample provision is made for the study of alternative methods and systems. Attraction lighting is portrayed in a variety of forms that invite shoppers to pause at the window, cause a greater number to enter the store, and that guide their movements and interest to specific items within, through accents of brightness and dramatic display, thus influencing the kinds of things they buy and the total of their purchases.

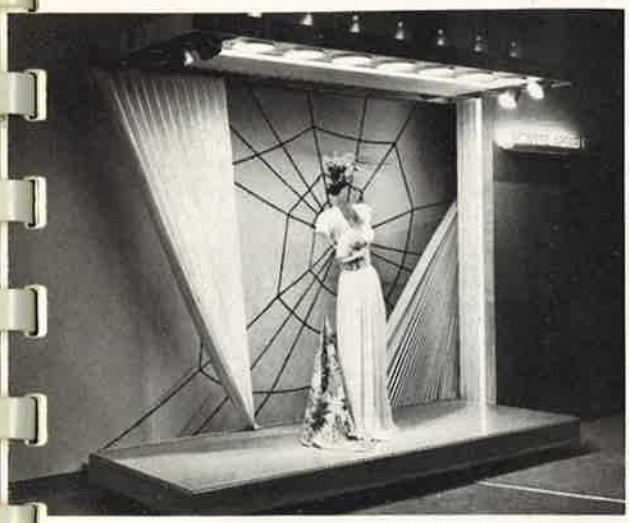
For *Appraisal,* illumination methods are demonstrated showing the effect of quantity, diffusion, direction and color of light in revealing form, texture, color and other inherent qualities of the merchandise, thus bringing quicker buying decisions and fewer returned goods.

And, finally, lighting is so applied and integrated with the design and decoration of units of the store as to impart distinction, create a mood appropriate to the business and an atmosphere which establishes a lasting preference for the establishment.

THE THREE A'S OF STORE LIGHTING

Lighting for *Attraction* + *Appraisal* + *Atmosphere* **Adds up to More Sales.. Greater Profits**

	Attraction	Appraisal	Atmosphere
Function	Gain attention of traffic Divert people from street into store Control store circulation Emphasize various departments Center interest on high-profit items	Show inherent quality of merchandise — color, texture, pattern, workmanship Speed up buying decisions Reduce returns	Arouse interest Provide stimulation Present distinctive character Establish lasting impression
Means	Eye-catching brightness —compelling contrast Backgrounds Modeling Emphasis	Spectral quality of light Quality of lighting — Direction Diffusion Amount of light	Architectural lines Appointments Color pattern of store Brightness pattern of store Brightness of ceiling and walls — Luminaires Luminous accents
Typical Examples	Signs, storefronts, entrances, show windows, store interiors. Contrasts in color and brightness between departments Lighted cases and niches Spotlighting	Interior lighting for quick, accurate, easy seeing where goods are examined by shoppers Show windows, spotlight, interior displays	Lighting to create desired mood All functional lighting for attraction and appraisal Decorative lighting for distinction Lighting to reduce objectionable contrasts



A LOW LEVEL of general or flat lighting does little to command attention for the display. (Top photo)

HIGH BRIGHTNESS invites the shopper to pause and inspect the display. The rich quality of the material in the evening gowns becomes apparent and the pattern in the scarf becomes clean-cut and distinctive. (Center photo)

FURTHER INTEREST and attention value are added by highlights from the directional beams from reflectors in streamlined housings, as well as by colored light sources and a mixture of color on the background. (Right photo)

Attraction

A display of fine merchandise may be carefully composed, yet if it merges into the surroundings it has little effectiveness. The same thing is true for a storefront or a show window. Brightness emphasis is the key to attraction; the higher the brightness, the more attention an article, a display or a storefront will command.

Light is the most versatile and controllable medium for imparting brightness and brightness variations for attraction and selling power. It may be applied to give higher brightness to display than to background or surroundings, or again, to reverse this relation giving prominence to an article presented against a larger area of brightness. It may be directed as a beam to give form with highlights and luminous shadows and thereby impart greater interest value. It may be applied in various colors or qualities of "white" to heighten contrasts and accentuate specific features or entire store areas.

High brightness of merchandise, making the goods easy to see, brings them visually closer to shoppers. And, bright goods and backgrounds reduce the veiling reflections from glass surfaces of show windows and glass-enclosed cases.

Bright, compelling displays strategically placed throughout the selling space influence within-the-store traffic and thus direct attention. Lighted displays may repeatedly gain a shopper's attention for additional merchandise, whereas the salesperson can tactfully direct attention but a few times.

These are matters that can be visualized and studied in the store area of the Institute. On this page are suggested, within the limitations of photography and reproduction, some of the comparisons demonstrated.

Appraisal

Merchandise varies in size and details. These may range from very fine line patterns on cloth to the large details of automobiles and furniture. The goods may vary from white to black and through a gamut of colors. Contrasts range from a low of black thread on black cloth to a high of jet buttons on a white dress. Surfaces range through numerous tones, and from a rough texture to a mirror-like finish. The physical form may vary from a simple, flat-surfaced article to a multi-form or irregular-shaped object.

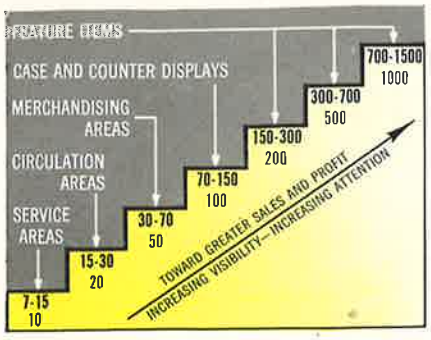
Goods must be viewed at different distances and in various planes, sometimes below and again above the eye level of the shopper, often under distracting conditions.

These many variables in the seeing task make it essential to provide light adequate in quantity and quality for shoppers to see clearly, accurately, comfortably and rapidly. While one would have little difficulty in appraising white yard goods with a sharply contrasting pattern under a few footcandles of light, most goods are not this easy to see, and merchants find illumination values of the order shown in chart at right are needed to meet the requirements of the range of items that may be sold.

The basic *appraisal* lighting should be reasonably uniform if the whole space is a merchandising area, as in variety stores, super markets, and furniture stores. In these types, the method of display lends itself to uniform foundation lighting, and this is also the system that affords greatest freedom in re-arrangement of selling areas.

QUANTITY AND SPECTRAL QUALITY OF LIGHT DEMONSTRATED. The upper compartments display the same goods under two different amounts of light. The one of higher brightness reveals the pattern more clearly and has the more attractive appearance. The lower compartments display the identical samples of colored material, at left lighted with 3500° fluorescent and at right with 4500° fluorescent so that the degree of change can be noted in the color samples. The 4500° fluorescent is becoming the most popular for all-around store use.

FOOTCANDLE LEVELS
REPRESENTATIVE OF MODERN PRACTICE



Approximately Equal Steps in Footcandle Effectiveness

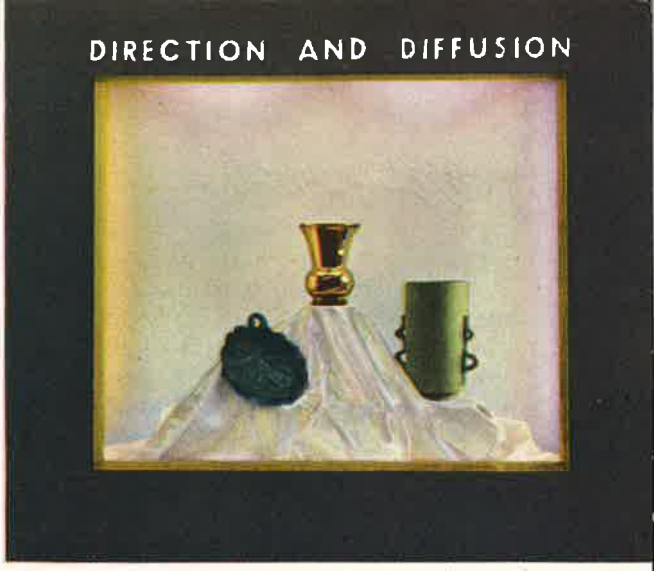
In many stores, such as grocery, drug, bakery, clothing and hardware, it is often feasible to concentrate relatively more light on the areas where appraisal influences sales and profits. Many goods are appraised on a vertical or inclined plane rather than a horizontal one—stacked packaged goods, wall-paper, books, draperies and clothing.

Goods displayed under high illumination for attraction shouldn't change too much in appearance when given to the customer to examine under a lower level on the counter or at the mirror. Ratios of the order of 2 to 1 for the two lighting values are in general satisfactory; with certain materials a greater difference is acceptable.

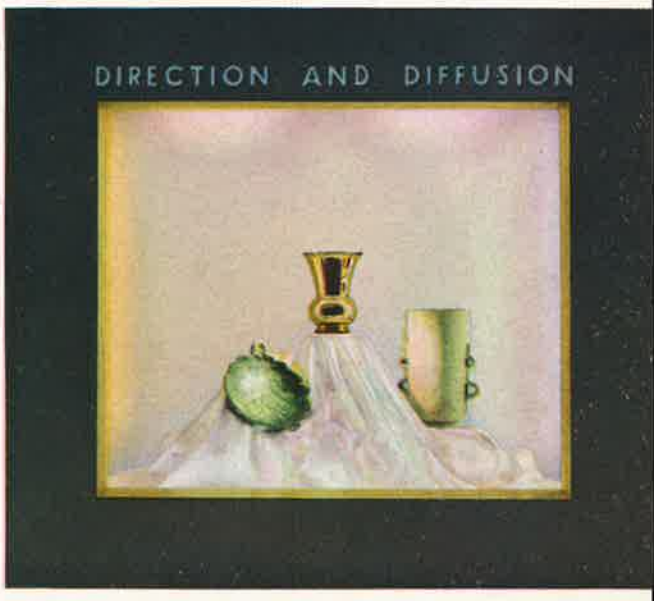
Color enters importantly into the purchase of many kinds of merchandise, from foods and wearing apparel to wall and floor coverings, draperies and motor cars. Lighting which fails to show merchandise about as it will appear where it will be used, is often responsible for customer dissatisfaction and the return of goods.

Other quality considerations are the direction and diffusion of the light and their effect on the appearance of merchandise in emphasizing such characteristics as form, finish and texture. A combination of diffused lighting from relatively large areas and directed light from small sources is desirable to fill out the whole form and to add highlights and sparkle from specular surfaces or reflecting elements as in jewelry, glassware, bright metal goods, shoes, etc. The sheen of some textiles, flat silverware, large appliances and automobiles appear to best advantage with indirect and semi-indirect filament or fluorescent foundation lighting.

The direction and diffusion display niche has luminous panels above, below, and on both sides. It is framed by concealed fluorescent lamps set forward of the panels. Directional spots are incorporated in each of the upper corners. Illumination of the background is accomplished by a separate group of fluorescent lamps. Thus it is possible to vary the direction and diffusion of light on the various articles to reveal form, texture or finish and to provide any desired contrast with the background.

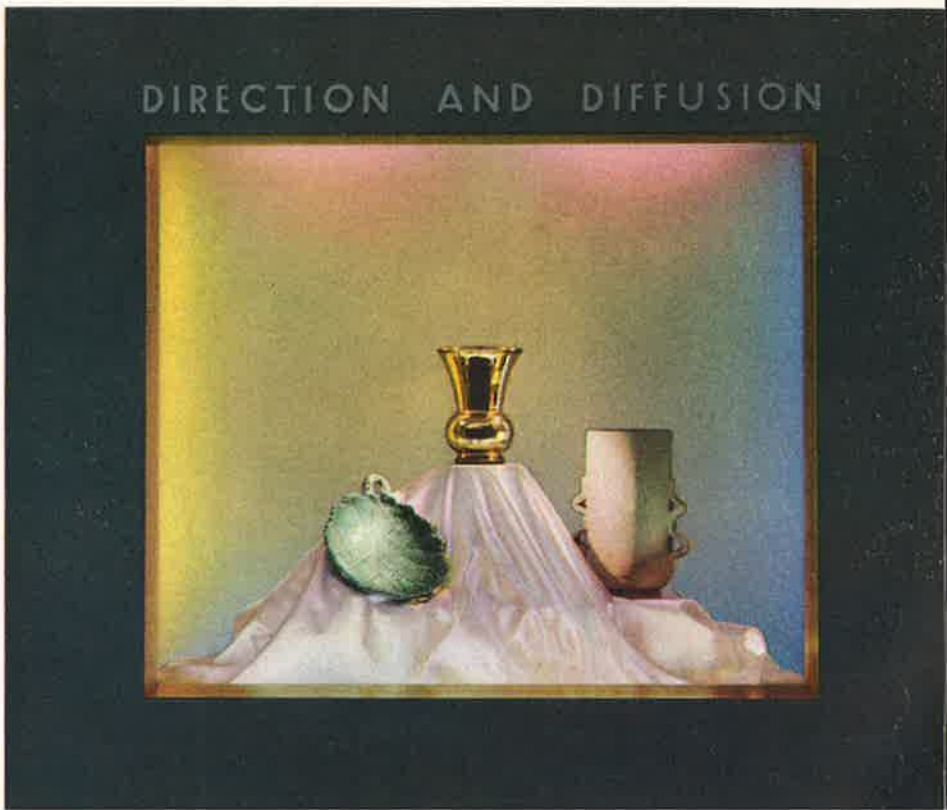


FLAT LIGHTING from a panel above (top photo).



MORE DIRECTIONAL illumination for dramatic highlights (photo at right).

INTEREST is added by introducing color in the background (photo below). This suggests that in addition to revealing the true character of the merchandise, light can enhance its appeal by providing the right setting.



Atmosphere

A distinctive and pleasing store atmosphere is the result of a suitably integrated combination of the visible appointments—the fittings, furnishings, floor coverings, decorations, color schemes, displays—the luminaires and the patterns of brightness which they create. All of these elements add up to an effect that is stimulating or relaxing, dignified or gay, masculine or feminine, outmoded or modern, blatant or subtly charming.

An attractive and distinctive store atmosphere is valuable for its favorable effect on shoppers and store personnel; it should also reflect the character of the establishment and suggest the quality of the merchandise.

Light is one of the most versatile mediums for creating atmosphere. It can impart warmth or coolness; it can emphasize or subdue; it can produce advancing or receding effects; it can suggest locale and establish a mood.

As indicated previously, variations in the brightness patterns serve to direct attention. By introducing a change of pace they relieve monotony and heighten interest.

In the Institute Women's Shop many of the elements of atmosphere

ATMOSPHERE created by the flick of a switch may be demonstrated in several ways in the Institute Women's Shop. A comparison of this illustration and the one on page 31 will reveal a change in atmosphere by merely introducing a different color of light behind the cases. Blue makes the walls appear to recede; gold has the opposite effect.

may be demonstrated and studied. For example, in photo on opposite page, note that the quality of the light from above the wall cases does much to influence the "feeling" of the shop. The color shown in the picture results from a mixture of gold and pink fluorescent lamps. The result is a "peach" tone suggesting femininity. The blue makes the wall appear to recede and the cases to stand out prominently. Changing the color of these lights to gold (see page 31) would create warmth and tend to advance the wall area. At right in photo, the wash of light on the natural-wood-paneled wall behind the feature display contributes a feeling of spaciousness.

These features incorporated with the basic general illumination and the lighted displays make up an ensemble that goes far in determining customer shopping preference. (See illustrations on pages 30 and 31.)

COLOR—AN IMPORTANT FACTOR IN ATMOSPHERE

We live in a color-conscious period as manifested by the great interest in subtle ensembles in clothes and in decoration, by the rising popularity of color photography, and by the growing use of color in magazine illustrations. How these things appear to the eye is determined by the spectral characteristics of the illuminant.

Light sources in a range of colors help the designer immeasurably in creating atmosphere and in designing unique, dramatic displays. Of all the techniques available to him, none surpasses this medium in flexibility and versatility. Color adds to lighting a new dimension as yet largely unexplored.

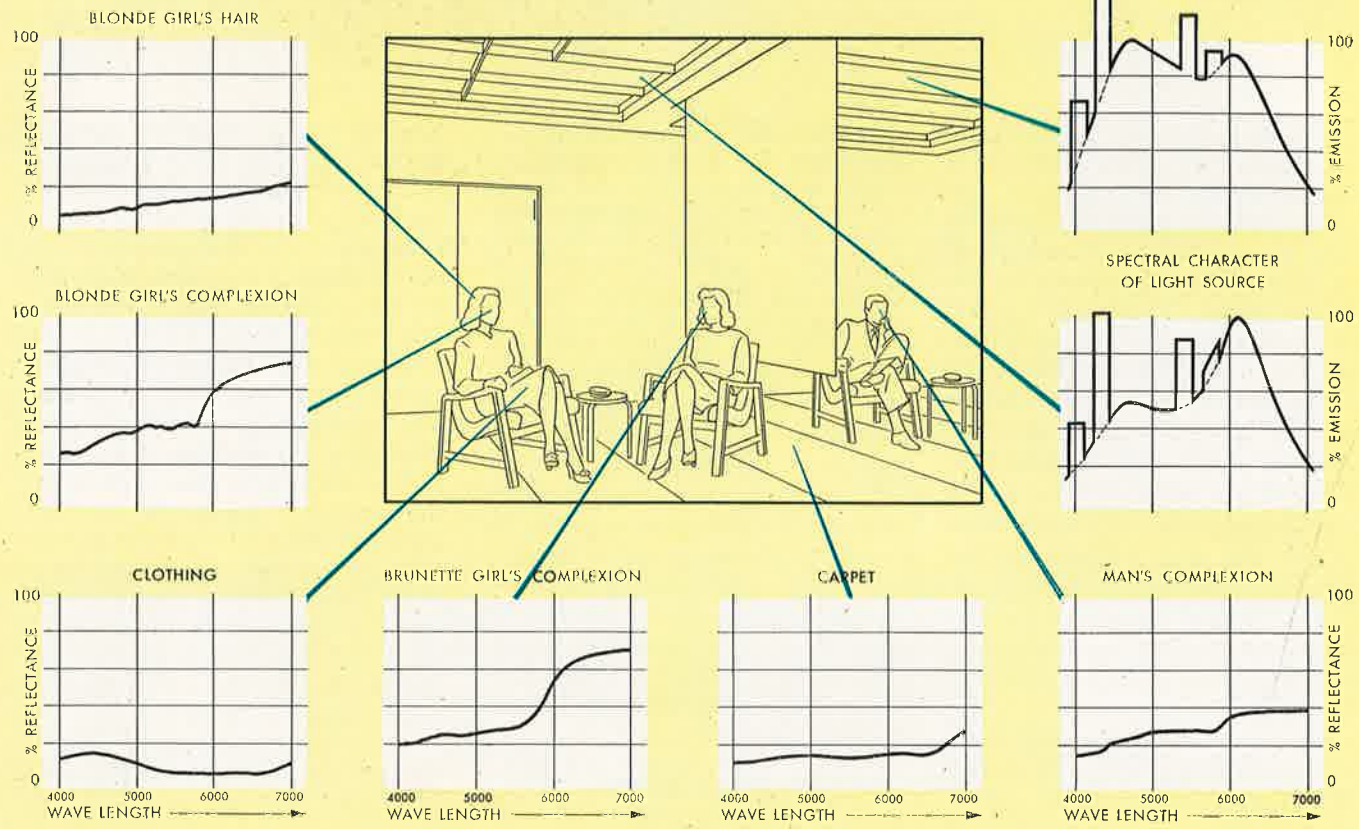
EFFECT OF LIGHTING UPON COMPLEXIONS

The color of human complexions is one of the important considerations in the lighting of all interiors, particularly in the home, restaurant, office, and store. In the study of this factor, as well as many others, the Color Center has proved invaluable because of the enormous range of colors available at nearly constant intensity.

Panels of pleated glass cloth are placed below the lamps to diffuse the light and give uniform color mixture at the working plane. The glass cloth and the room furnishings are neutral so as not to alter the color of light. The wooden frames on which the cloth is stretched illustrate four different patterns and types of construction for access to the lamps. About 60 per cent of the generated light flux comes through the panels.

To facilitate research and demonstration the ceiling is divided into quadrants, each equipped with separate systems of 3500°, 4500°, 6500° and Soft White fluorescent lamps. One has, in addition, a sys-

THE COLOR CENTER provides unique facilities for the study of color as a controllable factor in environment, and in the appearance of people, materials of decoration and articles of merchandise. The visitor's attention is being directed to the ceiling sections which are equipped to supply a variety of colors of light.


BLONDE GIRL'S HAIR
100
% REFLECTANCE
0
BLONDE GIRL'S COMPLEXION
100
% REFLECTANCE
0
100
% EMISSION
0
SPECTRAL CHARACTER
OF LIGHT SOURCE
100
% EMISSION
0
CLOTHING
100
% REFLECTANCE
0
4000 5000 6000 7000
WAVE LENGTH
BRUNETTE GIRL'S COMPLEXION
4000 5000 6000 7000
WAVE LENGTH
CARPET
4000 5000 6000 7000
WAVE LENGTH
MAN'S COMPLEXION
100
% REFLECTANCE
0
4000 5000 6000 7000
WAVE LENGTH


LUMINAIRE DISPLAY

tem of filament lamps. Another is equipped with fluorescent lamps of all standard colors, and can produce by combinations a full range of colors and tints.

Thus each ceiling quadrant may be lighted in a different color and separated by roller screens to permit full-scale displays to be viewed under each of four different colors of light. In the illustration on opposite page, two quadrants are in use with the screen between. The spectral character of complexions, clothes, and appointments of the room are shown in the diagram.

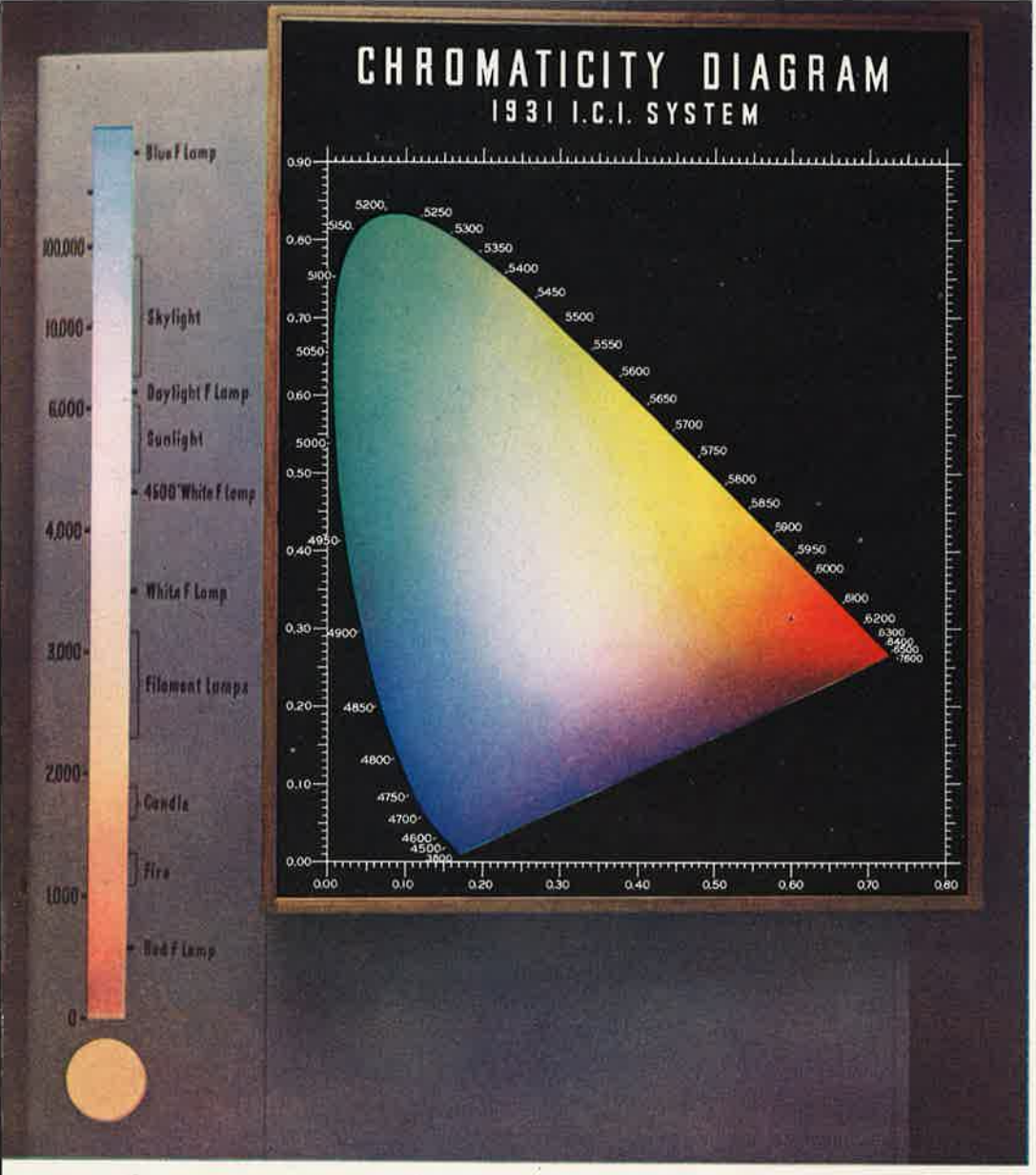
←TEST SETUP for the study of the effect of various colors of light on complexions, hair, clothes and room finishes, all of measured spectral reflectance.

APPEARANCE OF COMPLEXIONS varies with the color of the illuminant. A suggestion of the effect is carried by the three illustrations on this page. Accurate reproduction is, however, not feasible due to the many steps in the photographic, engraving, and printing processes; to say nothing of variations which may occur by reason of the spectral characteristics of the illuminant under which this magazine may be read.

Soft White ▲

4500° White ▼

▼ 3500° White

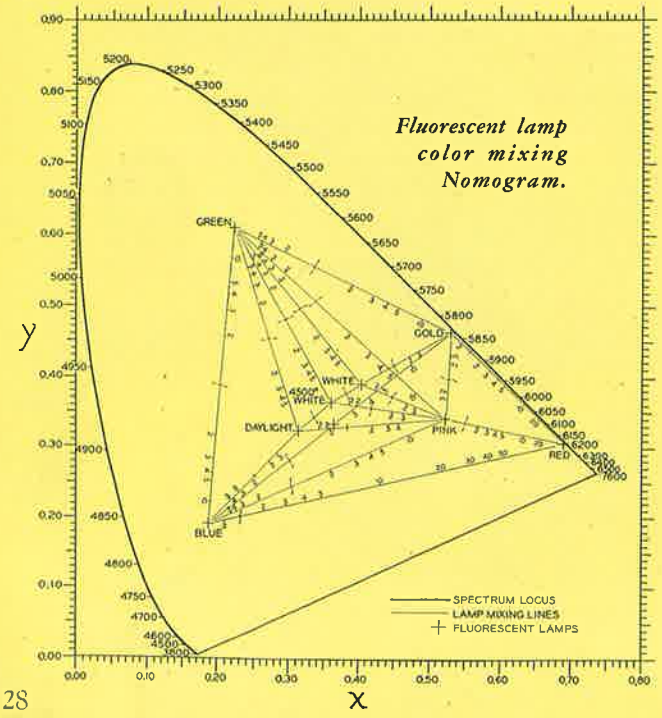


UNIQUE LUMINOUS DIAGRAM makes it easy to visualize the range of color the eye can see. The "thermometer" at left is a scale of "black body" color temperatures illustrating the change in color of a heated material from red through yellow and white to blue.

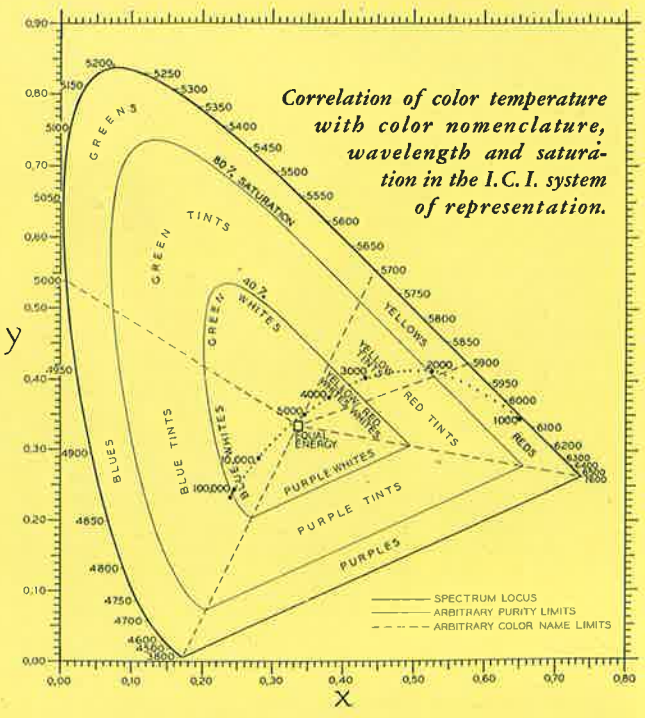
I.C.I. SYSTEM FOR SPECIFYING COLOR

The fluorescent lamp provides for the first time sources producing an inclusive range of colored light at high efficiency and with close control. If they are to be applied to produce pre-determined results one must be able to deal with color quantitatively. In the planning of the Institute an important contribution was made to color technology in the form of the Fluorescent Lamp Color Mixing Nomogram illustrated in the lower left drawing. This is based upon the Chromaticity Diagram of the International Commission of Illumination and enables one to make in a few minutes color computations that formerly required days. The nomogram made possible the design of the Center's completely controllable color facilities.

Perhaps the most striking feature of the I.C.I. system of color specification is the fact that each color seen by the normal human eye is represented by some point within the "horseshoe" curve, amounting to some 10,000,000 recognizable colors, according to some authorities. The pure "rainbow" or "spectrum" colors are found along the horseshoe itself, while all other colors, being mixtures of various wavelengths of light, lie within the "horseshoe." As various wavelengths



Fluorescent lamp color mixing Nomogram.



Correlation of color temperature with color nomenclature, wavelength and saturation in the I.C.I. system of representation.

of light are mixed, the apparent color becomes "diluted" and, if all wavelengths are mixed in equal proportion, the resultant "perfect white" is in the exact center of the diagram. Intermediate points may be considered mixtures of white plus a given wavelength.

Fortunately, all methods of color specification can be expressed in the I.C.I. system and shown on the diagram. The common color names and the more exact "hue" and "saturation" concepts of the artist may be represented as in the lower right drawing on opposite page. Boundaries between various hues are given by the broken lines radiating from the center and the concentric curves marked 40 per cent and 80 per cent of saturation serve to indicate the areas representing whites, tints and colors. The dotted curve is the "thermometer" expressed in the I.C.I. system. Three fluorescent lamps, the 3500°, 4500° and 6500° whites are on this curve, hence match in color a black body heated to these respective temperatures. Other fluorescent lamps, not on this curve, are identified by name.

Facilities more complete than any heretofore available, are provided for the study of the effect of spectral quality of light on various materials. The color impression received by an individual is affected by the color of the light source, the color of the material at which he is looking, and the level of illumination. Thus, a given material may appear strikingly different under different colors of light.

It will also change in appearance appreciably at different intensities of illumination of a given color. The effects are more pronounced in the case of tints and light grays than with saturated colors and darker shades. In the color illustration below one sees approximately how a neutral gray wall finish used in the Institute appears under the four most common fluorescent lamps—6500° and 4500° at top; Soft White and 3500° beneath.

Although the effect of these "white" sources on saturated colored materials is small, note how the changes become more striking when more saturated colors of blue, green and pink fluorescent lamps are applied to identical samples in right half of illustration below. Same samples are also shown under 4500° White for comparison.

A DEMONSTRATION-DISPLAY is one of the facilities in the Color Center where various samples may be observed simultaneously under four variations of white light or of more saturated colors. The lower section shows how form is emphasized by color contrast, a technique which presents many opportunities in decoration and display.

Combining the three A's in the Institute

GENERAL LIGHTING. Four rows of 72 T-8 4500° White Slimline operated at 200 ma. in polished reflectors of modified elliptical cross section provide illumination of 60 footcandles. The distribution is such as to direct a good part of the light to wall cases or other vertical displays. However, the illumination is flat in character and, used alone, tends to give a monotonous appearance to the store.

LIGHTING the individual displays to a higher value relieves monotony. The picture the store presents is more interesting, and of even greater importance to the merchant; the shopper's attention is directed to specific items.

Womens Shop

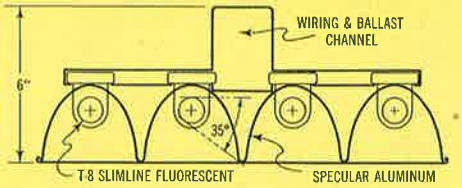
Lighting planned to move merchandise may be demonstrated in this specialty shop. The basic general *appraisal* illumination may be set at any one of several steps from 30 to 120 footcandles from fluorescent sources, or at 35 footcandles with filament lamps; or combinations may be made of the two.

In the upper photo on opposite page, the area is lighted to 60 footcandles with fluorescent. There is opportunity to judge the effect on store appearance of three luminaire positions: recessed in the ceiling, attached close to the ceiling, or suspended from it. The lamps may be exposed or shielded to 35° crosswise to study effect on level and distribution of illumination, on store appearance, and on relative attention to merchandise.

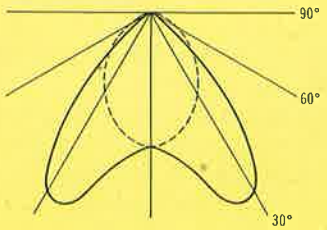
Emphasis — *attraction* — display lighting is presented in a number of forms, at levels two to five times that of the general illumination; and in the same or different colors. There is opportunity to compare fluorescent and filament lighting in the floor and wall cases. Supplementary downlighting from PAR-38 spots in the ceiling imparts sparkle to the costume jewelry in the shallow cases. One may observe the effect of the factor of relative position and of reflector form in achieving a desirable distribution of light in the wardrobe case, and for making labels easier to read on stacked boxes and to see merchandise in drawers. One may study the application of light for selling and displaying hats, and for lighting shoes before the floor mirror. A feature display lighted to several hundred footcandles from reflector lamps above illustrates how attention can be carried to the far side or to the end of a store.

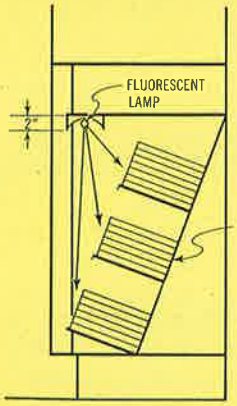
Accents of brightness in form, value and arrangement all help to create the display pattern. Thought

LIGHTING for attraction, appraisal and atmosphere are all combined for effective selling.

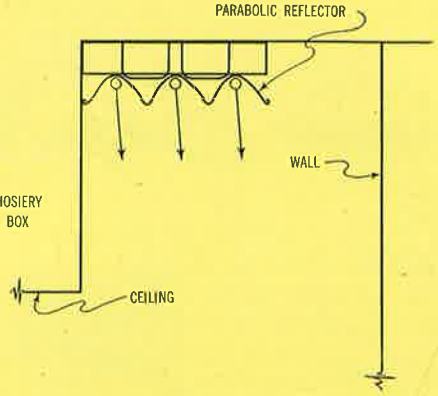


SECTION OF THE CEILING LUMINAIRE in the Women's Shop. The reflectors are designed to distribute the light both over the selling areas and over the vertical displays in wall cases. This is the requirement in many types of stores.





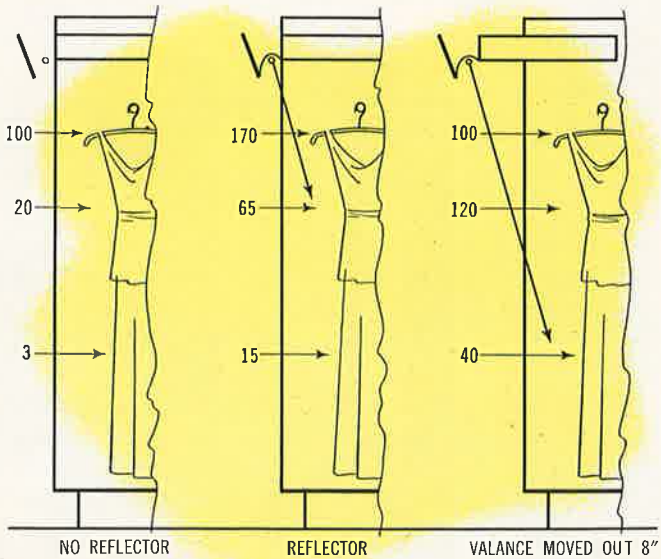
CASE FOR HOSIERY DISPLAYS illustrates a means of making stacked boxes attractive and labels easy to read.



ONE METHOD OF PERIMETER LIGHTING is illustrated on the end wall of the Women's Shop. Ceiling stops short of wall, providing space for concealing rows of fluorescent lamps in reflectors.

must be given to the creation of a satisfactory over-all composition both as to pattern and color. Blue, gold, pink, daylight and 4500° white fluorescent lamps are housed in the wall case tops. These give opportunity to control *atmosphere* through a wide range of combinations. Soft white, gold and daylight may be combined or tried separately with respect to the natural-wood walls and other appointments. Building up the brightness above the cases and at the end of the store, along with the bright vertical displays, illustrates the effect of perimeter lighting in creating a feeling of greater spaciousness and a stimulating interior. In open front stores, bright vertical areas assume a special importance in assuring an attractive ensemble and minimizing veiling reflections in the glass front.

GARMENTS IN WARDROBE CASES are often overlighted at the shoulders with the illumination falling off too markedly below. Lack of proper distribution of light is, in fact, a common fault in vertical displays of merchandise. Often this results from lamps incorporated within the case or behind a valance at the top. Good distribution and efficient use of light is a matter of using a good reflector for control and locating it a sufficient distance out from the display, as is readily apparent when a reflector is added to the lamp behind the valance and the valance is moved out from the top of the case. Diagram below gives relative illumination values over the vertical for three positions of the lighting equipment. A novel idea is included for lighting the articles within the drawers to enable the salesperson to make quick selection. Pulling out the drawers turns on 13-watt 21 T-5 lamps built into the nose of the shelf immediately above.



Combining several lighting components in one display case, the hat bar illustrates functional application of light.

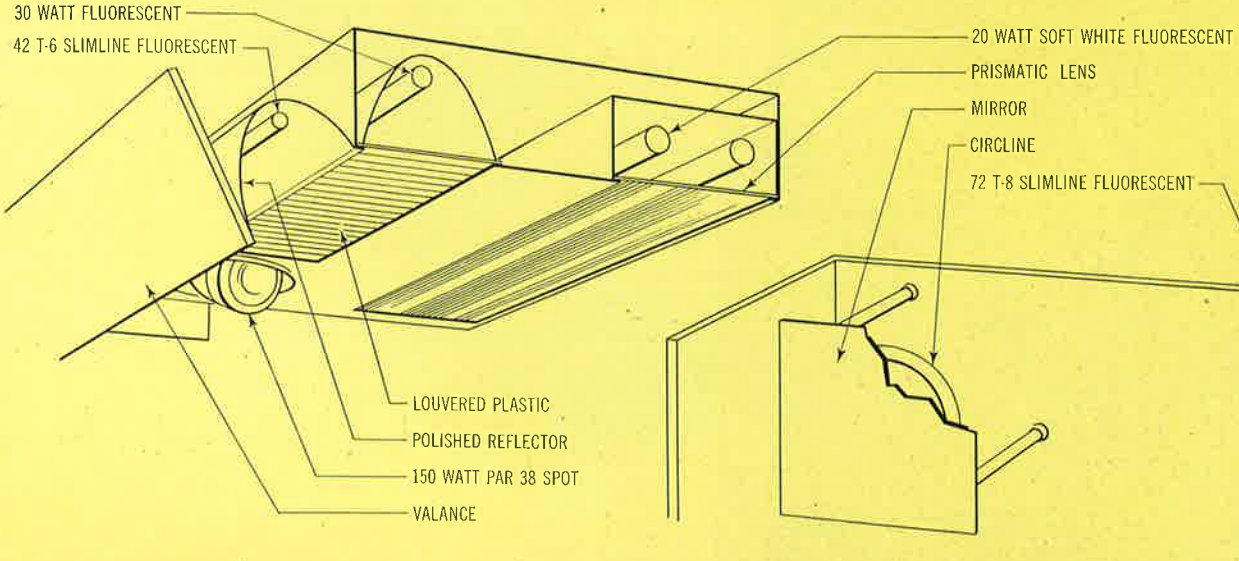
General basic illumination is provided by fluorescent Slimline in a reflector behind the valance.

Attraction lighting comes from a spotlight which directs attention to a particular hat.

To facilitate *appraisal,* another reflector is built in to light the top of the hat as the shopper tries it on before the mirror. Since she concentrates her appraisal first upon her face and judges the hat by its relation to her own looks, illumination flattering to the complexion is directed to her face from a prismatic glass panel. Supplementary light emanating from a Circline behind the mirror helps to make the experience of trying on hats both comfortable and pleasant.

A touch of pink at the right creates an *atmosphere* of femininity.

HAT BAR in the women's shop of the Institute store. Sketches show lighting installation details.



Department Store Section

SUNSHINE SHOP in the Institute store suggests to department stores, utilities and other lighting retailers a flexible display of portable lamps, ceiling fixtures, and lamp bulbs.

HIGH CEILING AREA typifies the main floor of an establishment with several departments clustered about it. The effect of space is created by the two mirrored walls. Here a range of levels of illumination from 30 to 150 footcandles may be experienced by employing combinations of luminaires arranged in a variety of line and closed patterns. Emphasis lighting is available from supplementary projector spots in gimbals integrally combined in the luminaire pattern. Also provided is an independent filament lamp system of fixed downlighting, so that one may study its use alone and combined with fluorescent for warmer quality, sparkle and highlights. Color from fluorescent lamps mounted in a cove above the Drug Section permits an interesting range of atmospheric tones over the ceiling and upper wall area. The central floor area is kept clear for chairs when the store becomes a lecture room as in the picture on page 19.

NOTE: For section view sketches of ceiling fixtures appearing in photo above and photo series on opposite page, see page 39.

CONTINUOUS LINES LENGTHWISE. Slimline fluorescent lamps of 8-foot and 6-foot length operated at 200 ma. with filament downlighting integrally interspersed. Crosswise shielding of 35°. All fluorescent lamps used are 4500° white.

CONTINUOUS LINES CROSSWISE. Standard line 40-watt T-12 fluorescent and 6-foot T-8 Slimline lamps of same brightness may be switched on, to compare the crosswise shielded view with the endwise view of lamps as illustrated in photo at left.

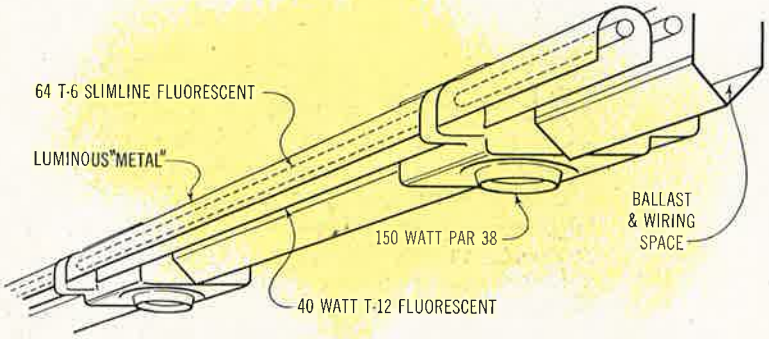
INTERRUPTED PATTERN of two luminaires for 40-watt fluorescent lamps in tandem. These provide a basic level of 30 footcandles. Large downlights have 500-watt filament lamps in mirrored-glass reflectors with glass covers and concentric louvers.

SIXTY FOOTCANDLES of fluorescent light supplied by this pattern. Groups of louvered projector spots in gimbals provide two or more times that amount for selling or display areas. Gimbals permit aiming the beam in any direction within 30° from vertical.

COMPLETELY CONNECTED PATTERN obtained by adding the 6-foot Slimline luminaires demonstrating illumination of 100 footcandles. The downlighting may be turned on and off to observe its contribution to quality and appearance of merchandise.

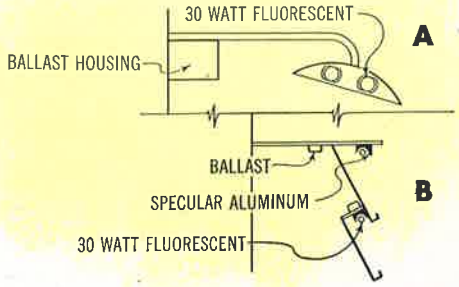
SYSTEM OF DIFFERENT CHARACTER may be appraised with square units. Inner elements have 35° shielding in both directions. Projector spots in gimbals. Exposed low-brightness 40-watt T-17 fluorescents on sides reduce contrast of luminaire with ceiling.

Drug Section



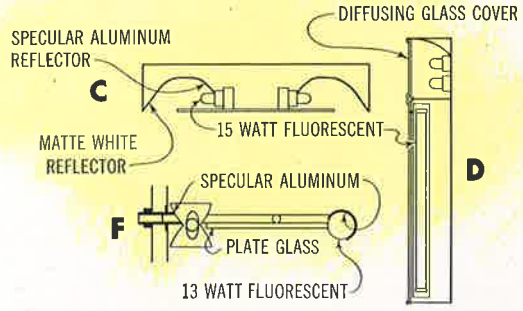
Slim luminaire proportions and lightweight appearance are permitted by Slimline fluorescent lamps. Projector spots integrated in design for downlighting. End units may be 6 or 8 feet long with combination units in continuous row where downlighting is needed.

DRUG SECTION LIGHTING. Small reflectors for T-6 Slimline fluorescent lamps, attached to the ceiling project a wedge of light on the selling and display shelves. This illustrates one step in an effective system. A broader distribution is illustrated with suspended luminaire. While good general selling light is directed from overhead, the character of the store immediately becomes complete and more attractive when the display lighting is added as in the illustration. Many forms of display lighting are featured. Some of these are depicted on the opposite page.



A — WALL-MOUNTED unit for counters. Ballast housing is part of design.

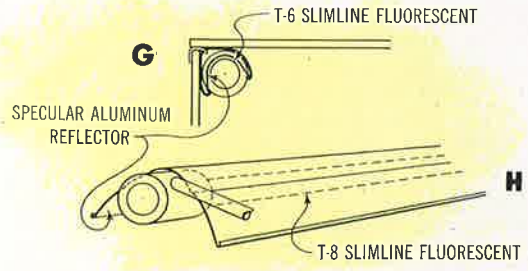
B — MORE ATTENTION is directed to magazines when lighted with small strips incorporated in case as illustrated.



C and D — COMFORTABLE LIGHTING for the face at the cosmetic mirror — indirectly from sides and direct from panel above.

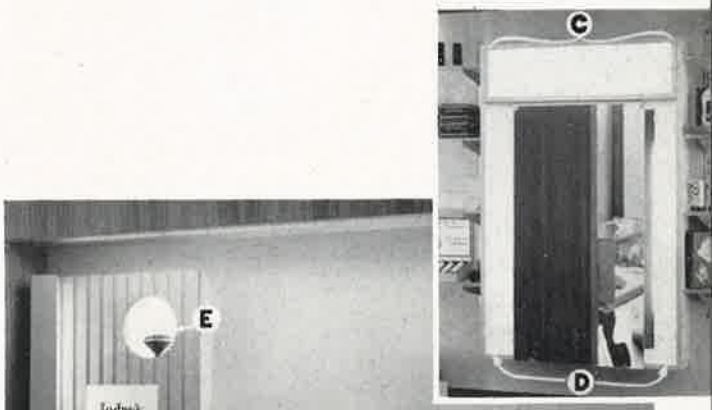
E — BRIGHTNESS EMPHASIS on the special display with concealed Circline fluorescent.

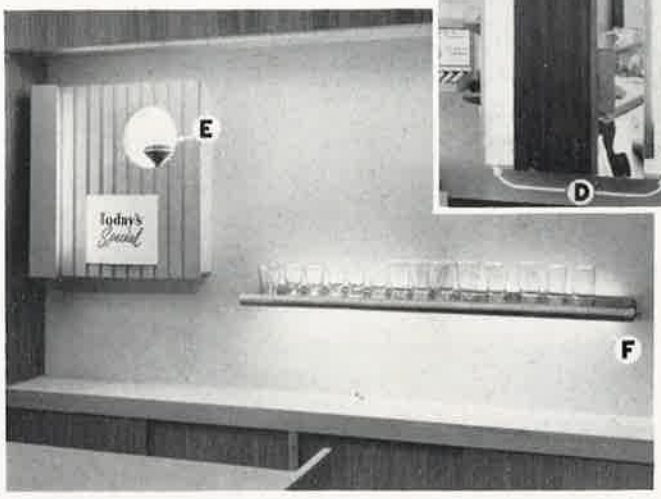
F — COMBINATION background and work space lighting unit may be small yet effective. Rotating shield on shelf edge directs light up or down to highlight articles such as glasses.



G — T-6 SLIMLINE fluorescent is ideal for shallow showcases. The small cross-section of the reflector gives neat appearance and minimum obstruction to view of the case.

H — VERTICAL or inclined displays are effectively illuminated by adjustable reflector which may be rotated around lampholders for aiming light from Slimline fluorescent lamps.





Food Shop

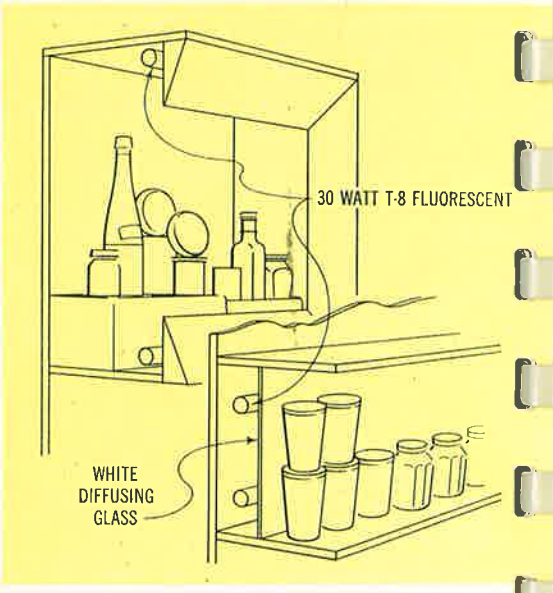
This section is devoted to showing some of the lighting principles that apply where the displays are on shelves or stacked vertically. The fluorescent ceiling fixtures serve to demonstrate that the characteristic light distribution of basic general illumination furnishes but half as many footcandles on vertical surfaces as on horizontal.

Reflector or projector spots provide a simple and effective means of building up brightness on the vertical for reading labels quickly and for greater attention. The equipment may be located on the ceiling, on counters, or built into displays. Framing them in higher brightness is one way of insuring that high-profit, impulse items will attract the shopper's attention.

An insert of luminous background attracts attention to jellies, preserves, or other translucent goods and reveals the contents of the containers.

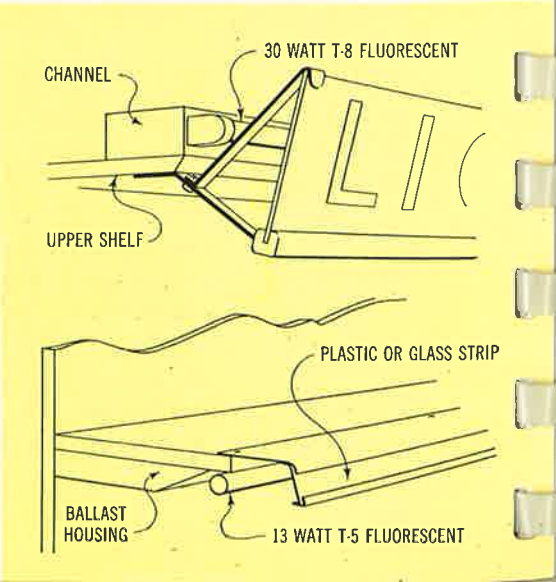
A translucent valance may identify a section and provide light for the upper shelves and the wall area above.

A luminous shelf strip may be used to accent prices and to light goods on shelf below.



SECTIONS of framed impulse display and translucent background insert.

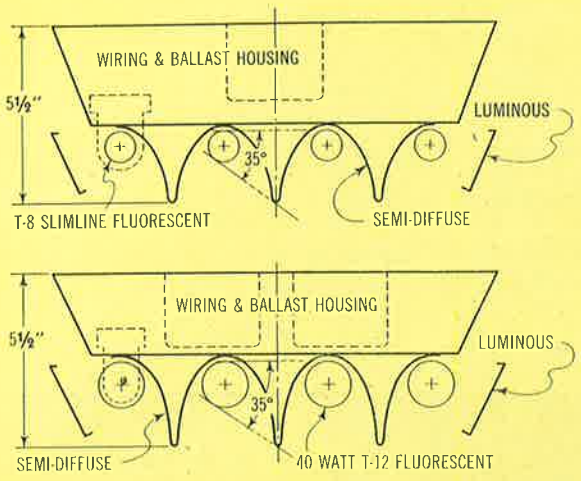
SECTIONS of the luminous valance and the price-card shelf-lighting unit.

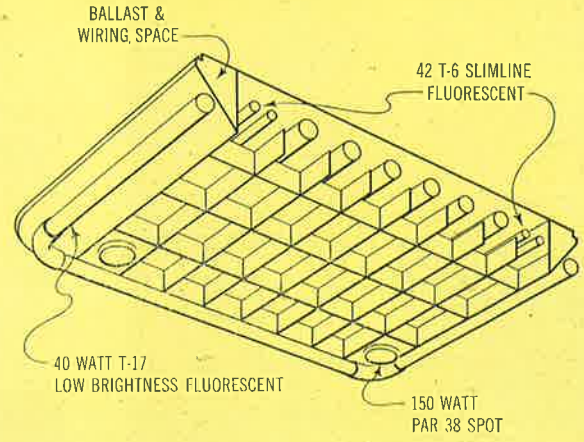


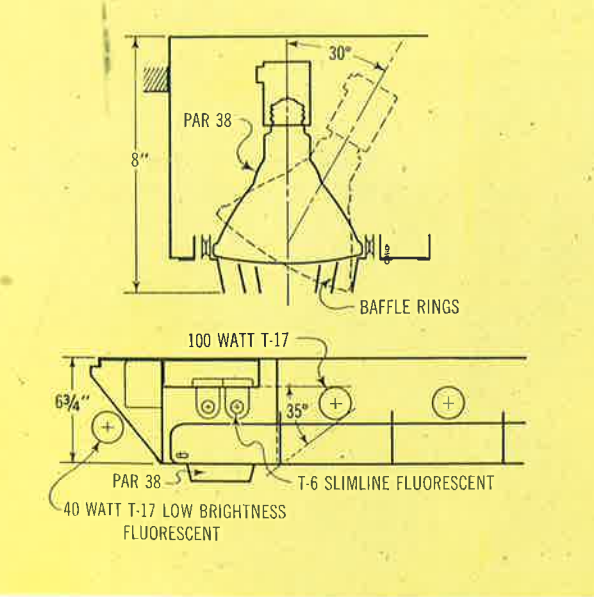
Luminaires

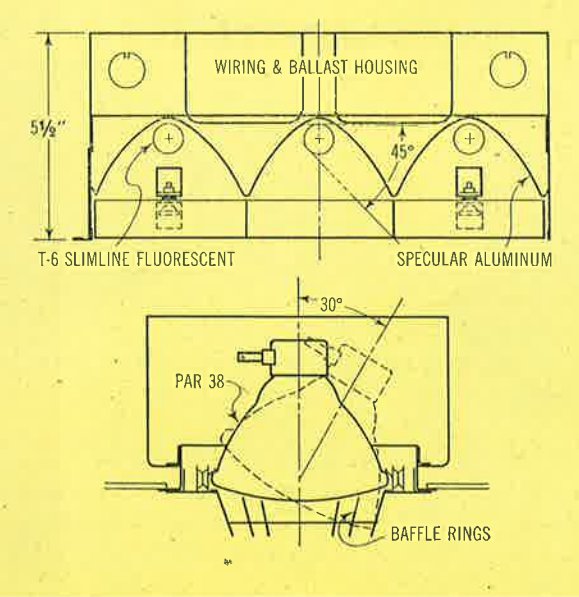
SECTIONS of the continuous luminaires in high ceiling area (pages 34 and 35). For uniformity in appearance, the same reflector openings are used for both 1 and 1½" diameter lamps, therefore the reflectors are deeper and the height of perforated metal sides greater for the larger lamps to afford the same shielding. At high mounting there is less need for shielding endwise.

CUT-AWAY view of the large square luminaires installed on the high ceiling. These incorporate shielding in both directions for the higher brightness 100-watt T-17 and 42T-6 fluorescent lamps. The shorter Slimline lamps are utilized to provide space in each corner for incorporating adjustable spotlighting. (See illustration at lower left for corner section.)









PAR 38 LAMPS with baffle rings at the intersection of linear luminaires illustrate another method of incorporating adjustable spotlighting. The other drawing shows a corner of the square luminaire indicating the relative positions of the lamps. Note the low brightness 40-watt lamps for the perimeter to add interest and reduce sharp contrast with the ceiling.

SECTION of one of the show window units (page 41) with parabolic polished reflectors for good control. This is louvered to 45° crosswise and 20° endwise.

THE PAR 38 lamp with the side prong base in shallow boxes as used for the show window and some of the other flexible spotlighting in other parts of store.

Show Window

Show windows occupy the most valuable space in a store and are designed to sell, by presenting merchandising ideas convincingly, and by registering the character of the establishment favorably at a glance. To make this street front space win customers, the display artist constantly strives to use it to create new, striking, and distinctive displays. To do this he needs to have at his command a flexible lighting system, so responsive to his creative talents, that he can adapt it with a minimum of effort to displays that vary in design and arrangement. The demonstration in the Women's shop suggests one of the ways of providing such flexibility.

The amount of attention a show window can produce from passing traffic is largely related to its over-all brightness. The window must compete with the many distractions which people experience in street traffic.

FILAMENT LAMPS in conventional show window reflectors can be of special value in building over-all brightness because they permit the maximum amount of light from restricted ceiling areas. Photo at left offers proof of this point. Filament units provide the initial step in building up general brightness, basic to winning attention.

FLUORESCENT LAMPS have special purposes for show windows, too. They possess much-wanted qualities, coolness, choice of color quality, high efficiency, lower brightness, and the suggestion of modernity. For windows with the greatest range and power, for the display man, both types of sources must be combined. Slimline lamps in the T-6 diameter, when operated at 200 ma., can provide the most light of any fluorescent source from a given amount of ceiling area. An excellent method of using these lamps is to incorporate them in polished metal reflectors of parabolic contour. Thus each reflector directs an extended "wedge" of light, which compares with the more completely tailored pattern available with filament units. The reflectors in the front portion of the show window ceiling are the most important in building up the over-all brightness. In the window shown, shallow louvers provide 45° shielding crosswise and 20° shielding endwise.

ACCENTS AND HIGHLIGHTS are superposed for modeling, sparkle, greater interest and attention value. Louvered PAR-38 spots set in gimbals illustrate one way of adding attention-compelling features. Built-in outlet strips in the floor provide connections for footlights, floor spots, lighted signs; background and side lighting strips for other display arrangements.

OFFICE . . . ACE* LIGHTING *for Appearance,*

OFFICE lighting in the Institute is designed with emphasis on appearance, comfort, and efficiency. Appearance plays an increasing role in selection of lighting systems; every installation should be appropriate, satisfying the requirements of architect or decorator.

In even greater degree, the comfort of a lighting system determines its long-time suitability, since it has a major influence on the seeing and over-all performance of office personnel. Comfort of seeing is dependent upon both the quantity of illumination and the quality of the lighting and the environment.

The over-all efficiency of a lighting system is a highly important factor, since it determines the illumination values economically obtainable. But efficiency gained at the sacrifice of lighting quality is self-defeating because of the resulting impairment of employee performance. When both quality and efficiency are integrated with good appearance, then up-to-the-minute ACE lighting for offices results.

INSTITUTE OFFICES

Institute offices are operating areas occupied by the Institute staff. Comfort is, therefore, the prime consideration, with appearance a close second. Fluorescent lamps are used extensively because they expand the opportunity to create lighting of requisite quality with great freedom in application and design techniques. This flexibility is stimulating the development of lighting in which the means employed are appropriately integrated with the room and are relatively unobtrusive. In the Institute offices are shown practical solutions that approach this objective with varying degrees of perfection.

The bold blade pattern of the louverall lighting in the office of L. C. Kent, is in keeping with the traditional panelling of the executive type of office. The appointments are familiar—the conference type desk of generous proportions, leather upholstered furniture for

LOUVERALL LIGHTING in the office of L. C. Kent, who is in charge of the Institute. The blades of this louverall ceiling are so positioned as to shield the crossview of the 64 lamps by 45 degrees or more. The 4500° white lamps are 40-watt T-17 low-brightness sources. Circuited to provide 40, 80, 120 and 160 footcandles, this system brings a new degree of seeing comfort to the executive-type office. Wall panels and the desk top are natural oak. These light-colored surfaces are accountable for much of the comfort realized in this executive's office and found lacking in most others.

* *A-C-E for Appearance, Comfort, Efficiency.*

Comfort and Efficiency

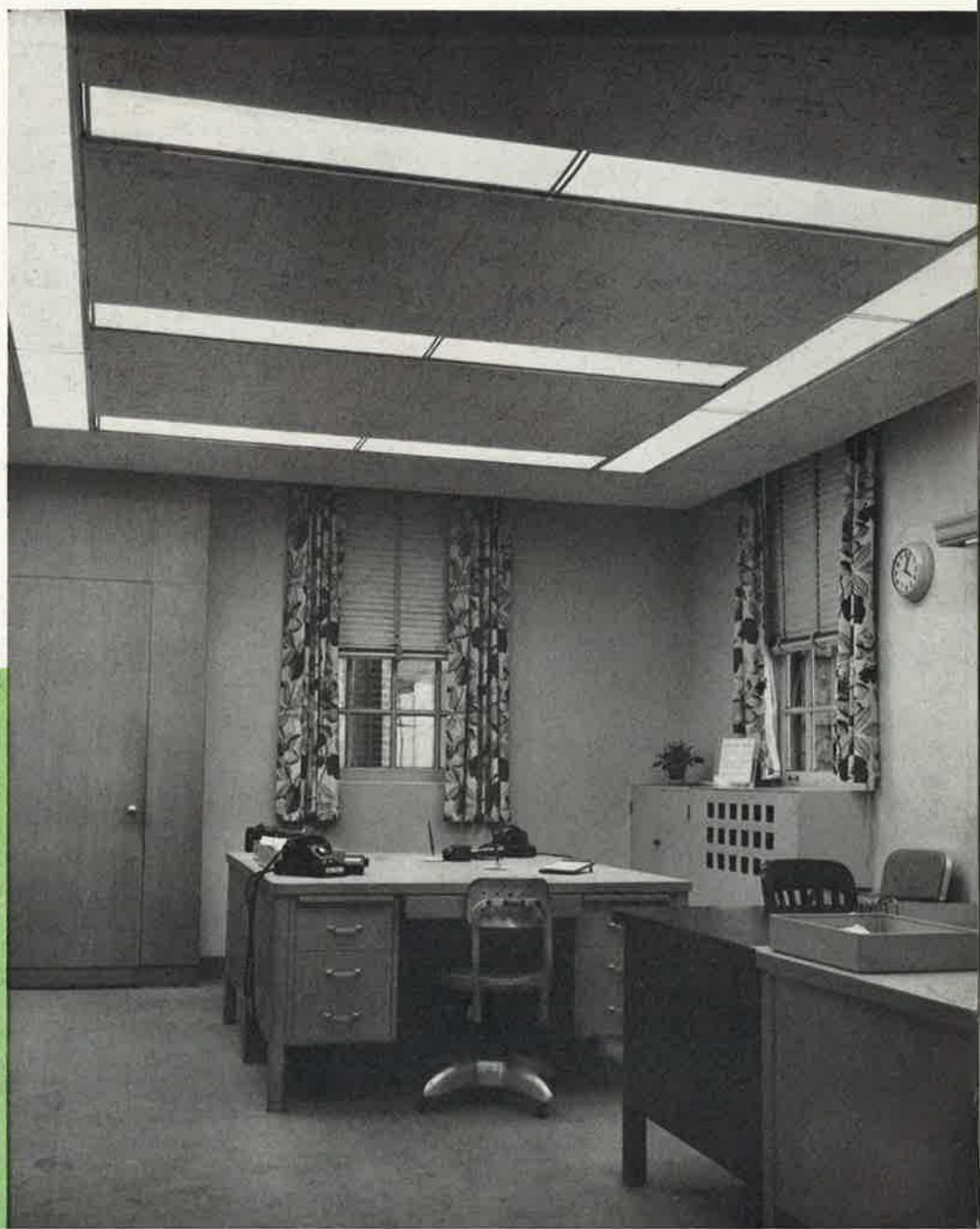
comfort and richness; carpeted floor; and concealed closets, files and heating equipment. Yet many other traditional conditions intentionally are omitted. The wall panels are natural oak finished with dull wax. They are several times lighter and many times more comfortable and cheerful than the usual dark woods. The desk, too, is natural oak (not golden). The full beauty of the wood is thus revealed and work at this desk is performed with freedom from the discomfort of a large dark desk top surrounding the work. In keeping with the insistent trend toward lighter finishes for better appearance and real visual comfort, the floor covering and the upholstery are also light by traditional standards. The lighting? Low brightness fluorescent lamps are unobtrusively tucked up above the louverall ceiling so that no one in the room has an appreciable awareness of the light sources although there are 160 footcandles of cool, comfortable, satisfying light.

The form, texture, proportion and color of the lighting equipment are but part of a satisfying over-all lighting design. The system as a whole should be pleasing to the eye, a logical, consistent and harmonious element of the complete room pattern. Integration of appointments must be achieved to produce real ACE office lighting.

The registration office presents a pleasing and unobtrusive lighting pattern developed with commercial troffer units. In this area, much of the work involves critical seeing, such as typing from shorthand notes, notation of carbon copy invoices and shipping memos, preparing and proofreading duplicated material, and checking or filing registration records. No sacrifice in quality or comfort can be tolerated, but the appearance requirements are more important than in some general offices. This is true of all such space in offices, hotels, stores, railroad and airline stations. The basically clean, functional appearance of troffers has been augmented by coordinating them in a simple pattern which becomes one element. This pattern also assures uniform perimeter brightness for the room, desirable for appearance as well as comfort.

Seeing comfort is dependent upon the quantity and the quality of the lighting and upon controlled environmental conditions. Seeing comfort steadily increases with more illumination provided no adverse factors of quality are introduced when the lighting is increased. The objective of ACE lighting is to guarantee increased comfort and performance with progressively higher levels of illumination as these become economically feasible.

The louverall and troffer systems



REGISTRATION OFFICE. From this office, the Institute staff greets its visitors, makes hotel reservations, arranges for meals, calls cabs, and performs innumerable other services. Accurate seeing through long hours of application is essential here if errors and confusion are to be avoided. The recessed glazed troffers form an interesting pattern on the ceiling while delivering more than 50 footcandles of cool, comfortable light to ease the seeing tasks.

DESIGN ROOM — FOUR-LAMP UNITS. Having explored the effects of such variables as luminaire brightness, spacing and mounting height, these men go at their lighting designs with new confidence and assurance. For example, they have seen how appearance and comfort suffered when these lines of fluorescent luminaires were dropped to a typical 30-inch suspension below the ceiling. Then they watched the improvement as the entire system was raised to a 6″ or 8″ suspension. No mistakes in mounting height specifications will be made by these Nela alumni.

DESIGN ROOM — TROFFERS LENGTHWISE. Here the same group is putting troffer lighting to the acid test of working under it. The designs they develop include the specification of lamp type, size, and color; luminaire performance, brightness, spacing and mounting height; work surface texture, reflectance and color; and ceiling, wall, floor and furniture finishes. These are the factors they will cover in their ACE lighting plans.

have predominant direct lighting components with favorable efficiency, light utilization and maintenance characteristics. They facilitate the provision of 50, 100, 150 or more footcandles within the economic limitations of today's lamp, power and equipment costs. With adequate shielding of the relatively low-brightness fluorescent sources, these and other direct, semi-direct, and direct-indirect types can be assigned excellent comfort ratings. Work surfaces and room finishes in Institute offices are of recommended reflectance and surface texture, thus avoiding annoying and distracting reflections. The quality of lighting at the work surface compares favorably with the inherently satisfactory work-plane quality of indirect and semi-indirect lighting.

OFFICE DEMONSTRATION

An outstanding feature of the Institute is the unique office demonstration and laboratory area. Located adjacent to the model schoolroom, it is part of the Office-school Center in which the fundamental characteristics of major lighting systems may be demonstrated. The equipment includes both the totally direct and indirect systems as well as the intermediate semi-direct, general diffuse, direct-indirect and semi-indirect types. The relative comfort of the systems can be readily appraised here. These large-scale, room-size facilities are helping to forge more definite concepts, greater precision in our knowledge of lighting quality.

No demonstration in the Institute

is more startlingly impressive than the one which in three or four seconds, transforms a typical unshielded fluorescent lamp installation into a completely comfortable, inviting, luminous interior. Never before has there been such a convincingly impressive demonstration of the influence of lighting quality upon the comfort of seeing.

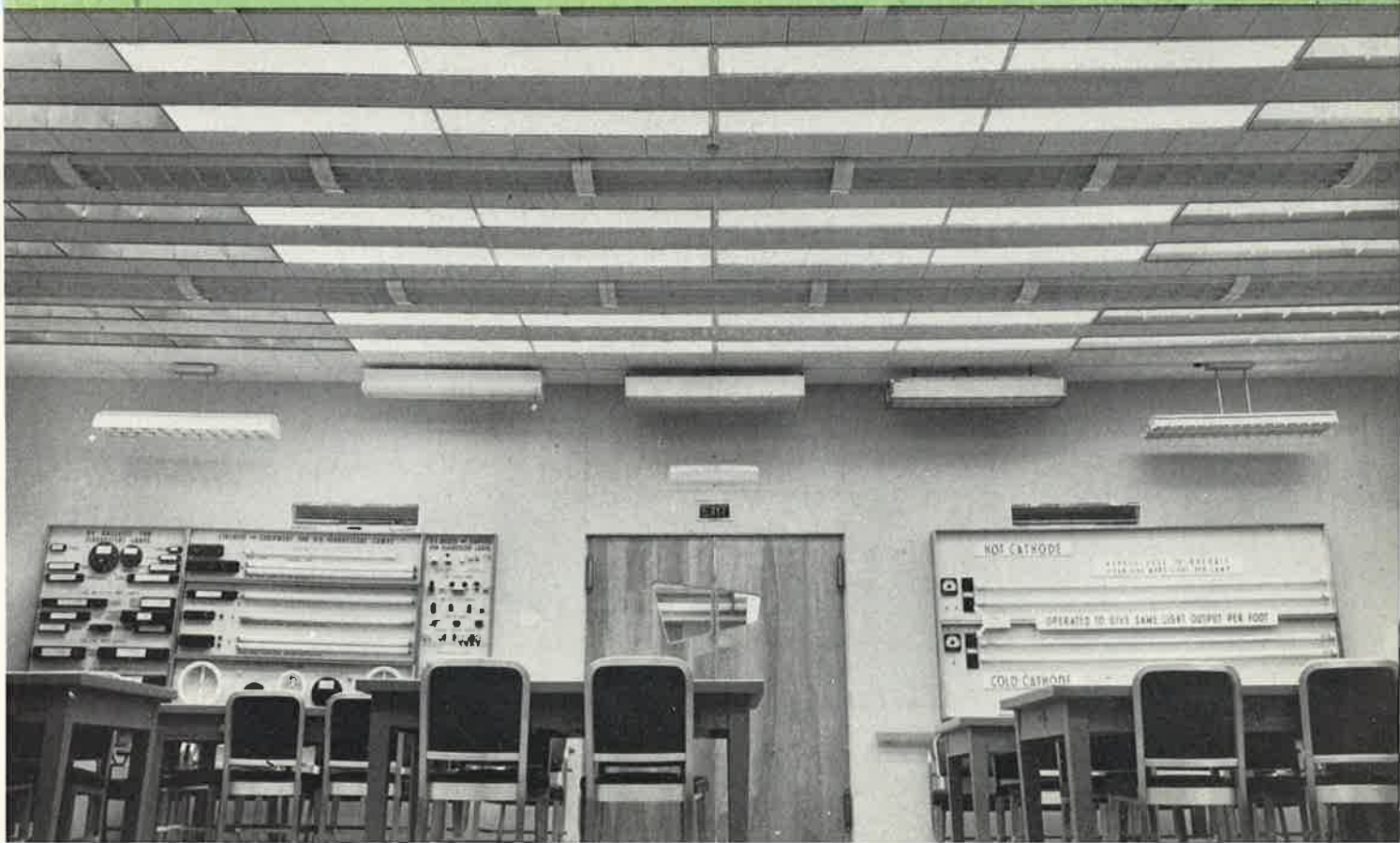
Here, too, one may compare, through side-by-side demonstration, the relative merits of single-lamp and two-lamp troffers — of white reflectors or aluminum. Some troffers are glazed while others are of the open louvered type; the appearance, comfort and efficiency characteristics of each are quickly analyzed. Those equipments which most nearly meet the office requirements of functional lighting, satisfactory appearance and reasonable cost may be selected by actual demonstration and comparison.

Twenty-eight 4-lamp units have been built into a demonstration which is as valuable as it is dramatic. It may be used to show the influence of the spacing of filament or fluorescent luminaires upon lighting appearance, comfort and cost. Starting with 4-lamp units on 12′ x 12′ centers and a minimum of a two-to-one variation in illumination on the work plane, the lighting is progressively improved by the flip of a switch or two as units on 6′ x 12′ and then 6′ x 8′ centers are added. This step provides at least 50 footcandles of uniform, well-diffused illumination on the desk tops, but certain deficiencies exist at ceiling level.

It is clearly evident that this hodge-podge forest of fixtures is anything but good looking and represents an inefficient wiring technique. Appearance and wiring considerations are found to improve significantly when continuous lines of light are created. The effect of mounting height on appearance and comfort is convincingly shown by raising and lowering these lines of light until a satisfactory balance is achieved between obtrusiveness of equipment and a satisfactory gradient of ceiling brightness.

Good lighting must be supported by favorable task and environmental conditions. Dark work surfaces which create large differences in brightness with most office forms must be avoided to assure good visibility of the task itself. Room surfaces, furniture and equipment should have finishes of relatively high reflectance. And there should be no polished surfaces such as glass desk tops and chromium trim on business machines to create annoying reflections. Color and decorative patterns should not violate the principles of comfortable seeing, but

DESIGN ROOM — ACROSS TROFFERS. This illustration indicates some of the facilities available for detailed office lighting and seeing studies. The right section of the ceiling contains white reflector troffers which may be demonstrated with one or two lamps per unit. Those at the extreme right are shown with louvers. In the far left section, the very low brightness of aluminum troffers is apparent. The units in the center are equipped with glass panels to show the influence of this design upon the brightness and appearance of both aluminum and white reflector troffers. All units may be demonstrated in continuous rows on three- and six-foot centers. Around the sides of the room are types of commercial units for close-ceiling or suspension mounting in offices.

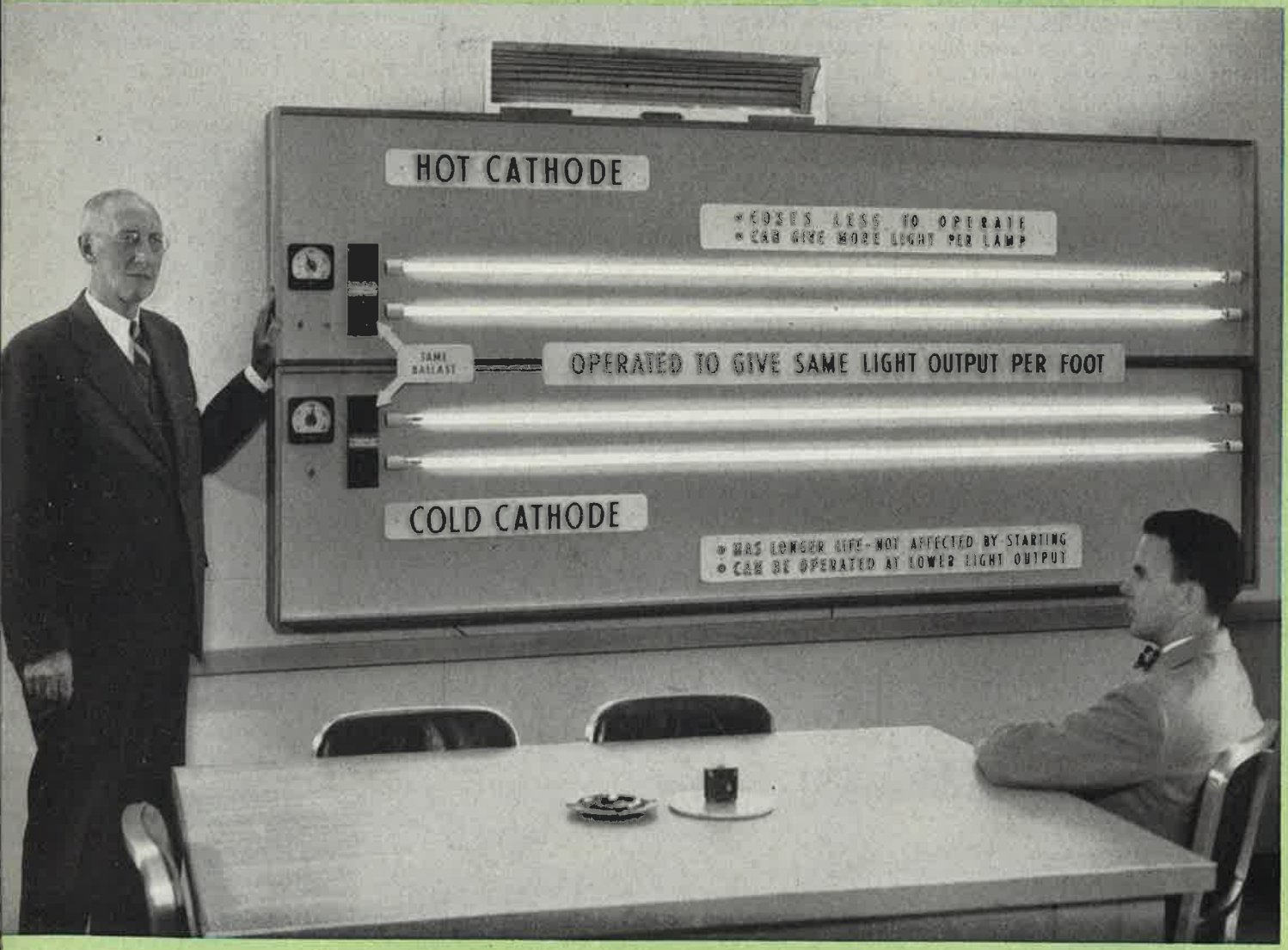


should be psychologically and aesthetically satisfying.

Extensive research and field experience have proven conclusively that the eyes perform most effectively and comfortably when all objects or areas in the field of view are of the same general order of brightness. It should be noted that the details of the seeing task itself are the exception to this rule—that best visibility of the task results when, for instance, black printing on white paper is used. But the areas surrounding the task should present no marked differences in brightness.

There are examples in the office design room that show practical solutions to these balanced brightness objectives. Matte finished desk tops range from the customary 6 or 7 per cent reflectance to pleasantly light 35 per cent reflectance materials. Desk bases, file cabinets and other furniture are finished in the typical dark up through the recommended 35 per cent reflectance colors. The ceiling is flat white to reduce brightness ratios with the lighting equipment and utilize light to the best advantage. The floor, too, has a reflectance of about 25 per cent, which is about the highest value currently obtainable.

The demonstrations show the advantage of producing brightnesses above eye level below those frequently experienced in the past, and increasing those below the horizontal through the use of high reflectance finishes. These more nearly balanced brightnesses assure comfort and satisfaction from ACE lighting installations.



CHOICE BETWEEN HOT AND COLD CATHODE depends upon the application. This display shows the two types operated at the same light output. A. B. Oday points to wattmeters indicating the substantially greater efficiency of hot cathode Slimline lamps. Hot cathode may also be operated at much higher light output than cold cathode. The combination of higher efficiency with greater light output results in lower cost for equal illumination, making hot cathode the better value for most lighting services. For low brightness operation either type may be used, hot cathode yielding higher efficiency, cold cathode longer life. Though light depreciation continues throughout life, cold cathode is particularly suitable where lamps are switched on and off very frequently or where inaccessibility makes lamp replacement unusually difficult.

INDUSTRIAL

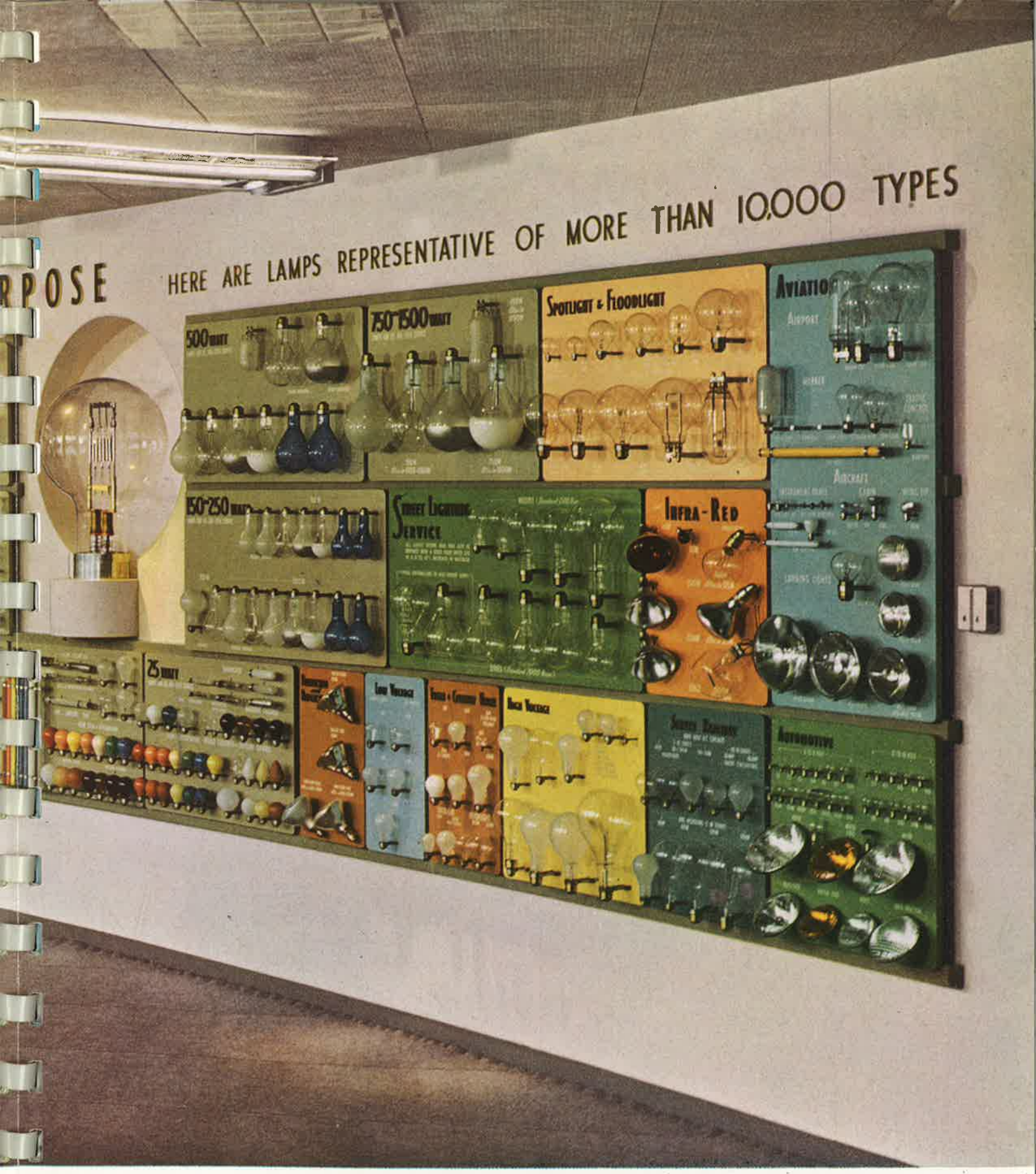
Within the Institute is a small shop used for the construction of exhibit material and the maintenance of the Institute facilities.

The overhead lighting system was designed to provide 50 to 60 footcandles of well-diffused illumination from either incandescent or fluorescent lamps. The incandescent system utilizes 500-watt silvered-bowl lamps in silvered-bowl diffusers and the fluorescent system utilizes two-lamp (40-watt 48-inch) industrial luminaires.

No industrial lighting system is complete with just luminaires. Environmental factors, such as painting of walls and factory equipment, should be planned to provide visual comfort as well as pleasing appearance. Accordingly, the ceiling is white, the upper walls on one side have been painted a pleasing shade of green having a reflection factor of approximately 50 per cent; the lower walls have a similar but darker color with only 25 per cent reflection factor. On other walls, light brown and aluminum finishes having similar reflectances, are demonstrated. The machinery is painted with harmonizing colors with reflection factors between 25 and 35 per cent. The floors are relatively light in color with a reflection factor of the order of 20 per cent.

INSTITUTE EXHIBIT SHOP offers opportunity to present ideas on recommended lighting for industrial areas. Details of lighting and paint selection are given above. Note that in addition to the conventional continuous-row mounting of the fluorescent channels, similar units are mounted at right angles, providing the "grid" pattern. This represents the latest practice for minimizing shadows and reflected glare at the higher lighting levels needed for modern shop illumination.

LAMP GALLERY OF THE GENERAL ELECTRIC LIGHTING INSTITUTE — A panorama of lamp types selected from 10,000 varieties made by General Electric. Here is a graphic portrayal of the amazing range of services for which General Electric has developed specialized sources of light and related radiation. "Lamps for every purpose" is more than just a slogan. It suggests an engineering, manufacturing, and distribution service which is unparalleled in its completeness. The largest lamp in the panel is 50,000 watts; the smallest is the 0.17-watt "grain of wheat" lamp.



Lamp voltages range from 1½ volts for the single cell battery lamp to 840 volts for the 1000-watt water-cooled mercury lamp. Major groupings of lamps in the gallery include: fluorescent, mercury, germicidal, black light, sun, neon glow, sodium, photographic, miniature, Christmas tree, motion picture and stereopticon, street lighting service, projector and reflector, low voltage, high voltage, train and country home, street railway, automotive, aviation, spotlight and floodlight, and infrared. The Lamp Gallery is a feature display in the G. E. Lighting Institute at Nela Park, Cleveland.

AUDITORIUM

The auditorium, accommodating 200 persons, affords a comfortable setting for lectures, motion pictures and demonstrations which supplement the Lighting Institute demonstration rooms during lighting courses and conferences.

Photo below was taken during the stage presentation "Highlights of Progress," a show which demonstrates many amazing lamp research and development achievements. This popular feature of scheduled meetings and regular Institute open house programs, takes the audience back stage into the laboratory. A projection microscope throws upon a screen enlarged images of tungsten filaments, enabling the audience to see clearly the nice detail which goes into the coiled coil and other filaments, some so small that they are almost invisible to the naked eye.

A secret of the sealed beam lamp is revealed when the audience sees aluminum turned into vapor inside a bulb to create on its inside surface a bright mirror-like reflector. Lamps of the sealed beam type are demonstrated including powerful built-in landing lights carried by large commercial transport planes.

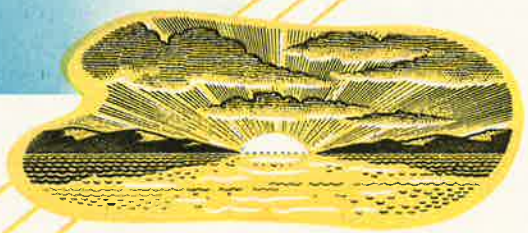
Lamps without filaments, powerful arc lights within glass bulbs containing metal vapor, are shown and their high lighting efficiency demonstrated. Another treat is a glimpse into the realm of invisible rays, ultraviolet and infrared, by use of unusual devices for detecting and studying these unseen radiations.

Popular with Institute audiences are several trick demonstrations including the following: lighting fluorescent lamps without wires, stopping action with tiny photoflash lamps, demonstrating the spectacular G-E repeating flashtubes, writing in glowing letters with black light, producing black script on a white screen with infrared, and showing how photography employs invisible radiations.

Finally an interesting story of research which produced today's high efficiency fluorescent lamps is traced by demonstrations heretofore seen only in the laboratory in which they were developed.

HIGHLIGHTS OF PROGRESS, a popular stage feature of the G. E. Lighting Institute, is one of the many presentations for which the auditorium is used. Alston Rodgers, illuminating engineer of the Institute staff, is the lecturer.

HORIZON HOUSE



MAXIMUM FUNCTION of living room facilities. For very exacting eye work such as needle point on dark fabrics, Horizon House makes available more than 100 footcandles with attractive and comfortable balance for easier seeing.

HORIZON HOUSE is dedicated to new beginnings—to a new dawn when "out of the shadows of the night, the world rolls into light."

It was planned with unflinching optimism for the enlarging future of artificial lighting in the home and its manifold contributions to living.

It was created with deep faith in a great industry and in professional leadership to study and actuate its new goals.

It was motivated by the horizon of tomorrow's homes that *can* experience in their evening living the benefits of Nature's changeful, charmful, and bountiful daytime lighting. Such is the promise of recent developments in expanded filament and fluorescent light sources. The promise, too, of newly established lighting standards which recognize with new awareness man's basic dependence on his natural environment.

It was developed, step by studied and experimental step, with the guidance of interior designer M. L. Gormley, as the home-lighting demonstration center of the new G. E. Lighting Institute. The new-dawning tools, ideas, and standards that it attempts to visualize, extend beyond any single home. Thus it evolved into a composite medium for their demonstration, study, and appraisal more than a model or pattern for any specific home. It retains appropriate, realistic, and gracious domestic qualities. It takes on the added flavor of the theatre and display world to give striking emphasis to the unlimited possibilities in translating its basic concepts to the greatly diversified individual home and its family-living needs.

The result is Horizon House—contemporary — colorful — prophetic—and convincing of lighting's new charms and services.

§ § §

It is pictured on these and following pages in many moods, for many uses, from many angles for over-all and close-up effects. Lighting installation, decoration and color analysis are detailed in figures and captions. It must be borne in mind, however, that the camera "sees" a more limited range of brightness difference than the human eye. In color photography and reproduction there are even heightened problems in depicting what the eyes see and the senses feel. Accordingly, one can completely appraise the lighting effects only by experienc-

SHEER ATMOSPHERIC EFFECT—at the other extreme from the room's functional facilities page 51—is here created through contrasting highlight and sharp shadow from downlights and wall elements to form a sparkling backdrop for formal entertaining. Costume, mood, occasion — even conversation — all take on the verve and glamour of the theatre.

HORIZON HOUSE FOYER doubles for the audience room in which 30 guests may be seated. As the fabric wall opens, guests look into the living-dining room to see how new light sources and lighting methods may serve in a prophesying variety of decorative and functional ways to set the home stage for more colorful, dramatic and comfortable living. They also see a stage of bedroom settings arranged behind the central dining window which raises electrically. See plan views, page 57, and photograph of mechanical wall on page 71.

NIMBLE-FINGERED Aileen Page, home lighting specialist of the Institute staff, sits at the switchboard (controlling nearly 10KW) and plays her keyboard of 80 notes for changing harmonies of light. Projector pulls up out of cabinet when needed.

ing them. *The only adequate medium of expressing light is light itself!*

DEMONSTRATION PATTERN

Horizon House offers a completely new pattern for demonstrating lighting ideas, one which, while exhibiting essential good taste and retaining semblance to natural home planning, handles smoothly, effectively, and dramatically the requirements of the diversified numbers, interests, and needs of Institute visitors. Architectural plan, furnishing treatment, and operation details are naturally adjusted to its uses.

Pictures on this page, floor plans on page 57, and details of the mechanical wall on page 71 will visualize the working plan. The demonstration of the living-dining room and bedroom stage is given while guests are seated in the foyer. Distraction is avoided, and drama gained, by the complete switchboard control and by its positioning so that the demonstrator is seated. Guests pass through the living-dining room after the demonstration into a passageway off the dining end, from which they see the complete all-electric kitchen-laundry. They leave by a rear exit. The details of

GUESTS ARE GREETED by E. W. Commery who is in charge of the engineering division's residential lighting section and who is responsible for the design and installation details of the challenging lighting techniques which are used in Horizon House.

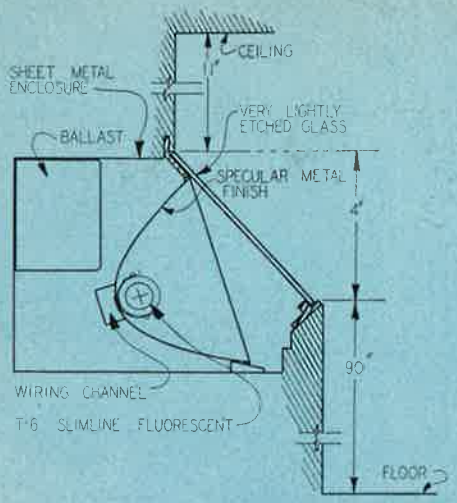


FIG. 1. COVE DIAGRAM. Vertical Section through cove and wireway. Shows design of continuous enclosed cove used on the two long walls of living room for one method of soft over-all room lighting. Provides unique smoothness of upper wall and ceiling brightness and average of eight footcandles on horizontal plane. See two photos at bottom of opposite page for cove lighting distribution and effect.

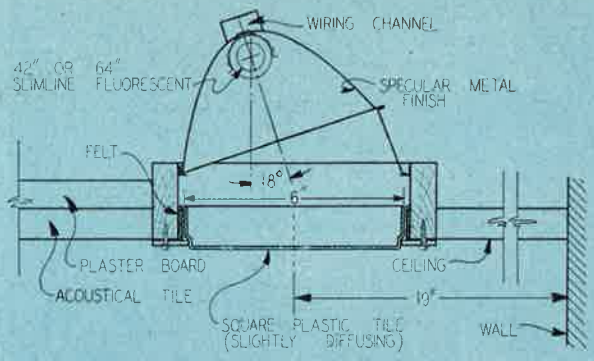


FIG. 2. CEILING-BAND. Section through unit and ceiling. An alternate method of over-all room lighting, very different in effect, is this arrangement for continuous, flush, ceiling-band downlighting. Instead of lighting the ceiling, four sections of this element light the walls evenly. Horizontal plane ft-c. range between four and 16, from room center to near side walls. See photo upper left, next page.

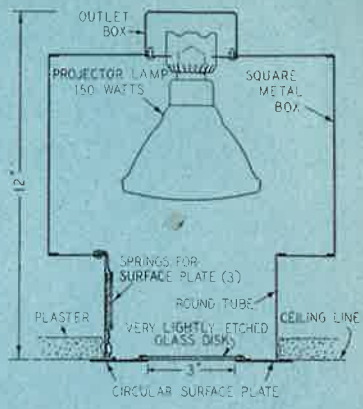


FIG. 3. CEILING SPOTLIGHTS. Section through ceiling and downlight. Twenty carefully placed spotlights of this design provide optional downlighting both for added functional illumination at furniture groupings (90 footcandles with spot lamp on reading planes and 30 with flood) and for purely dramatic effect on coffee tables, dining bay, or entire room. See below, also Fig. 6, page 57.

the demonstration can be fitted to the group interest, and it can vary from 10 to 90 minutes.

In its first six months of operation, its workability was proven in handling 25,000 persons. If knowledge and understanding of its new lighting trends are to evidence their influence in the millions of projected new homes, the need is clear for similar centers to be opened throughout the country.

COMPLETE DESIGN FOR FLUORESCENT

Horizon House represents the premiere showing of residence interiors completely designed and decorated for the integrated use of the extending and developing types of fluorescent lamps. A non-utility room can be lighted by fluorescent solely, as the living-dining room demonstrates, although its full facilities also include fila-

AUDIENCE VIEW of the living-dining room. Sharp definition of line, form and texture . . . brilliance of color . . . scintillating spirit . . . these are the effects of downlights. The softening addition of several light patterns on the walls complete the blend of light for smart entertaining. Approximately 3,250 watts in use in this view.

NOTE: To show effects of lighting on the room as a whole, the views on these two pages were taken from a point outside the room. As one moves into the room, he gains desirable impressions which are sacrificed in these views, namely: a feeling of spaciousness, and comfortable low brightness of all lighting elements.

FOR ENTERTAINING in a different key — more quiet and restful than stimulating — is this setting, with the ceiling band wall-lighting strips replacing the downlights. Approximately 1,000 watts in use.

A FAMILY'S BUSY EVENING at home needs functional lighting to suit the deed (30 to 125 ft-c from lamps and seven downlights), held in comfortable balance by the cove lighting. 2,200 watts in use.

THE DINING BAY takes the center stage, while five separate effects are suggested to inspire the imaginative hostess with ideas of blending more lighting flavor with her menus. 1500 watts in use.

THE SMALL DOWNLIGHT OPENINGS, further fore-shortened by viewing angles, are acceptable in brightness, due also to light returned to the ceiling from high reflectance carpeting. Twenty are used. 3000W.

ONE COVE is demonstrated to show its unusual light distribution across ceiling and opposite wall which when balanced (opposite) results in previously unrealized smoothness and effectiveness. Uses 204 watts.

OF ACADEMIC INTEREST is a study of the extremes in totally direct and totally indirect light distribution in this, and picture above it. Except for special effects, the need for mixing the two is evident!

ment sources (see pages 64 and 65). Perhaps because of flagrant misuse and misapplication of these new sources, there has been a general feeling that fluorescent could not appropriately invade other than utility home rooms.

The fresh and pleasing effects attained in Horizon House contradict this while emphasizing the importance of choosing room colors that react harmoniously and avoid overplay of the recognized "cooler" color of fluorescent. Until there is wider general applied experience with it in homes, advance testing of wall, floor, and furniture colors under the light sources to be used is recommended.

The wall color (page 60) of the living-dining room is an extremely

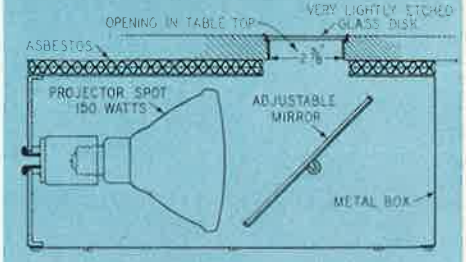


FIG. 4. TABLE SPOTLIGHT. An ingenious solution to dining table spotlighting is this underside of table attachment, which projects light through a circular hole in table top or extra table leaf, to a ceiling-mounted mirror, one-half table dimension (for this ceiling height) for redirection over table top (20 footcandles). A circular flower container shields table opening.

potent and fortunate factor in contributing to the room's satisfying and flattering atmosphere. In the comfortable lighting of rooms *for family living*, walls take on increasing importance in reflecting light, and it seems desirable with fluorescent sources that their tone be warm.

Blues, blue-greens, greens, and yellow-greens are all especially vibrant under fluorescent lighting. They were, therefore, selected for Horizon House, but to avoid a too-cool and unfriendly result, the exciting flamingo red was introduced. The wall tends, too, to fuse together the cool and warm colors. The room uses mainly blonde wood and colors of exciting brilliance yet soft sublety (see page 61). They all reflect light generously. For this

DINING BAY DESIGN, color, and lighting detail deserve a closer look. The table spotlight (Fig. 4) directed at a ceiling mirror which reflects light to the table top produces several pleasing effects: sparkle and vibrance of table service and flowers; no direct light in the eyes of persons seated at the table; yet soft flattering light reflected from table back to faces to complement the candle glow. Slimline lamps tucked in at the top of side windows filter fascinating highlight through the glass shelves on ornaments particularly suitable for their garden background. Lighted hand-colored photographic murals give here reality to the picture window, and are a practical solution to bring vista to basement recreation rooms.

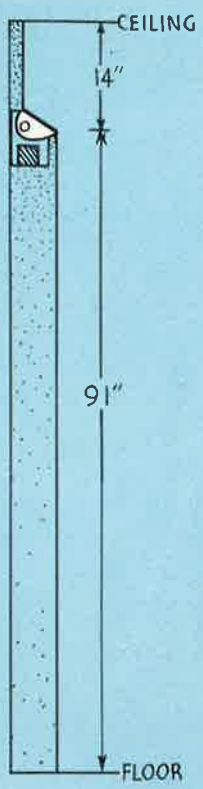


FIG. 5. SIDE WALL. Section showing setback upper section for cove.

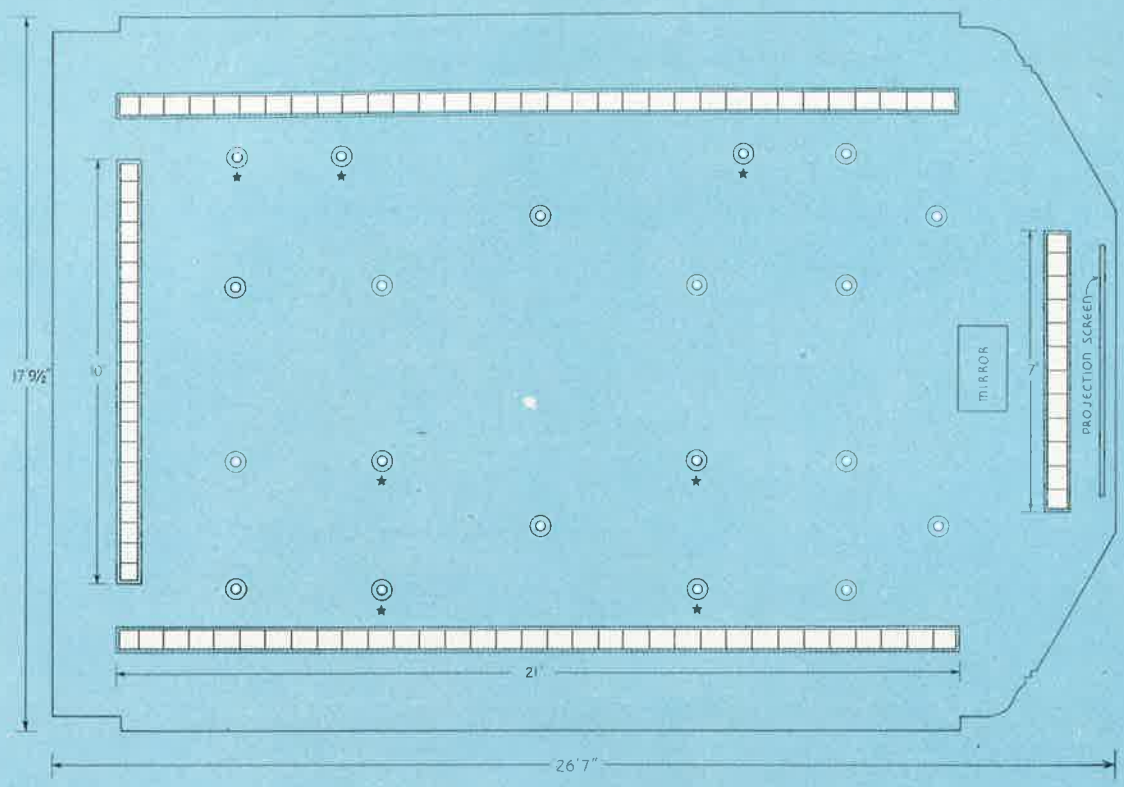


FIG. 6. CEILING PLAN of living-dining room, with lighting elements in white, indicates pattern of downlights and positioning of continuous flush strips for wall illumination. Starred downlights are located for functional lighting at the four important eye-use furniture groupings.

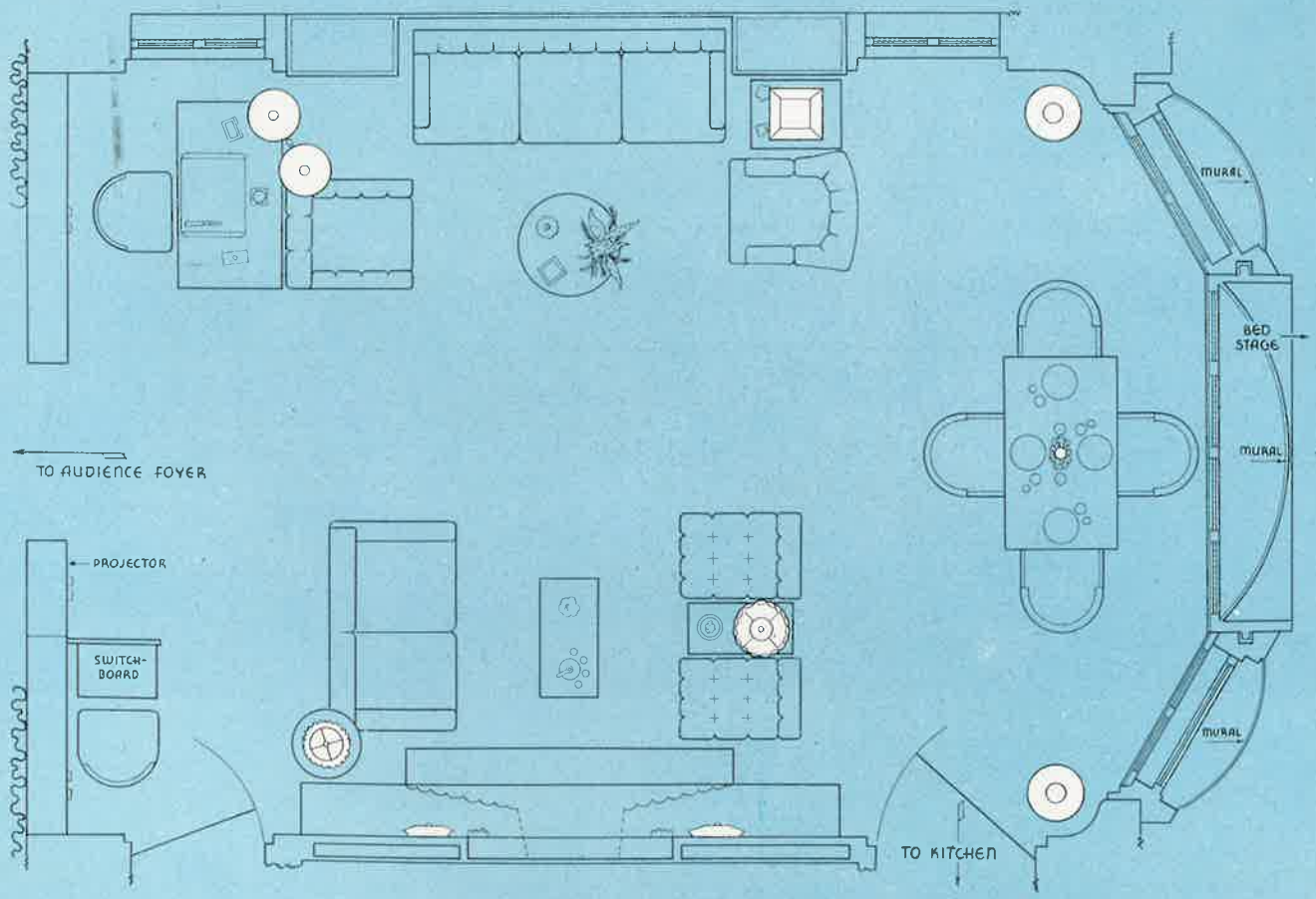
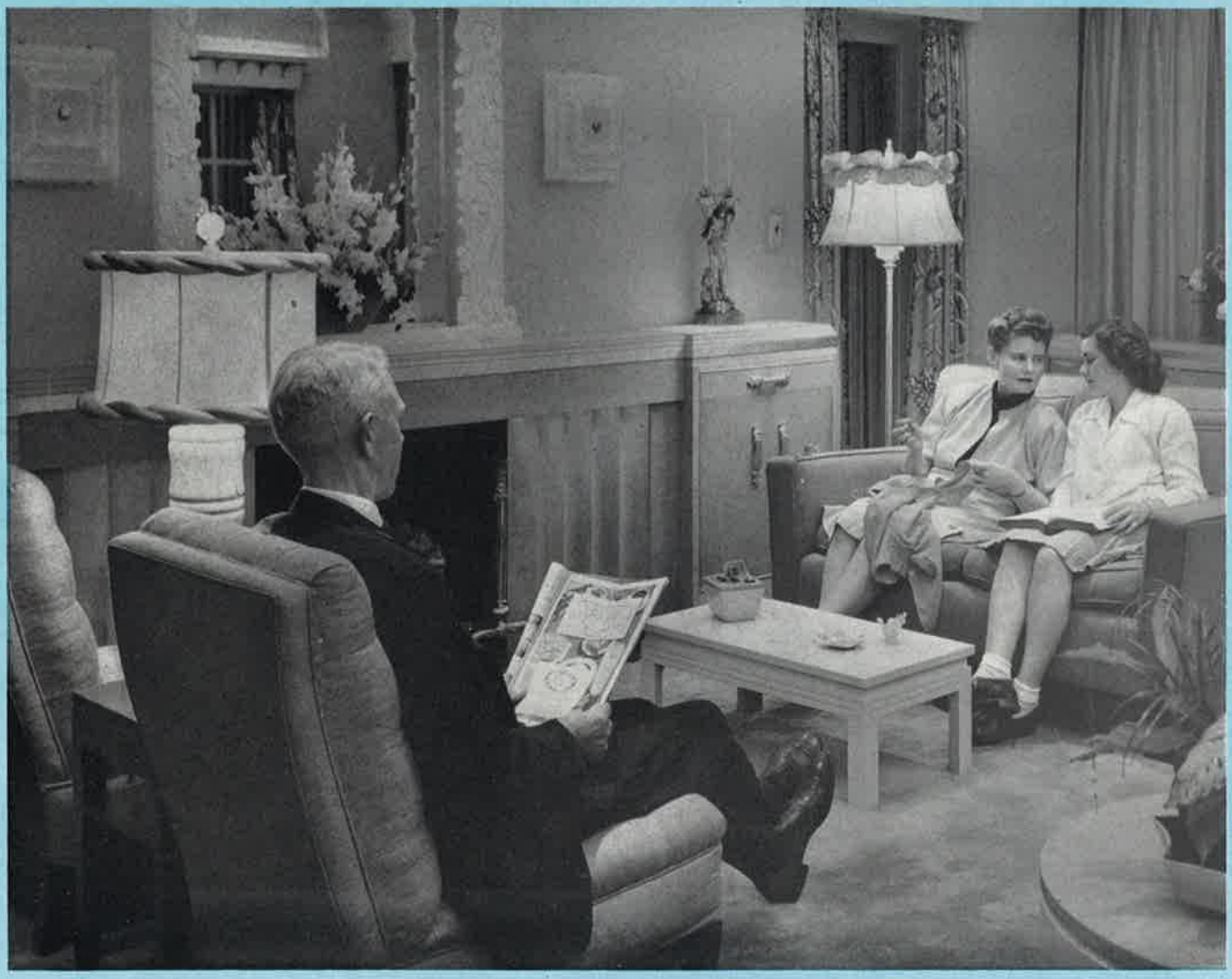


FIG. 7. FLOOR PLAN of living-dining room should be helpful in orienting the reader with the relationship o, groupings shown individually in close-up photographs on other pages. This scaled plan indicates, too, the room's balanced treatment and open spacing. Wall brackets, portables, and dining table spot are indicated in white.



FOR TRUE APPRAISAL of its lighting qualities, Horizon House needs homefolk enacting the roles for which the lighting was designed. Its lighting ever aims to serve human beings through a range of eye requirements. This includes careful study of balance between task, task background, and surrounding brightnesses. The ratios between them are essentially within ten to one in this exceptionally high footcandle setting. There's no sacrifice of decorative charm or personal flattery either!

reason, the room feels luminous and alive. It is for this reason, too, that the relatively high amounts of light provided for serious eye business do not seem excessive or even unusual.

NEW PATTERN FOR SEEING COMFORT

Horizon House makes the first realistic attempt to provide today's recommended amounts of light (footcandles) for all typical home eye tasks, with equal attention given to suitable styling and visual comfort. Current practice urges scientifically established footcandle values, which "aim to fit the light to typical home tasks." These values range from 20 to more than 100 footcandles for severe eye tasks, and they do represent a progressive step toward providing eyes with a proven adjunct to better seeing conditions and thus to eyesight protection and conservation.

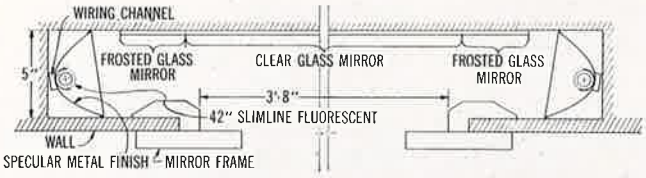
Actually there is five to ten times more light available where eyes direct activity in Horizon House than in almost any home today. A pitiful minority of the millions of portable lamps and other lighting equipment, in use and sold each year, produce where it is needed—on the task—an amount of light which, by actual measurement, even approaches 20 footcandles! This level is doubled and tripled by several of the Horizon House portable lamps (see page 68) through new design principles and the use of Circline fluorescent lamps. The highest levels noted in several picture captions, however, were attained only by the added use of the downlights. (Fig. 3, page 54.)

Downlights of this new design yield considerably more light than typical spotlights utilizing such small ceiling openings. They can serve in place of portable lamps in

FIG. 8. PARABOLIC REFLECTOR. Small in cross section (5 inches) it and the T-6 Slimline lamps proved basic tools in fitting effective directional lighting into the architectural elements with proper residence scale. ▶

Only through the study and adjustment of wall elevations in advance of construction can full advantage be taken of new tools and modern lighting.

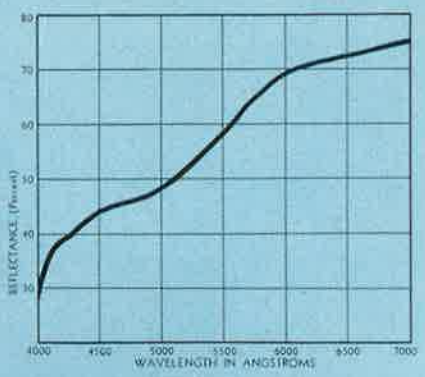
FIG. 9. MIRROR ELEMENT. Horizontal section through mirror. Details of wall pocket which gives the "punch" crosslighting and mirror frame backlighting pictured below. Average 75 footcandles striking flower arrangement. ▼



DRAMA OF LIGHT AND SHADE, the enchantment of nature's color, the magic of third dimension are sculptured in light and plaster with a mirror background as an ever enchanting setting for floral beauty.

FLAMBOYANCE, restraint, drama, and simplicity are all paradoxically blended with a master's touch in this original and colorful treatment of the fireplace wall — created by Interior Designer M. L. Gormley as a brilliant foil for the lighting patterns. The square wall brackets, using Circline lamps are of formed glass, "frothy" in appearance, and decorated with simple lines of color matching the unusual wall color (see page 60). Circline lamps, to encircle the figurines with light and to add wall pattern, are embedded under etched glass in the false drawer tops of the end cabinets. In photos above and below, lighting sets the stage for relaxation in quite different moods.

SPECTRAL REFLECTION CURVE of the wall paint used in Horizon House living-dining room. This color was mixed to match as closely as possible Nature's warm color found in the inner layers of birch bark, which was measured by a spectrophotometer for its color composition. It proves an outstandingly pleasing and flattering background for the light quality of fluorescent sources.



cases where lamps are not desired. Inherently their lighting effect is contrasty and shadowful—the intent for drama, emphasis, or glitter—but for eye use it demands alleviation by other room lighting.

In fact, illumination values of the order of magnitude for good seeing conditions from any type of light source may not be acceptably introduced at any single furniture grouping without providing a closely related lighted effect on the surroundings. The basic commandment for ultimate eye comfort is "that light quantity must ever be balanced with a mellow lighting quality."

"SLIMLINES" SPELL NEW LIGHTING TECHNIQUES

Two alternate general lighting systems provide the desired balance to local lighting in such outstanding manner as to establish quite new trends. They create "washes" of light over extended areas—free of spots or streaks of bright light—in a manner similar to the unobvious filtering of natural daylight throughout an interior.

Both the cove lighting system (Fig. 1 and page 55) and the wall lighting elements (Figs. 2 and 5 and page 65) develop a perfection hitherto not experienced, both in

IT'S ACES HIGH in bridge and in homes that can claim such a well-planned and lighted living room. One or several card tables can be set up in a whisk — with no moving of furniture or lamps and yet with lighting at each table that makes seeing the cards and following the play easy and pleasurable — and perhaps even the partner gayer to look at! See Fig. 3, page 54 for ceiling spotlight diagram.

Description of Principal Colors in Horizon House	Munsell* Color Notation
Wall paint — pale grayed yellow-red	8YR 8/4
Carpet — sage	5B 6/1 to 5B 7/1
Painted tops of desk, fireplace, cabinets — horizon blue	5BG 7/3
Wood—fireplace, cabinets, dining table, desk, large coffee table — burled maple.	
Davenport — ice blue	5BG 7/4
Pair of fireside chairs — grayed blue	7BG 5/2
Love seat, desk chair, large wing lounge chair—flamingo red	4R 5/9
Lounge chair in front of desk — citron	10Y 8/5
Leather dining chairs — citron	9Y 7/6
Drapery background — citron	10Y 8/6

*Munsell Book of Color: A Revision and Extension of the Atlas of the Munsell Color System, Standard Edition of 1929.

smoothness of light distribution and in decorative and architectural appropriateness. The narrow dimension of each system and the absence of heavy metal trims and of heavy attachment "screws and bolts" are of great importance in maintaining the proper scale, harmony, and refinement of detail of fine domestic interiors.

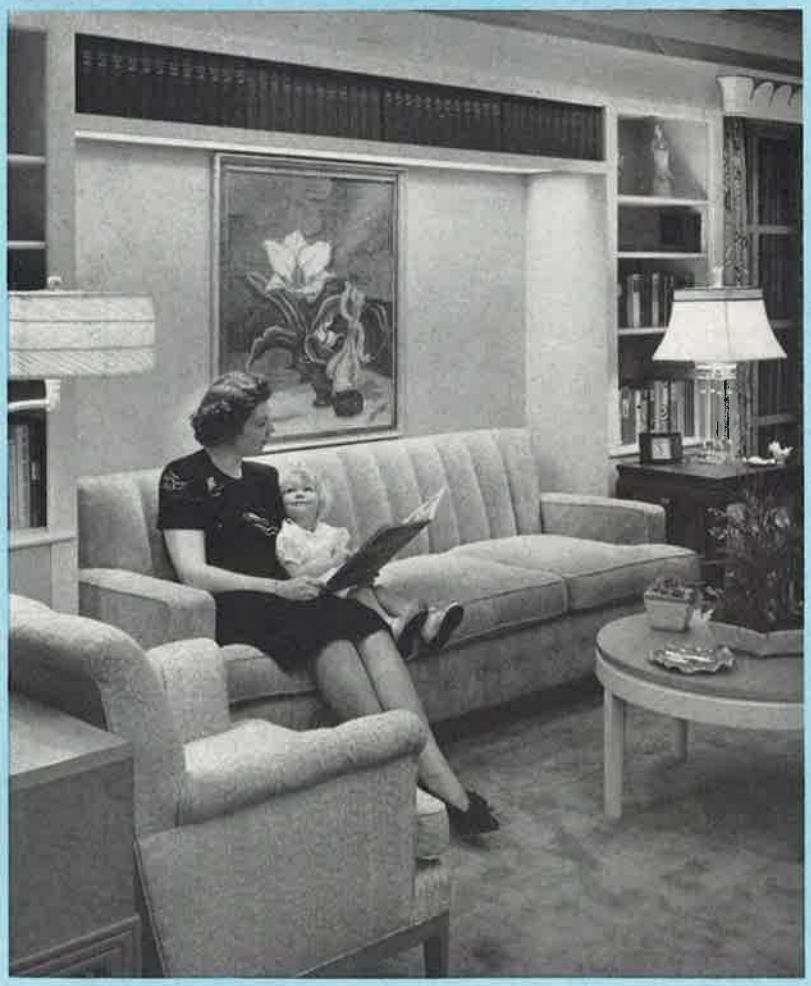
Only through the use of new small-diameter Slimline fluorescent lamps is this happy integration of room design and lighting effect possible. Combining the new tubes with directional reflectors, positioned in the set-back upper walls, this new cove lighting design avoids the more usual overly-bright adja-

(Continued on page 66)

CAREFULLY PLANNED furniture groupings, each with its fitted, cheerful, and smooth lighting, encourage family kinship and companionable sharing of mutual interests — for more keenly anticipated and happy family hours! The double swing-arm lamp, with its shallow shades and shortened proportions made possible with Circline lamps, serves both desk and chair with beautiful efficiency. This lamp, another of the Horizon House innovations, is shown in detail on page 68.

DAVENPORT WALL has its special charms in change of architectural and decorative emphasis with change in lighting scheme. Lamps on low level with Circlines only, one strip over davenport, luminous bookshelves, and "spotted" coffee table combine for sparkling conversation.

MUCH MORE LIGHT now for extensive eye activity and without discomfort, because of small differences in brightness of all surfaces. This results from use of highest intensity of lamps and soffit, with cove lighting that softens but does not obliterate the shadows from local spotlights.



"THE TWO NOBLEST THINGS which are sweetness and light" is spoken well in expressing the spirit of this scene.

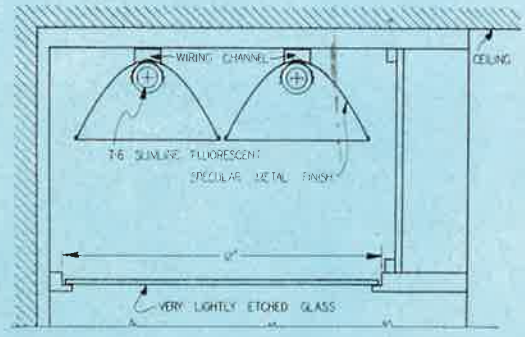


FIG. 10. SOFFIT DIAGRAM. Section through soffit over davenport. Mechanical-appearing metal framing is avoided by this handling of light pocket above davenport. Two lamps per row fit the niche and provide 45 ft-c. on horizontal plane four feet beneath and 30 ft-c. on reading plane. Ballasts located in separate metal enclosure.

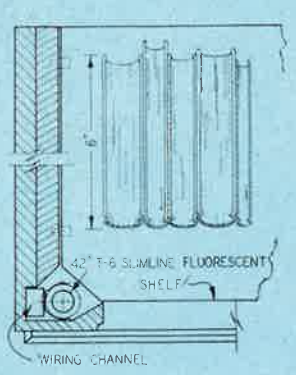


FIG. 11. BOOKCASE LIGHTING. Cross-section through bookcase. Part of the construction detail is this groove in bookshelf corners for vertical placement of minimum-size channel and T-6 lamp. Very narrow wood frame amply shields the lamp, operated on low wattage.

EVEN "SMALL FRY" seem to settle down into more concentrated attention when good, unobtrusive lighting is a natural part of their environment. Could it be that parental poise and patience might also be thus engendered? Lighted window valances, such as the one shown here, prove a delightful and practical means of adding new light touches in both old and new homes. Valance diagram on page 67. Diagram of soffit lighting over davenport shown on opposite page.

LIGHTING'S DYNAMIC FORCE in establishing the decorative emphasis, spirit, and tempo of an interior — speaks for itself in this and the opposite picture. Visitor reaction to the convincingly varied light patterns in Horizon House portends a broadened concept and use of this medium in future home design.

SUMMARY OF G-E LAMPS IN LIVING-DINING ROOM OF HORIZON HOUSE

Description of Installation	No. of Lamps	Lamp Ordering Designation (Except Voltage)	Type	Description	Total Watts①
CEILING					
Flush band for wall illumination — (four sections)	8	F64T6/W	Slimline**	3500° white	408
	5	F42T6/W	Slimline**	3500° white	179
Downlights (concentrating)	2	150PAR/SP	Projector spot	.....	300
Downlights (moderately spread ②)	18	150PAR/FL	Projector flood	.....	2,700
WALL					
Coves—running length of room	8	F64T6/W	Slimline**	3500° white	408
Brackets (flanking fireplace mirror)	2	F32T10/W	Circline	3500° white	86
Fireplace mirror	2	F42T6/45W	Slimline**	4500° white	68
Glass-top cabinets (both sides of fireplace)	2	F22T9/W	Circline	3500° white	53
Artificial electrical firelogs	3	25A/R	Red filament	.....	75
Soffit over davenport	4	F42T6/45W	Slimline**	4500° white	136
Bookcases — two (flanking davenport niche)	4	F42T6/W	Slimline*	3500° white	87
Window & door valances ③ (balancing pairs on opposite walls)	4	F30T8/45W	Gen'l line fluor.	4500° white	152
	4	F30T8/W	Gen'l line fluor.	3500° white	152

① Wattage includes ballast wattage in cases of fluorescent.
② Eight additional used in audience foyer.
* Operated at 100 milliamperes.
③ One additional pair of valance lamps used in audience foyer (3500° white used for valance up-lighting, 4500° white used in down-lighting).
** Operated at 200 milliamperes.

LUMINOUS WALLS and portable lamps switched now to their highest light level transform the "feel" of the room by subtracting from the drama and intimacy of the lighting combination in the opposite picture. Walls so lighted require careful color treatment for room and occupant flattery.

SUMMARY OF G-E LAMPS IN LIVING-DINING ROOM OF HORIZON HOUSE

Description of Installation	No. of Lamps	Lamp Ordering Designation (Except Voltage)	Type	Description	Total Watts①
Luminous plates (switches and convenience outlets)	6	NE2	Neon glow	.....	1/5
Projector (built into room end cabinet)	1	500T10P	Projection	.....	500
Bay window murals (2 vertical strips per window)	6	F64T6/45W	Slimline*	4500° white	189
Bay side windows (glass shelves)	4	F42T6/W	Slimline**	3500° white	136
FLOOR					
Dining table (through table top)	1	150-PAR/SP	Projector spot	.....	150
PORTABLE LAMPS					
Pair of torcheres (dining end of room)	2	100/300	I.F. three-lite	.....	600
Two-arm swing desk lamp	2	F32T10/W	Circline	3500° white	80
	4	60A19	I.F. filament	.....	240
Plastic base table lamp	1	F22T9/W	Circline	3500° white	27
	1	50/150M	I.F. three-lite	.....	150
Pottery base table lamp (between fireside chairs)	1	F32/T10/W	Circline	3500° white	43
	1	50/150M	I.F. three-lite	.....	150
Silver floor lamp (by sofa)	1	F32T12/W	Circline	3500° white	43
	1	100/300	I.F. three-lite	.....	300

① Wattage includes ballast wattage in cases of fluorescent.

** Operated at 200 milliamperes.

* Operated at 100 milliamperes.

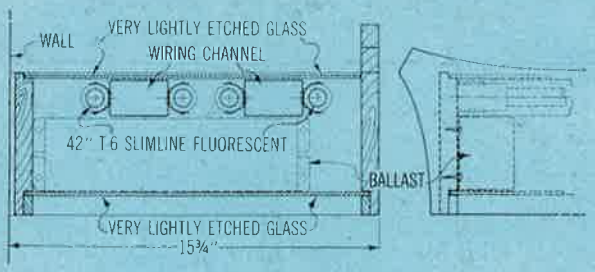


FIG. 12. MIRROR CANOPY. Section through and end of front elevation of over-mirror canopy shown lighted in photograph above.

FACE-HEIGHT dressing table lamps of future Certified type give equally good face and under-chin illumination, but require light from a central fixture for top-hair dressing. Make-up completed, the lamps may be switched to low, purely for decorative value.

WALL-MOUNTED CANOPY, papered like the wall for size reduction, gives lighting not only for every make-up need but also for general room lighting. Lack of shadow results from specially etched mirror table top. One hundred forty footcandles, top of head; 28 on face, 18 under chin.

(Continued from page 61)

cent wall and the usual dark areas in the center of the ceiling. The installation method reduces the floor dimension by ten inches but allows space for unusual decorative and lighting treatments. This available space suggested the delightful mirror treatment above the fireplace (Fig. 9, page 59). It also made possible the slightly recessed side window and door openings for unusually smooth inclusion of lighted valances (Fig. 13, page 67).

Only by study and adjustment of detailed wall elevations can the lighting specialist make intelligent recommendations for really new effects.

More emphasis on wall treatment is of course gained by the ceiling-recessed strips which "flow" light over the walls. The system produces a luminous environment of both restfulness and interest. The carefully engineered design of this installation avoids unpleasant brightness through the use of asymmetric reflectors and the very thinly etched, low diffusion plastic shielding, which extends slightly

below the ceiling line but sufficiently to cast some light on the surrounding ceiling and to avoid an otherwise dark area on the upper wall.

Slimline lamps prove their trustworthiness again in fulfilling a long-felt need to incorporate light in small spaces without bulky architectural detail in the smooth lighting of the bookcases (Fig. 11) and the photomurals outside the three bay windows. Wiring channel and tubes are neatly fitted into grooves made in two vertical mullions of the center window and at the two sides of the end windows. One-half of the tubes (on the room side) are opaqued to avoid angle viewing.

WINDOWS ALIGHT—DAY OR NIGHT

The lighted valances (Fig. 13) atop window and door openings also exhibit outstanding charms and versatility. Their design is unique and particularly creative in allowing great flexibility both in function and decorative effect.

Through their balanced placement in the room and their form, they illuminate sufficiently large areas of drapery and ceiling to provide adequate and eye-pleasing balance to the light from portable lamps. Obviously they accent window treatment and drapery colorfulness.

The one-inch or less diameter fluorescent tubes are most applicable since over-all depth can be kept "in scale" and still allow sufficient space between tubes and draperies that light may flow the full drapery length. The necessary depth of valance for uninterrupted-"flow" of light over the drapery is made to appear less by the set-back design of doors and windows. The front-lighting of the valance nicely accentuates its color and flowing line.

The two side windows of the bay, not treated with valances, include glass shelves for ornamental accessories. To highlight these, two Slimlines are embedded in a pocket above each window. No shielding is necessary.

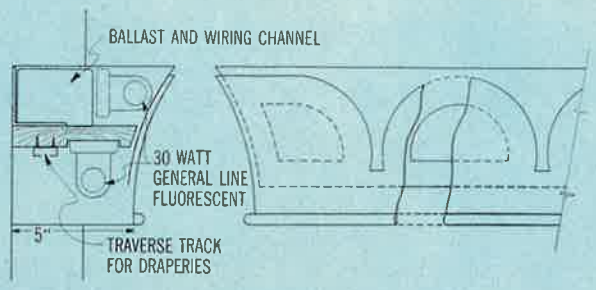


FIG. 13. VALANCE LIGHTING. Section through and front view of valance. Four balanced window and door openings are slightly set back to include top valances with minimum projection from walls and maximum light distribution over draperies. Separate control of individual lamps supplies totally indirect or direct lighting. Valance is in two slightly separated planes for backlighting of scalloped face with either system.

THAT LAST APPRAISING LOOK as one "steps out" is made with confidence when there's light at the full-length mirror. Valances such as shown in Horizon House not only serve this purpose but also contribute room lighting and give draperies that important and intriguing luminous effect. One sees here the backlighted silhouetting of the scalloped front (painted citron to match drapery fabric) against flamingo red.

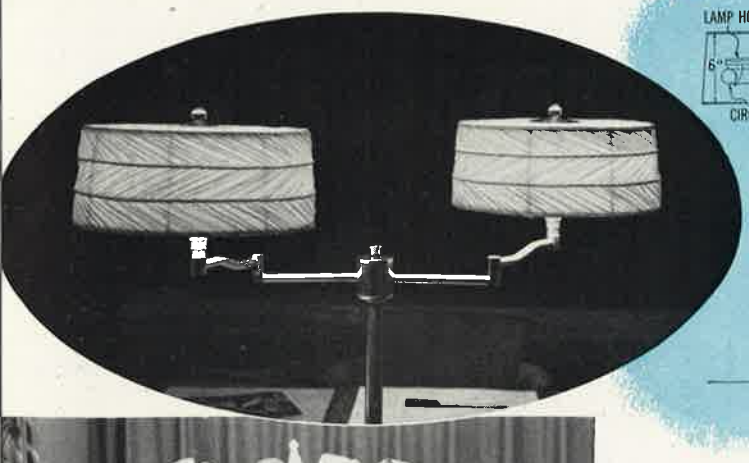
News in Portable Lamps

There's news in Horizon House table and floor lamps too—all especially designed to meet the decorative and seeing needs of specific living, dining, and bedroom groupings. Over half of the eleven portables shown in Horizon House are "firsts" on display to embody the parts, flexibility of light levels, and improved lighting performance of forthcoming Certified lamps. The Certified Lamp Makers' new specifications allow greater freedom of artistic design and insure, through improved engineering design, higher average footcandles in use than previous specifications for tagged lamps on the retail market. Nine distinct types of lamps to suit varying furniture and eye needs comprise the first market showing of the new line.

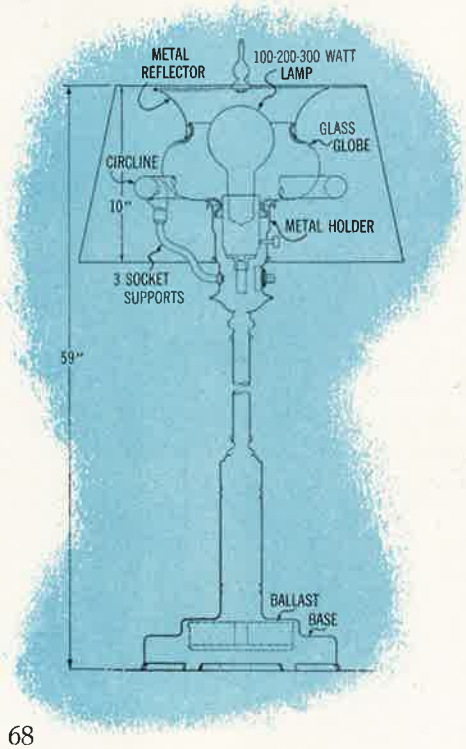
A "Certified" lamp is one which carries a Certification tag and is manufactured to and tested for compliance with specifications requiring definite and authoritative standards of sound construction, electrical safety, and lighting performance.

The tag becomes thus of inestimable aid to the ultimate purchaser

(Continued on page 74)

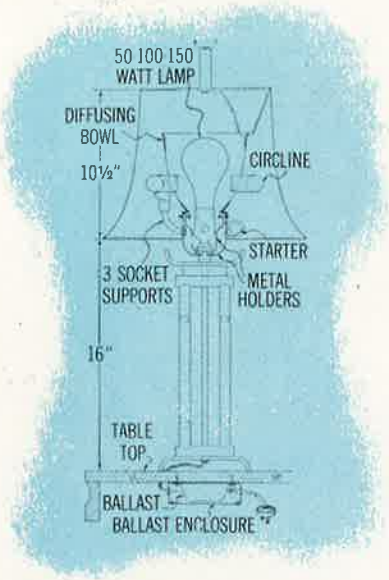


LIGHTING SOLUTION for desk and lounge chair in this grouping required the development of this new type lamp. Circline lamps allow shallow, suitably-scaled shades. Shade top should be enclosed but use high-transmitting material for upward light. In Horizon House both shades also contain two 60-watt lamps for demonstration purpose (approximately 80 footcandles). Circlines alone give 40 footcandles at each spot. Future designs could nest 8¼ and 12-inch tubes for flexibility and more light.

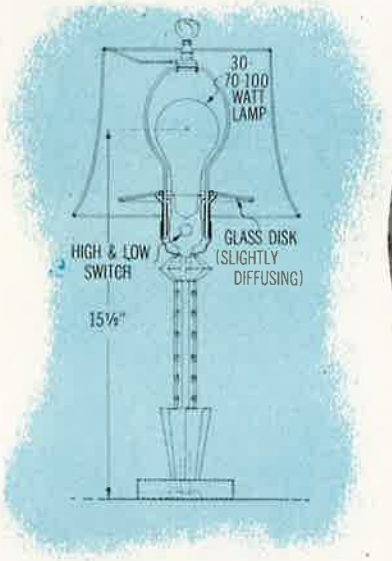


NEW PERFORMANCE STANDARDS are assured with this general-purpose floor lamp, a major type in the Certified line. New diffusing bowl shapes combined with reflector crowns, specified by CLM, result in definite user benefits: more light on the work with less ceiling and side wall brightness than earlier bowl types, more delicate scaling in design, reduction of glare as the lamp is looked into from standing positions, less breakage possibility, and standardization of replacement parts. Note rear side placement for 50 footcandles over book.

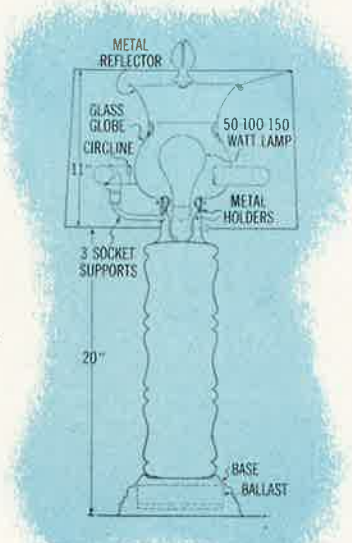
MODERNIZATION of valuable existing lamps that they may become worthy to see by as well as lovely to look at, should become important with the wider use of better lighting and fluorescent lamps. One method of placing the ballast and all parts of a suggested conversion head is shown here — using the 6-inch plastic bowl and small Circline necessary for inclusion in this popular-sized lamp. In this close grouping — 20 footcandles.



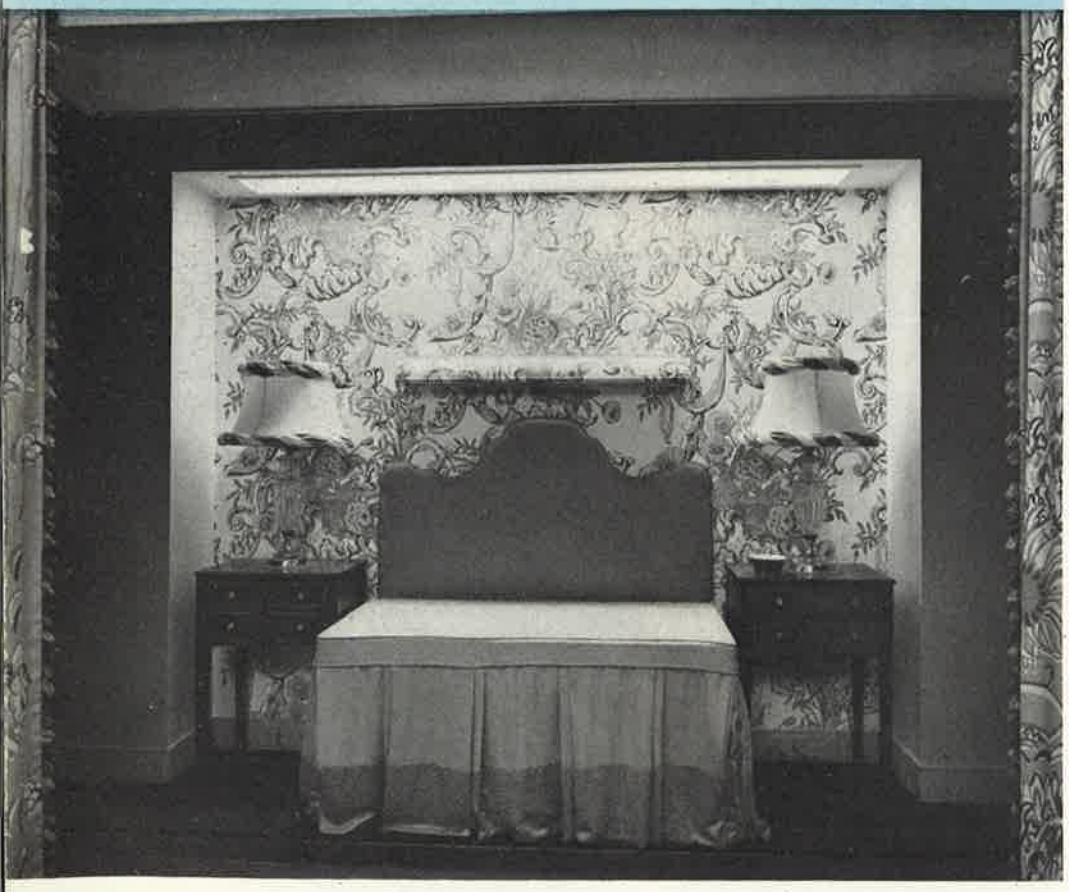
MAKE-UP LIGHTING that tells the truth is the promise of new dressing-table and dresser lamps to be included for the first time in the Certified line. Dresser type, not shown, is six inches taller to bring shade at face height for standing use. The glass disc surrounding the socket diffuses bulb reflections in glass or mirrored table tops. 25 footcandles on the face here.



THIS LARGE-SCALED TABLE LAMP on a 20-inch table is in proper "weight" for its grouping and provides the matching chairs with 40-footcandles. Different lamp-table heights call for lamps differing in basic dimension. A guiding "rule of thumb" is that the lower edge of the shade be approximately 40 inches above the floor. The eyes of a user, seated in a lounge chair, cannot then see into the shade. The bedside lamps use similar CLM parts, are shorter for the taller bedside tables and do not incorporate the Circline tube. 20 footcandles.



AMPLY SCALED crystal end-table lamps, with the undershade mechanics of forthcoming Certified lamps, form one of the three demonstrated ways of insuring comfortable bed-reading light. The table lamps may be turned to a low level for their luminous charm. One lamp on "high" provides 20 footcandles on book if reader is in correct reading position on lamp side of bed.



WALL-MOUNTED FLUORESCENT BRACKET, 36 inches long, shown lighted above, is one of the newest bed-reading lamps. It is papered to fade into the wall pattern and has an open grilled slot along its upper side to give interesting and softening upward light. This type of bracket, hung about 26 inches above the mattress, provides 20 footcandles.

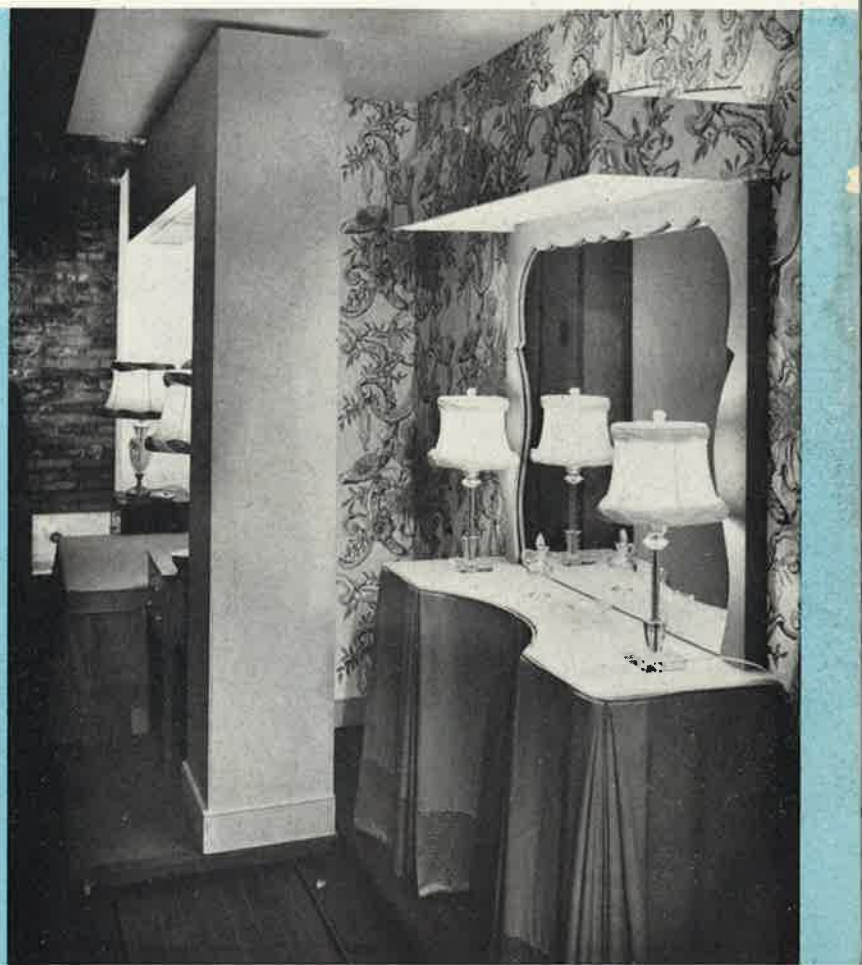
A "NATURAL" FOR FLUORESCENT TUBES, in lengths to fill the space, is the shallow alcove for bed placement. Above very thinly etched glass, two rows of 72-inch Slimlines in reflectors give 20 footcandles. Higher illumination can be attained by combining any two methods or by adding another row of lamps in the soffit.

SUMMARY OF G-E LAMPS IN BEDROOM SETTINGS, KITCHEN-LAUNDRY AND HALLS

Description of Installation	No. of Lamps	Lamp Ordering Designation (Except Voltage)	Type	Color Temperature	Total Watts①
BEDROOM STAGE SETTINGS					
Dressing table (pair lamps)	2	30/100	I.F. three-lite	.....	200
Dressing table (canopy)	4	F42T12/W	Slimline**	3500° white	136
Bedside table lamps	2	50/150M	I.F. three-lite	.....	300
Wall bracket (over bed)	2	F15T12/W	Gen'l line fluor.	3500° white	39
Soffit (bed niche)	2	F72T8/W	Slimline**	3500° white	100
KITCHEN-LAUNDRY					
Ceiling fixture	2	F40T12/IS/W	Gen'l line fluor.	3500° white	108
Soffit over sink	2	F40T12/IS/W	Gen'l line fluor.	3500° white	108
Wall bracket (over range)	1	F40T12/W	Gen'l line fluor.	3500° white	50
Wall bracket (under cabinets)	4	F20T12/W	Gen'l line fluor.	3500° white	98
Under cabinets (over laundry center)	1	F64T6/W	Slimline**	3500° white	61
False window	1	150PAR/SP	Projector spot	.....	150
	1	F40T12/W	Gen'l line fluor.	3500° white	50
Incorporated in equipment	9	.....	.....	.....	132
HALLS					
Utility	1	60 A-19	.....	.....	60
Kitchen passage	1	F40T12/W	Gen'l line fluor.	3500° white	50
Lamp storage cupboard	2	F42T6/W	Slimline**	3500° white	68
HORIZON HOUSE TOTAL Including audience foyer (not listed) and lamps in summaries of living-dining room pages 68 and 69	150	.....	.....	.....	10,506

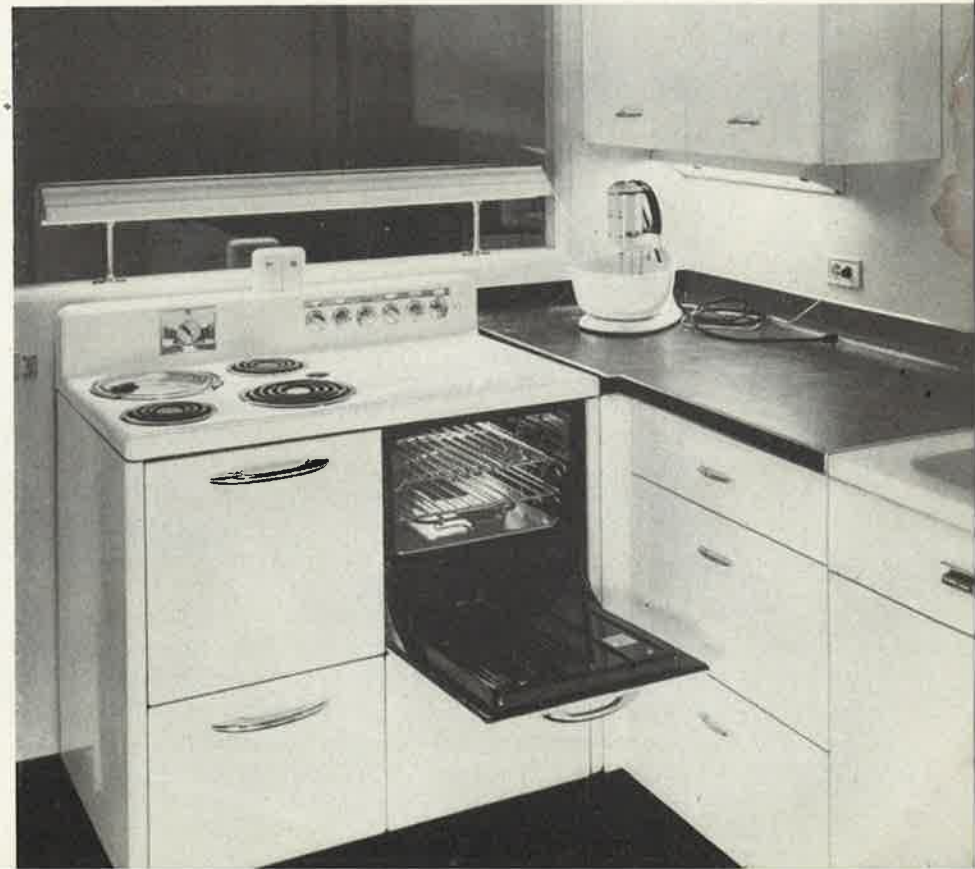
① Wattage includes ballast wattage in cases of fluorescent. ** Operated at 200 milliamperes.

MECHANICS OF CENTER BAY WINDOW, a smart device to show important bedroom lighting needs in a small space. At the touch of a switch, the bay window of the living-dining room raises to reveal the stationary dressing table stage setting. Another switch operates the motor driven bed setting which moves into view upon completion of the dressing table demonstration. Photo below shows mural being raised. Photo at right taken from wing of the stage shows how bed setting moves on track. Bottom molding of cornice over bay window is the lower edge of a projection screen which rolls down for additional pictures of lighting design.



◄ WORK SHADOW IS BANISHED in the atmosphere of the Horizon House kitchen-laundry — lighted and decorated for out-of-door freshness and cheerfulness. This combined kitchen and laundry in a 10 x 12-foot area boasts the "last word" in its fluorescent central fixture. It incorporates unusually generous light distribution, instant start, ease of maintenance, and decorative airiness. (Average 15 footcandles). With the added support of lighting tailored to each work center (40 footcandles) and of General Electric electrical servants, kitchen work can fly with minimum drain of energy and disposition — and with time to spare for extra niceties in family living.

UNDER-CABINET LIGHTING "flows" ► the full length of the laundry wall to add its worthy contribution to the simplified and speeded-up processes of laundry day with new General Electric automatic equipment. One for the "idea" book is the drop-leaf shelf (now raised in wall position). Lowered, it covers the G.E. automatic washer and G.E. tumbler dryer, providing six feet of additional counter space. The ironer is pulled away from its wall position to be included in the picture. At left of laundry equipment is the G.E. home freezer.



NO GUESSWORK at the range, where ► light tells the cook for sure that the range controls are accurately set and that both oven and surface-prepared food are being cooked to recipe perfection. Note desirable height above range of the bracket — that light may shine into, rather than shadow the surface pans. One hundred to 30 footcandles from back to front edges of the range surface. (Glass wall for easy viewing of complete room by Institute audiences necessitates unusual method of mounting bracket.)

(Continued from page 68)

in selecting lamps that are charming yet worthy of their prime lighting purpose. The new tag carries the initials CLM.

The four living room lamps each skillfully combine Circline fluorescent with filament bulbs for greater flexibility and for new "highs" in fitting light to the eyes. Each one is in design scale with its grouping and placed with close attention to both decoration and lighting effect. White shades, desired for their decorative harmony when unlighted, are all *inter*lined with a tinted fabric to blend them, when lighted, with the wall color, to cast a flattering light, and to avoid over-emphasis of the "cooler" fluorescent source.

A pair of silver torcheres allow three levels of indirect lighting and suggest a very pleasing dining room application. Their shallow glass bowls have a "frosty" appearance and a simple line decoration in keeping with the wall-bracket glassware.

FRESHNESS IN FIXTURES ALSO ADDS NEW CHARM

Horizon House foyer exhibits the first experimental ceiling fixture adapted to nested Circline tubes, using the eight and twelve-inch diameter sizes. The tubes are suspended 13 inches from the ceiling, and are completely shielded by a shallow, fluted, bent-glass bowl, 18 inches in diameter. The fixture prophesies great promise for Circline lamp application in attaining new grace and freshness in residence fixture design and more smooth and effective distribution. The kitchen fixture is a worthy leader of better standards for more discriminating design of fluorescent equipment for residence application.

No ceiling fixtures are at present used in the living-dining room, but two are provided for, with six switches on the keyboard for their flexible control, as soon as development and design experience suggest types in harmony with the room's design and its lighting goals.

VERSATILITY KEYNOTES IDEAL HOME LIGHTING

The concept is clear in Horizon House that the artificial lighting of a home need no longer be static—geared mainly to overcoming darkness. It is today, and increasingly tomorrow, a versatile medium—decoratively, emotionally, and functionally. A worthy competitor of daylight—it, too, establishes environment, attitude, activity. The form, the motive, the cost naturally vary with the home and the family habits.

No single room would utilize all the lighting ideas shown in this demonstration center. No guest sees all of its lighting elements operating at once. Each has its especially conceived role to play in changeful harmony with others, but the end result ever recognizes and fits itself to human variability, human need, and constant change in living pace. Versatility *is* the keynote.

* * *

The need is for advance planning —coordinated planning of architect, interior designer, lighting specialist, manufacturer, and homeowner. The need, too, is for a wider realization of the quickened progress in lighting's mode, purpose, and performance, with accompanying re-evaluation of appropriate costs. The reward comes with its worthy execution and its living experience. Assurance of this reward is found in Horizon House itself. The gratifying reactions to it, the multiplied expressions of amazement, fascination, and acceptance give strengthened faith in its new ideals—in brightened horizons ahead for industry, home, and family life.

A SPARE LAMP CUPBOARD will become almost a necessity in tomorrow's home of sunshine standards. Simple carpentry and ingenuity can create a lamp locker like this which allows immediate and convenient replacement of burned-out bulbs. As demonstration and understanding of the broader uses of light grow, so will the required types and sizes of lamp bulbs. Having spares of each on tap insures the uninterrupted benefits of light for health, recreation, charm, and good seeing.

SCHOOL LIGHTING

THE classrooms of the country easily hold the record for number of individuals engaged in critical, prolonged seeing. More than 30,000,000 people, nearly one out of every four, are engaged in school activities. Increasing enrollments are imposing a tremendous load on our educational systems and schools must attain the maximum efficiency from their teaching personnel and school facilities. Educators are turning to good lighting more than ever before as one valuable ally to help them meet this challenge.

Seeing is the most important medium of instruction used in modern education. Fortunately, seeing conditions are controllable and can be improved by higher levels of illumination and balanced lighting environments. Proper lighting assures comfortable seeing, easier seeing, and seeing which results in clearer and more lasting impressions. To the educator, the advantages of good illumination are apparent, and he accordingly is seeking ways of getting the best lighting for the dollars available.

The Institute demonstration classroom has been designed to demonstrate the principles and techniques of classroom lighting, and to show the advantage in comfortable seeing when illumination of good quality, as well as adequate quantity, is provided. For example, one observes that by simulating the effects of typical natural lighting in this classroom, and combining it with the light from six 150-watt enclosing globes, an illumination of 12 footcandles is obtained in the center regions of the classroom. When the daylight fails, as it so frequently does during the winter school months, the students are left with about six footcandles. This condition is typical of the lighting situation to be found in most schools today.

By increasing the wattage of lamps in the enclosing globes, the illumination level is improved, but

ENCLOSING GLOBES, considered representative of light conditions prevailing in the nation's schools as a whole, are relatively comfortable at six footcandles. Using higher wattage lamps in larger 18" globes, the illumination could be increased to 15 – 20 footcandles before the system became unduly uncomfortable due to glare. In photo below, J. M. Ketch, in charge of the Engineering Division's office and school lighting section explains the Institute's school lighting demonstration while C. J. Allen reports Lightmeter readings. Note use of recommended light finish desk tops.

the brightness of the fixtures correspondingly increases. At a level of 20 footcandles, the brightness of these enclosing globes of average size becomes too annoying and distracting for good classroom use. Not only is the direct glare objectionable, but so also are the images of the bright globes reflected in the dark, glossy desk tops. Switching from 20 footcandles of enclosing globe lighting to an equal value of indirect lighting, such as that from luminous-semi-indirect or silvered-bowl totally indirect equipment, provides a striking demonstration of the advantage of the softer and more comfortable lighting environment produced by the indirect luminaires. Levels of indirect illumination up to 40 footcandles with incandescent lamps are practical and feasible if the necessary wattage does not exceed the capacity of the wiring.

FLUORESCENT SYSTEM

The limiting factors in filament lamp systems are usually heat, operating cost, or current carrying capacity of the wiring. The more efficient and cooler fluorescent lamp has greatly reduced these limitations. For example, the lower heat radiation from fluorescent lighting permits levels of 150–200 footcandles before heat becomes an annoying factor. Furthermore, the higher efficiency of these lamps results, at a three-cent energy rate, in an operating cost for lamps, cleaning and energy, of only 40 per cent that of a comparable incandescent system; thus, it makes much higher standards of illumination feasible, often without additional wiring capacity.

The initial cost of fluorescent fixtures is, in general, three to four times the cost of incandescent fixtures giving the same footcandles, but the off-setting lower operating cost ordinarily results in lower overall cost per footcandle hour (equipment amortization, lamps, cleaning and energy) for energy rates above one and a half cents per kilowatt hour. Where the energy rate is three cents, 40 footcandles of fluorescent lighting can be owned and operated for the same cost as a 25-footcandle incandescent installation. Even at energy rates below one and a half cents per kilowatt hour, the fluorescent lamp has a distinct advantage in that, by reason of its increased efficiency, appreciably more light may be brought into a classroom without resorting to a rewiring program.

EXPOSED FLUORESCENT LAMPS in the field of view produce a distracting brightness and uncomfortable condition and are not recommended for classroom lighting without shielding. Here they are producing 40 footcandles of uniform lighting on the desks, with good economy and little sensible heat, but with too much glare.

One is able in the Institute's demonstration classroom to observe, too, why school lighting authorities are in general agreement that exposed fluorescent lamps of any kind are too bright and distracting for good classroom lighting, where prolonged, comfortable seeing is so important. As shown in the accompanying illustration, as soon as the exposed lamps are shielded from view, the installation becomes agreeably comfortable. Many of the schools which are relighting today are using louvered fluorescent luminaires which direct much of their light downward with part of the light directed upward to light the ceiling and thereby relieve contrast.

Typical installations consist either of two continuous rows of two- or four-lamp units or of three rows of two-lamp units. The continuous rows carry their own wiring, thus saving the cost of additional outlets. Direct lighting systems employing single-lamp shielded troffers have the distinction of having the lowest operating cost and providing the most light on the school desks with a given wattage. They give the room a clean and unobstructed appearance. Troffers are especially to be considered for new buildings. In old structures, their installation involves the cost of a drop ceiling, which, however, affords the opportunity for important acoustical gains. When a quality of lighting free from all direct or reflected glare is desired, luminous-indirect fluorescent luminaires are used.

WALL AND DESK COLORS

Classrooms of the past have too frequently been finished in dark colors which absorbed the light and gave a gloomy and oppressive appearance to the classroom. Today, ceilings are painted flat white for maximum lighting efficiency and walls are cheerful light-tone pastels to bring the brightness pattern of the room into closer harmony, and to give a cheerful atmosphere to the classroom. To provide a more comfortable seeing condition for desk work, the surfaces in the student's visual field surrounding the task are also being lightened through the use of lighter finishes on desks and floors.

The better-lighted better-finished classroom becomes not only a more efficient seeing area, but a center of learning which is more cheerful and more stimulating, hence more conducive to scholastic accomplishment and good citizenship.

WHEN SHIELDS ARE DROPPED down between the fluorescent lamps, the value of comfortable, balanced brightness is dramatically illustrated. Shielding the lamps from view instantly changes the environment of this room from one of definite distraction and discomfort to one which is most comfortable and pleasing in appearance.

POINT OF SALE ROOM

Recognition of the importance of higher standards in selling methods and sales tools at the point of sale is found in the Institute's Point of Sale Room.

The room is not designed as a model to be adopted completely as the perfect point of sale room for any particular market area. Rather, it demonstrates several ideas, from which fundamental principles and a few specific examples may be studied for adaptation to meet local requirements.

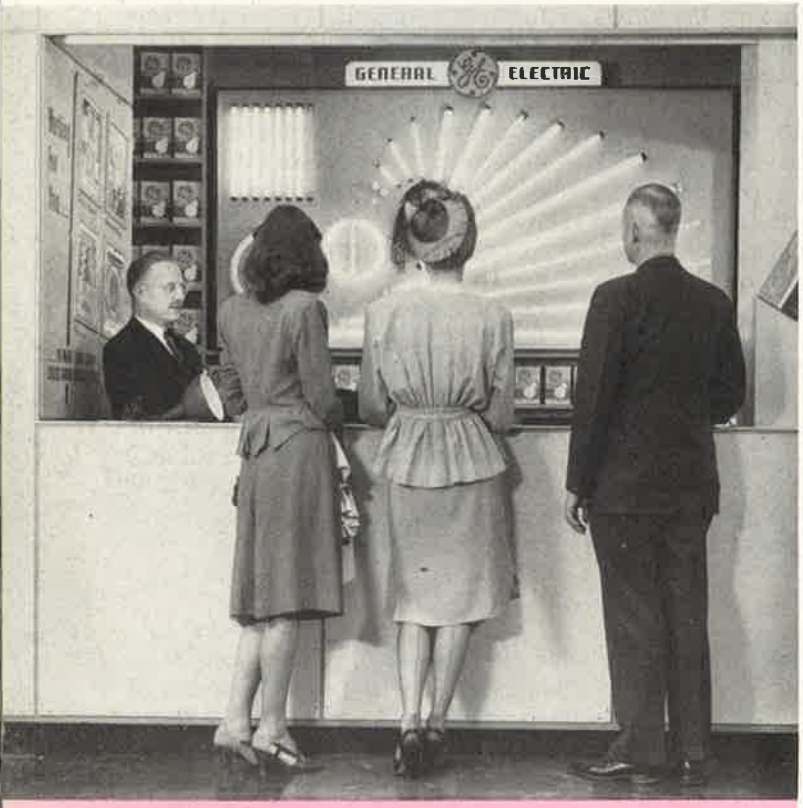
In demonstrating the room, the lecturer points out the logic and need for following up today's far reaching "planned lighting" program with point of sale methods that are as modern and well planned as the advertising, promotion and engineering methods which help to bring the prospect to the point of sale.

Several methods for converting unused wall space into useful planned merchandiser areas are shown with suggested copy. The importance of such merchandisers is stressed for use by lighting sales and service companies—both retailers and wholesalers—as an aid to salesmen, particularly those representing small contractors and dealers.

Point of sale ideas for replacement lamps are shown, and equal stress is placed upon suggestions to aid the selling of initial installation business which has increased in importance since the war.

Planned lighting merchandisers are recommended for strategic locations throughout all establishments which display or sell lamps or fixtures.

Such merchandisers help the wholesaler and retailer to find, develop, equip, and keep lighting sales specialists. They provide untrained men with a lighting vocabulary, and teach them the proven steps for making sales. For both trained and untrained salesmen they provide a story guide, an inspiration as to lighting fields. The merchandisers also stimulate interest of prospects and help them to buy wisely.



CITY COUNTER. Some of the ways in which wholesalers can take full advantage of city counter space for attractive product display and reminder copy are shown in the Point of Sale room.

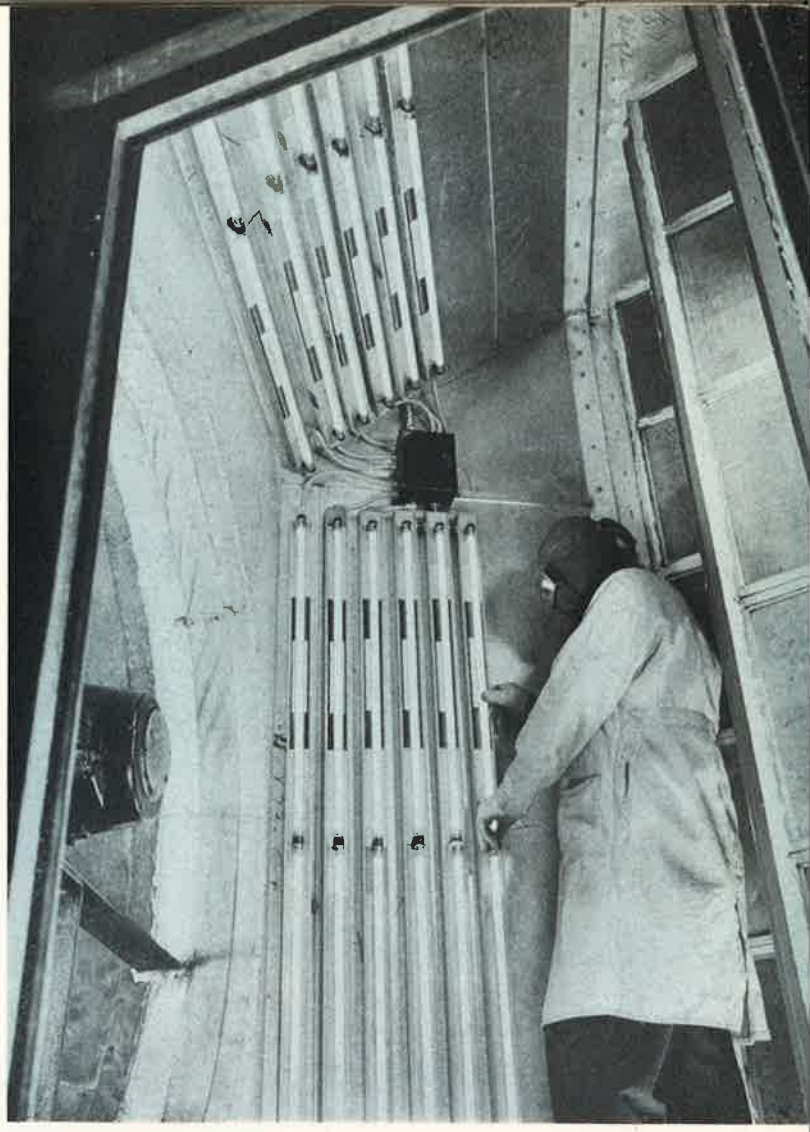
NO FOREST of fixtures here. A. F. Loewe demonstrates an idea for showing one fixture at a time. Fixtures pull out of a wall soffit on tracks. Customer can choose better when ceiling is not cluttered with a bank of varying sizes and shapes of fixtures.

GENERAL VIEW of one side of the Point of Sale room. N. W. Townsend, behind counter, demonstrates point of sale lamp display ideas. Walls of the room are used to suggest how unused space can be used for planned lighting merchandisers.

GERMICIDAL

To show the ways in which ultraviolet may be used to disinfect air, germicidal lamps have been installed in many Institute rooms as well as in the building's air-circulating system. They are like fluorescent lamps except that shortwave ultraviolet is transmitted to the air through a special glass tube instead of being transformed into light. By filling the upper air of a room with this germicidal ultraviolet it is possible to maintain a freedom from living bacteria comparable with that of outdoor air, a provision of sanitary ventilation comparable with that of removing side walls and ceiling of a room.

Air circulation within the room provides a dilution of the lower air and a reduction in contamination comparable in the case of crowded rooms with the ventilation otherwise only possible by opening all of the windows. Ultraviolet air disinfection by this method is extensively used in hospitals, especially the infant and contagious disease wards. Ultraviolet air disinfection, in conjunction with other methods of patient isolation, makes it possible to use a general hospital for contagious cases and, in emergencies, the contagious disease hospital for general purposes.



IN AIR-CIRCULATING DUCTS of the Institute (photo at right) germicidal lamps prevent the movement of live bacteria from one part of a building to another. Here are twenty-four 30-watt germicidal lamps, sufficient to disinfect 60,000 cubic feet of air per minute.

IN THE SCHOOL ROOM at the Institute, Dr. L. J. Buttolph, head of the Engineering Division's health applications section, explains a germicidal lamp installation. Germicidal lamps in a school room, building or system, will reduce the spread of childhood respiratory diseases there. Since, however, influenza and common colds spread everywhere that people are, it may be necessary to provide ultraviolet air disinfection in every public gathering place and, perhaps, some of the homes in order to secure a similar reduction in colds and influenza. ▼

ANOTHER INSTITUTE germicidal display is explained by H. Haynes. A variety of fixtures are available to adapt germicidal lamps to various local installation conditions. ▼

QUANTITY

Two Basic Aspects

BY VARYING THE ILLUMINATION on this visual task (0 - 1000 footcandles available), the observer selects the amount which enables him to see best.

In the Quantity Room the Institute visitor learns why ease and speed of seeing depends on amount of light supplied. He may step up to a booth containing typical visual tasks and adjust the light to a value he finds best. Usually the amount he finds desirable is much more than generally used today. The reasons for his choice become apparent from demonstrations of four fundamental factors in seeing:

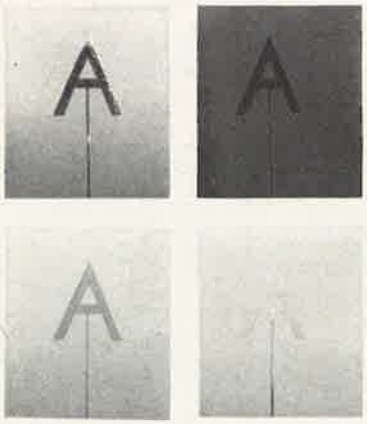
(1) *Brightness*—A dark object needs more light to make it readily visible. Two boxes—one white, one black—appear of equal brightness and whiteness when the illumination of the darker one is increased by 25 times.

(2) *Brightness contrast*—Higher illumination is needed to see when contrasts are low. Black letters A in front of each of the boxes stand out equally clearly when backgrounds are brought to the same brightness. But as the letters are moved back and receive the same light as the background, the one in the white box remains highly visible while the other merges into the surface of the poorly reflecting box.

(3) *Acuity*—With more light one sees more accurately—finer detail, smaller objects. A piece of suiting, gray and undistinguished under low illumination, takes on interesting pattern, texture, and coloring under higher values.

(4) *Time*—More light—faster seeing. The blurred spokes of a wheel rotating at constant speed lose fuzziness as the illumination is increased, and the wheel appears to slow down. It appears to speed up again as the light is reduced.

VISIBILITY INCREASES with greater contrast in brightness between a specific detail and its immediate background. ▼



THE TWO SURFACES above are identical; the one appears much whiter solely because of higher illumination.

THE DISC revolving at constant speed appears to rotate faster when the light is dropped from a high to a low value because the eyes require more time to see and the visual images are therefore blurred. At higher illumination the spokes stand out more distinctly and hence give the impression that the disc is moving more slowly.

QUALITY

of Lighting

The Quality Room gives the visitor opportunity to experience other factors influencing the acceptability of a lighting system.

Direction and diffusion of light are demonstrated as they relate to modeling, or to disturbing shadows.

Major emphasis is given to glare—to the several factors that determine whether a lighting system is comfortable, including:

(1) *Brightness of the source or luminaire*—shown by adjusting the amount of light from a one-inch disc as well as from a full-scale luminaire.

(2) *Area of bright surface,* as determined by the dimensions of an enclosing globe or luminaire, and by the number of such units. As area of luminous surface is increased its brightness must be reduced to maintain comfort.

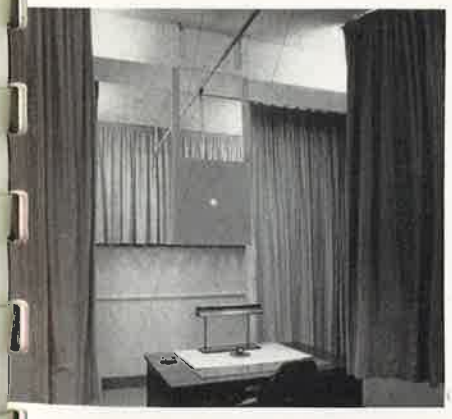
(3) *Angle above the line of sight,* depending upon the mounting height of the luminaires and their distance down the room. The greater the angle, the more comfortable the system.

(4) *Distance from the eye.* The distant enclosing globe in a long room is seen to be approximately as glaring as the nearer one since the advantage of distance is offset by the lower angle of the far unit.

(5) *Relative brightness of the surrounding surfaces,* as affected by the general illumination and reflection characteristics. Comfort increases with less marked contrast.

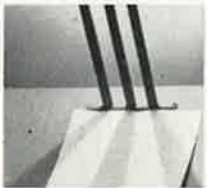
Fluorescent lamp luminaires are presented in the Quality Room in both side and end view. End-wise their brightness is lower and becomes less with greater distance. Viewed side-wise they are more glaring at all distances, indicating a need for more side shielding.

DR. WARD HARRISON is explaining to these visitors that a lighting system which is comfortable in a small room may become uncomfortable when it is repeated in a larger area. By means of mirrors at the front and back, this demonstration room has been given the appearance of one several times its actual length.



◄ INCREASE in either the brightness of the luminaire or in its area of a given brightness makes it less comfortable. Elevating the luminaires above the line of vision progressively reduces glare.

SHADOWS ► give form to objects, but become annoying if they are moving or if they conceal the visual task.



MINIATURE

IN THE CUBICLES of this Institute display are shown representative applications of some of the millions of miniature lamps sold per year. On display are such applications as flashlights, toys, surgical instruments, portable marine lamps, miners' cap lamps, night lights, emergency lanterns, novelties, pilot lamps, bicycle lamps and illuminated switchplates and outlets. The entire lower section is devoted to a scale model train and accessories, completely equipped with miniature lamps. In the pinball machine at left, fifty-four miniature lamps are used.

To implement the policy of "Lamps for every purpose," more than one thousand different miniature lamps have been developed and are being made.

To cover all requirements, both filament and glow lamps are available, the filament lamps being mainly of the low voltage, low wattage type while the glow lamps are low wattage, 115-volt, gaseous discharge lamps.

The requirements of the miniature lamp field are as exact as those for larger lamps and therefore they are as carefully engineered and designed.

For example the requirements of flashlight lamps, operating from small low capacity battery cells must be radically different than those for radio panel lamps, where ample power is available but an extreme range of vibration frequencies are encountered.

The lamps used in emergency handlanterns and miners' lanterns can be designed for maximum light output from the relatively high capacity storage batteries used without too great an emphasis on physical size, while those used in surgical instruments must be extremely small and strong since they are inserted into the body cavities.

For many applications such as telephone switchboard lamps and railway dispatchers' panels, special bases must be used which require little space and permit quick removal from the front of the board.

Indicators and pilot lamps must be dependable and must have long life. In this field the neon glow lamps are particularly well adapted. Glow lamps of very small size consuming 1/25-watt are built into switchplates and convenience outlet plates. Others are used in pilot light assemblies and indicators.

Lamps for toys and models must be rugged and in many cases must be scaled to the model. Low price is also a feature here.

Miniature lamps may light up the eyes of a teddy bear or indicate the position of the gates that control the floods from Boulder Dam. They cover a widely diverse field and are indeed "Small Bulbs for Big Jobs."

INSTITUTE DEMONSTRATION unit shows how the automotive industry is using lamps to help make night motoring pleasant and safe. In photo, G. E. Meese demonstrates fluorescent instrument lighting, the recently improved General Electric all-glass Sealed Beam headlamps, the new all-glass spotlight fog and back-up lamps. Proper aiming and use of headlamps is emphasized.

AUTOMOTIVE

Some 300 million lamps on the motor vehicles of this country contribute in many ways to the safety, comfort and convenience of night driving.

Primary in importance are the headlamps which must make it possible to see for a distance greater than required for stopping—often under adverse conditions. The General Electric integral all-glass, precision optical unit sparked an industry-wide cooperative activity which resulted in a universal Sealed Beam headlighting system of radically improved performance. The G-E all-glass Sealed Beam unit has unique properties. It does not grow dim, but continues to supply new car lighting of peak efficiency throughout its life.

Additional lamps required by law, are those employed for tail and stop lights, registration plate illumination, parking and, on commercial vehicles, for markers, clearance and identification.

Safe night operation is further aided by fog lamps, turn indicators, spotlights and back-up lamps on the exterior. Inside the car, step lights facilitate entrance or exit by lighting automatically when a door is opened. Courtesy lights under the dash function similarly in the front compartment and may serve for reading road maps. Instrument lighting has shown steady improvement and now employs several lamps for uniform legibility with brightness controllable to suit the driver. A recent innovation is fluorescent instrument lighting. Numerals and pointers coated with fluorescent paint glow softly when irradiated with near ultraviolet energy from concealed, filter-capped filament lamps. Indicator lamps supply varied and important operating information to the driver. One example is a warning that the glaring upper headlamp beams are on.

Still gaining in popularity are the convenience lights in domes, glove boxes, trunks, engine compartments, vanity mirrors and for general utility or tire service. With the others they are evidence of the industry's continued effort to increase the safety, comfort and usefulness of its cars.

For safety on the highways, G-E constantly emphasizes the importance of proper aiming and use of headlamps. Drivers are urged to:

Be certain the headlamps are properly aimed.
Use the upper beam only when the road is clear.
Use the lower beam always when other cars are near.

PHOTOGRAPHIC

Contributions to lighting for photography have been numerous and outstanding. The lamps developed specifically for photographic applications form an impressive list.

Photoflash *Flashtube*
Photoflood *Photoblue*
High wattage for Motion Picture Studios
3350° K for Technicolor
3200° K for Commercial Color Film
Sound Recording *Sensitometric*
Photoengraving *Film Printing*
Sound Reproducer *Enlarger*
Mercury for Photo Reproduction, Blueprinting, Diazo Printing, Copying
Fluorescent Viewer for Correct Color Appearance

In addition, many of the regular "F" type lamps, while not developed specifically for photography, serve admirably for portrait photography, copyboard lighting and other miscellaneous applications. But most of the above types were developed to meet the requirements of particular photographic applications as established by G-E's engineers after thorough study. Many involve new discoveries and new techniques in the art of lamp making.

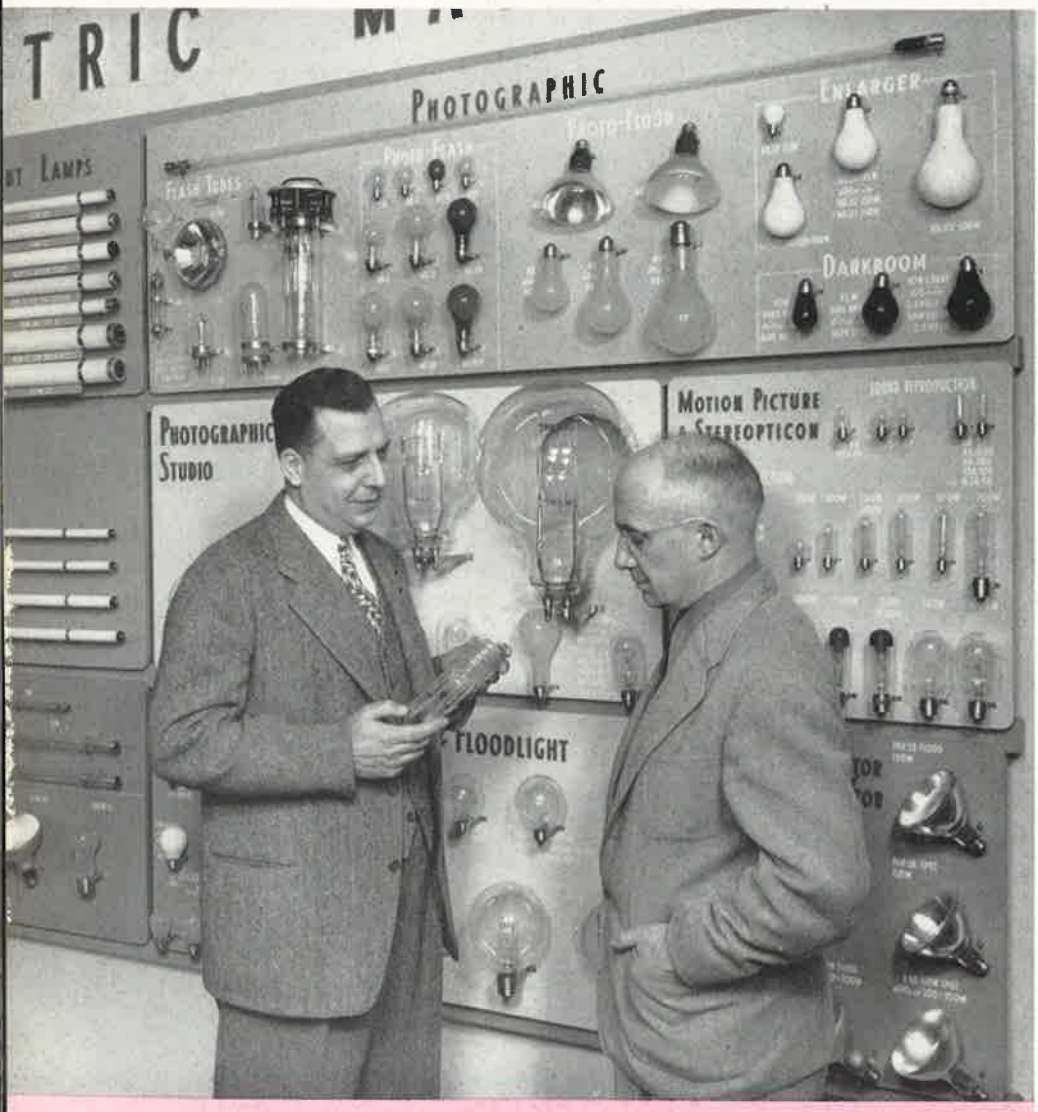
General Electric believes that its responsibility to the photographer, amateur and professional, goes much farther than merely making a variety of lamps available to him. General Electric has been the leader in contributing original technical papers, bulletins and instruction booklets on the use of light in photography.

The popular Guide Number system which has been of such great help in simplifying flash photography was pioneered by G-E's photographic experts. The G. E. Exposure Meter had its origin in the Lightmeter.

Typical of the cooperation which G-E has extended to photographic lamp users were the devices engineered to solve the problem of newspapermen, as well as many other photographers, who wanted to synchronize exactly the flash of a lamp with the exposures as fast as 1/400 second. Cooperating with manufacturers of synchronizers, G-E developed flash bulbs with highly precise timing characteristics, and worked out several devices such as the Synchrograph and Electronic Synchronization Checker which enable the photographer to check both the performance of his shutter mechanism and the setting of his synchronizer.

G-E's Nela Park staff has made a thorough study of reflector design, materials, surface finishes and has provided equipment manufacturers with many efficient designs.

The photographer, visiting Nela Park's new Lighting Institute, sees samples of the many types of lamps available to him, together with their various characteristics. He can inspect in detail the power and triggering elements supplying the condenser discharge through a typical ultra-fast, ultra-intense Flashtube. He learns about synchronization and control of light. And he finds how the spectral characteristics of light sources and films can be matched to produce faithful color rendition.



PHOTOGRAPHY and picture projection require a wide variety of light sources. F. E. Carlson and R. E. Farnham, both veteran G. E. photographic engineers, examine a powerful flashtube, capable of taking aerial pictures at night. Panel of lamps in background is that part of the Institute's lamp gallery which pertains to lamps used in photography.

CONFERENCE ROOM

The merchandise conference room in the G-E Lighting Institute was designed with a two-fold purpose—first, as a display showing uses of architecturally planned lighting for a modern, efficient conference room; second, as a meeting place for merchandising groups.

The unusual rectangular "wedge" shape of the conference table permits all members of a conference to sit in a comfortable position with working area and a full view of the conference chairman.

Above each side of the table is a specially designed ceiling fixture using rows of 40-watt instant-start fluorescent lamps. These fixtures are completely shielded from normal view and, although they supply a high level of illumination on the table surface, they do not produce any reflected glare.

Running overhead, over the center of the table, is a second lighting fixture using Lumiline lamps controlled by a dimmer rheostat. This fixture is particularly adapted to conferences which use slide or film strips as a part of the presentation. The control for the Lumiline fixture is located near a projector, allowing the operator to control the level of the room illumination. The effect is much like that of dimming the house lights of a moving picture theatre when the feature picture starts.

The dramatic showing of a new idea is often the main feature of a conference. For this the merchandise conference room is well equipped. Directly behind the flowered curtains is a small stage for the showing of a surprise idea in a truly dramatic fashion. It is complete with overhead spots and off-stage area, and a rear-stage door for moving equipment in and out without disturbing the conference.

Around three walls of the conference table are large light-colored tack boards for a display of photographs, charts and promotional material. Here again light plays an important role. A high level of efficient illumination is provided by the main overhead fixtures.

At the operator's finger tips are a set of light switches which control all the lighting in the room.

A motion picture screen can be un-reeled quickly over the stage.

If the chairman needs a sketching board he merely opens a concealed door in the side wall and a pad is available for his use as shown.

Part of the room's permanent equipment is modern sound-recording and play-back equipment.

BUILT-IN FACILITIES make possible smooth running, effective conference presentations in the Institute's merchandise conference room. Wedge-shaped table, a small stage behind the curtain and fingertip control of the special lighting, are some of the conference room features.

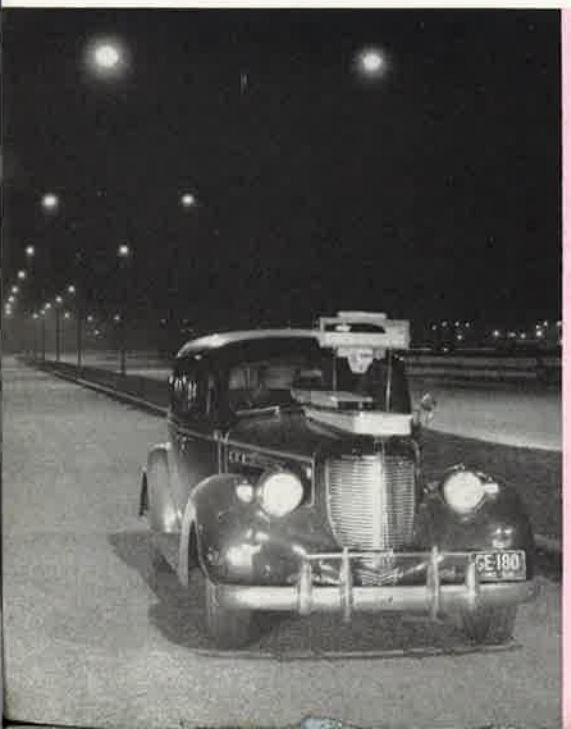
IN THE INSTITUTE Auditorium, Kirk Reid discusses street lighting and sports lighting. Suspended above the speaker are modern street lighting luminaires designed by General Electric for the following applications: business streets (extreme left), for vehicular traffic arteries (second from left), and for residential streets (three at right). R. J. Diefenthaler holds one of the new "Yankee Stadium" floodlights embodying unique features which simplify installation, aiming and maintenance.

STREET . . . SPORTS

Better street lighting at lower cost!

With this goal, General Electric engineers have made major contributions to more adequate lighting of streets for public safety and convenience. They have developed new forms and improved types of light sources. They have created extensive laboratory facilities, instruments, and techniques of research, with which they have established and measured the basic factors in safe seeing. They have applied the new knowledge to the design of luminaires of radically greater effectiveness.

Full-scale outdoor street lighting facilities near the Institute assist the city official and the supplier of service to reach a common understanding of the lighting problem and its best solution.



STREET LIGHTING Evaluator, (left) a Nela Park development. With the Evaluator the three principal factors in visibility—pavement brightness, obstacle brightness, and glare—can be measured simply, quickly, and accurately, and combined to obtain the relative over-all seeing value of the lighting system.

IN SPORTS, better lighting means better playing performance as well as greater enjoyment of the game by players and spectators. One of the tests which prove this, is this test setup using the flexible facilities of the Institute to study performance in table tennis. Improved lighting resulted in greater consistency and accuracy of returns.

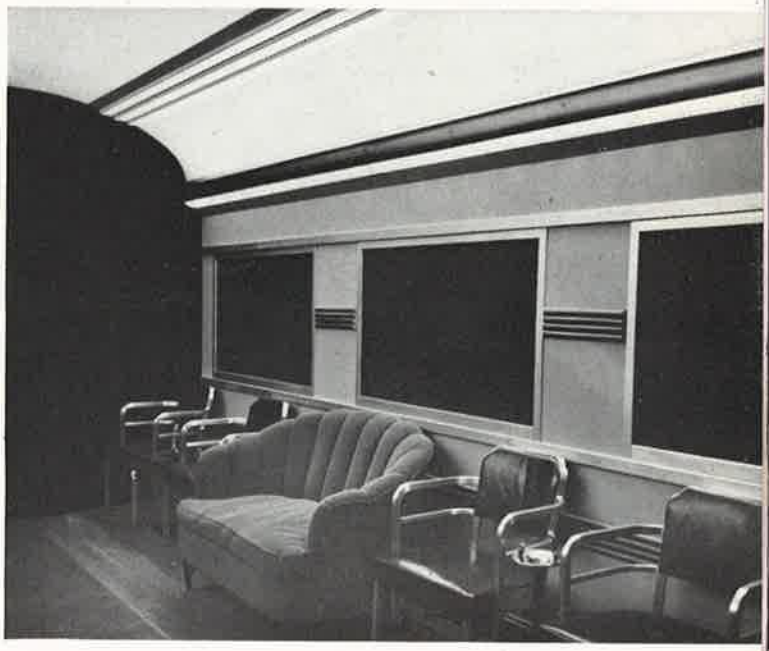
RAILWAY . . . TRANSIT SYSTEMS

Groups of Institute visitors attending lighting schools or conferences are often transported to and from their hotels in this Nela Park bus in which experimental lighting systems are tested. At the present time the interior of the bus is lighted with two continuous rows of 42" T-6 white Slimline lamps. Three types of fixtures are being used to illustrate different designs to accomplish essentially the same results.

The Engineering Division at Nela Park cooperates with the transportation industries in the development of lamps and lamp applications in every way possible. The photograph at right shows a mock-up of a railway lounge car which was used in the development of the lighting on one of the original "streamliners." In addition to development work on car lighting, work is carried on in all phases of railroad and transit system lighting such as locomotive headlighting, cab lighting, train markers, signal lighting, etc., plus the application of light to all of the stationary properties.

The trend in most transit vehicle lighting is toward fluorescent. The higher luminous efficiency of the fluorescent lamp gives it considerable advantage over the filament lamp for car lighting where in most cases the supply of power is limited. Added to this, the fact that it is a linear source, makes it most welcome to car designers.

REPRESENTATIVE of the many mock-ups used by the Engineering Division to aid fixture manufacturers and railroads in working out lighting systems, is one shown at right.



INTERIOR of the Nela Park bus is lighted by an experimental system of two continuous rows of fixtures using 42" T-6 Slimline.

DISPLAY OF TEXTS prepared by the Engineering Division is reviewed by Walter Sturrock, head of engineering publications. These texts are used as standard reference in lighting practice, and in the teaching program of the Institute. The publication shown in inset at right gives details of luminaires used throughout the Institute.

ENGINEERING PUBLICATIONS

Illumination practice develops rapidly following the pace set by public demand and the constant improvement of light sources by the lamp manufacturer. While many people come to Nela Park to study the latest practice many more must keep up by using the reference texts prepared by Engineering Publications. Only a few of the current references are shown in the Institute display. The total publication output provides the means for projecting the teaching program of the G-E Lighting Institute to the nation and the world. Classes on illumination, wherever they are held, rely on Nela Park reference texts for the most up-to-date reports on lighting practice.

INSTITUTE DISPLAY of advertising publications is explained to visitors by F. O. Maltby, Jr., assistant head of the Institute. Maltby urges consideration of the industry brochure "A Planned Lighting Program to Build More Net Revenue" (shown in inset at left), and then discusses supporting G-E promotion material which is shown in the display.

ADVERTISING PUBLICATIONS

To aid all people who are engaged in selling, installing and maintaining Better Light for Better Sight has long been the aim of the Lamp Department of the General Electric Company.

To that end, the Advertising Division has created educational and promotional programs for residential, commercial, industrial and specialty lighting sales organizations.

Because the materials for these programs have been quantity produced and sold on a cooperative basis they have greatly reduced user costs.

The present endeavor is to coordinate this activity with the far reaching Planned Lighting Program for the electrical industry which has been conceived and sponsored by the Edison Electric Institute.

INSTITUTE AS A T

REGISTERING for a class in lighting.

TYPICAL store lighting demonstration.

HOME LIGHTING group in Horizon House.

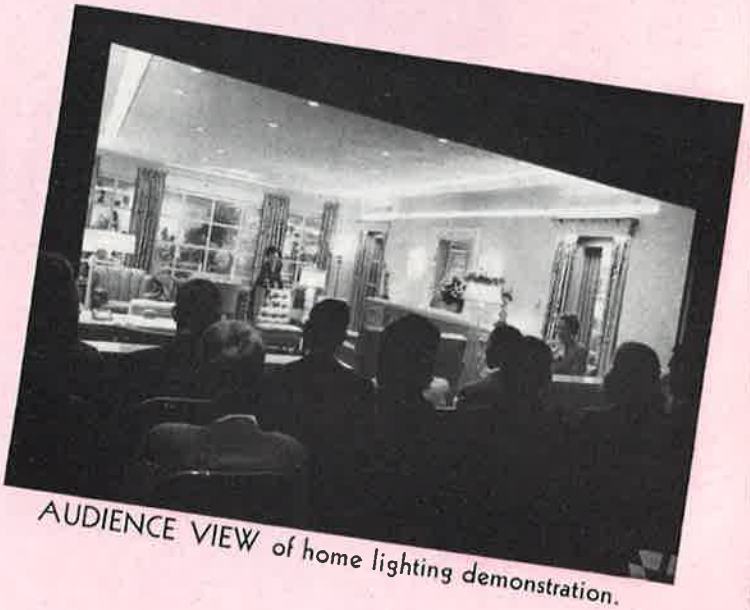
THE training courses given in the new General Electric Lighting Institute at Nela Park, Cleveland, are the product of twenty-six years of development of Nela's Institute methods and facilities for teaching sound lighting practice.

Institute classes were first held in 1921 at which time comparatively crude facilities were installed in temporary quarters for instruction of the Lamp Department's salesmen. The Institute Method immediately proved so effective that courses were added for personnel of electric power companies and others in the lighting industry.

The "Nela School of Lighting" as it was called for many years, continued to expand in size, scope, and number of students. The Institute kept pace with the rapid progress of lighting application knowledge by periodic remodeling. See photos on pages 6 and 7.

In the new Lighting Institute, regular courses and conferences take more than half of the scheduled time. The remainder of the schedule is allotted for special one or two day conferences for electrical industry groups, and customers interested in particular lighting applications. Both regular and special conferences must be arranged well in advance of actual dates.

More than 60 thousand persons have completed lighting courses of three or more days duration at Nela Park. The number of persons who have attended one or two day conferences, or participated in daily tours of demonstrations, runs into the hundreds of thousands over a period of years. During the first five months of 1947 the number of persons who learned about lighting at the new G-E Lighting Institute averaged 200 per day.



AUDIENCE VIEW of home lighting demonstration.

A TRAINING CENTER

REGULAR COURSES

Regular courses given at the Institute several times a year include:

Courses in Commercial Lighting Fundamentals—5 days, limited to 60 persons per course.

Advanced Commercial Lighting course—5 days, limit 120 persons.

Industrial Lighting course—2 or 3 days, limit 60 persons.

Course in Home Lighting Fundamentals—3 days, limit 60 persons.

Home Lighting Refresher course—3 days, limit 60 persons.

Advanced Home Lighting course—3 days, 120 limit.

CONFERENCES

Each year conferences, (usually two days) are held for many groups including:

Architects and consulting engineers.
School and college executives.
Building owners and managers.
Store managers.
Display men and decorators.
Street lighting engineers.
Lighting equipment designers.

In the interests of lighting users, lighting salesmen or consultants in lighting and related fields, the engineers and other specialists who form the faculty of the "University of Light" in the new G-E Lighting Institute stand ready to cooperate. This is part of the service that goes with G-E lamps.

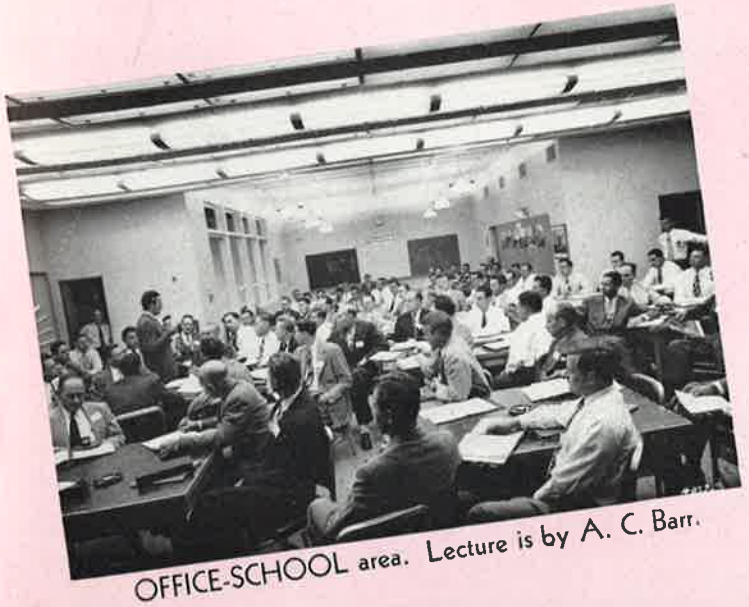
Institute Staff

LECTURERS (above): L. C. Kent, in charge; F. O. Maltby Jr., Alston Rodgers, Aileen Page, W. D. Riddle, F. B. Degner, D. H. Vincent.

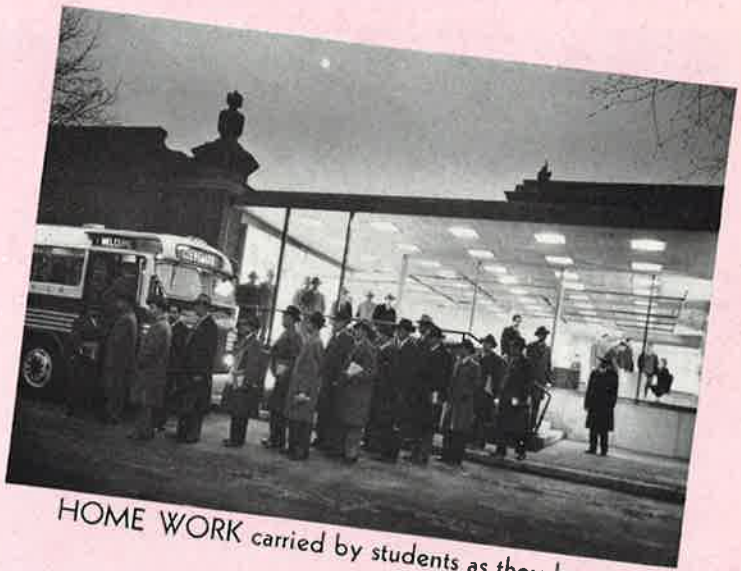
OFFICE (right): Grace Withington, Ethel Knight, Mary Brucklacher.

SHOP (left): W. C. Ingham, A. L. Reas, R. H. Ferree, J. T. Fisher, Don Mallory, H. T. Goldthorpe.

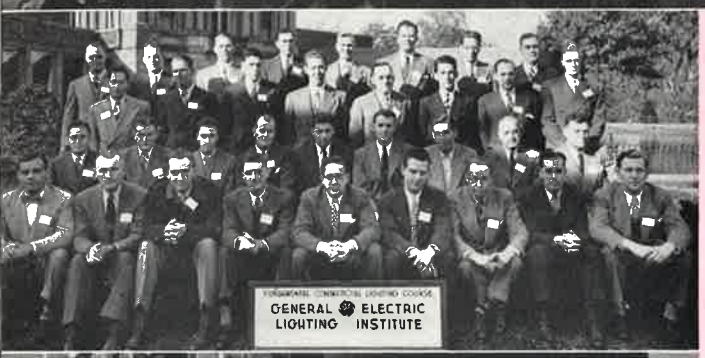
MAINTENANCE (right): Sammie Smith, D. N. Dunning, H. W. Benz, Bradley Dresser Jr., M. H. Kastner, Richard Wilson.



OFFICE-SCHOOL area. Lecture is by A. C. Barr.



HOME WORK carried by students as they leave.



▲ TYPICAL group taking the course in Advanced Commercial Lighting.

◄ CLASS in Commercial Lighting Fundamentals.

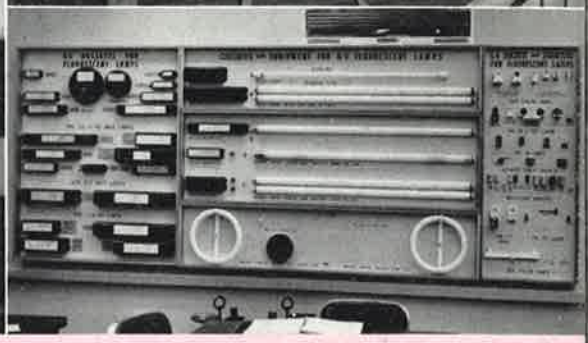
INSTITUTE guests ► between sessions.

◄ PANEL DISPLAYS attract interest.

◄ GROUP arriving by bus for a special Institute program.

VISITORS from Brazil are Dedei Aranha and Perla Maciel.

PHOTOGRAPHERS find in the Institute a wealth of opportunity for unusual pictures. Circline lamp inspired novelty photo above.



THE STORY on color in relation to lighting becomes a demonstration as well as a lecture in the new Institute. G. B. Buck shows samples under various types of lamps.

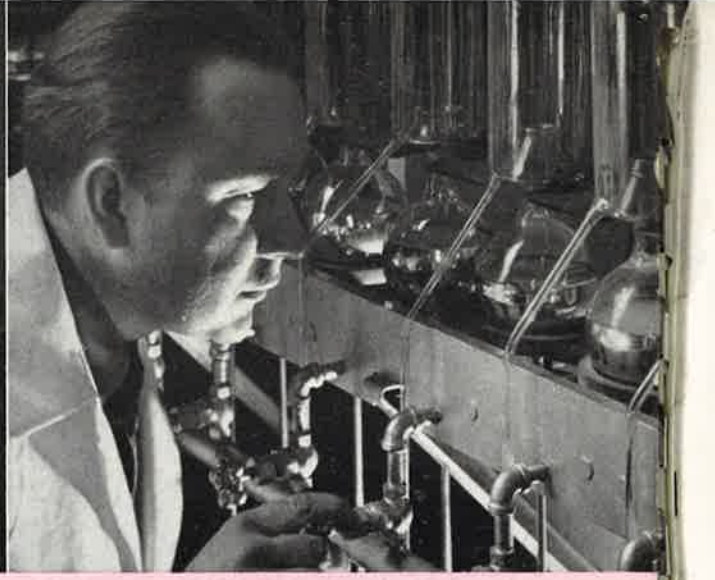
Above: H. H. Green explains the industry's Planned Lighting program. Other photo shows Institute display of fluorescent accessories in the office lighting room.

TYPICAL of the dozens of groups of men who worked night and day to get the new Institute in shape for the opening. At extreme right is W. D. Riddle, resident architect. Others are W. M. Potter (left), and R. T. Dorsey (center).

GIVING the home lighting story are Helen McKinlay, with a visitor in the foyer, and Mary Webber on stage.

HOME LIGHTING courses, both refresher and advanced, are part of the new G-E Institute's regular schedule.

DR. MATTHEW LUCKIESH of the Engineering Division works for the future. Continuing his research and writings, he is enthusiastic about what lamps may be doing for humanity 10 or 20 years from now. Photo shows Dr. Luckiesh (left), with Tom Knowles during research on disinfecting water with germicidal lamps.



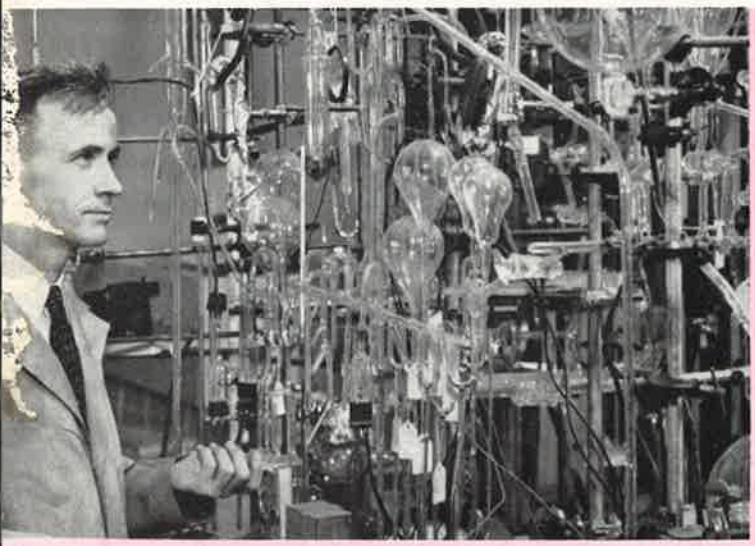
QUALITY CONTROL is as important in the continuing improvement of lamp manufacture as it is in lighting application. Equipment above makes possible 99.998% purity in the drop of mercury which goes into each fluorescent lamp.

LOOKING TO THE FUTURE

The lighting applications of the new G-E Lighting Institute will constantly change with the progress of lamp research, manufacturing and engineering, so that it may continue to set the pace for good lighting practice.

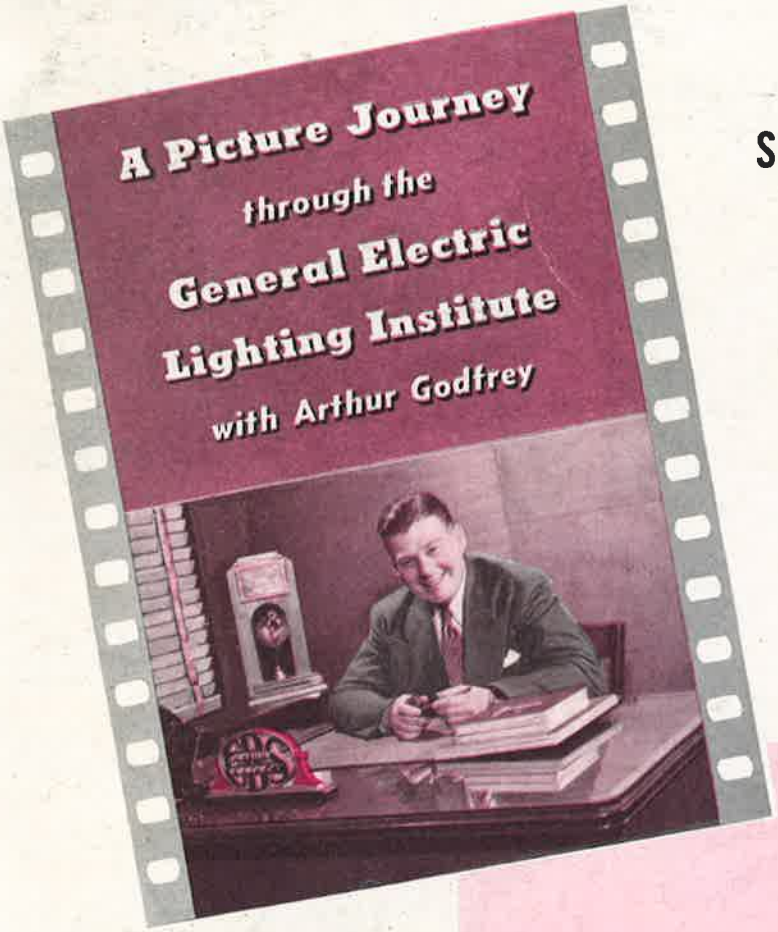
The Institute is but one indication of the extent to which the Lamp Department will go to help the lighting trade to help the customer get the most benefit possible from lamps and lighting.

The Lamp Department has no crystal ball into which it looks for future developments. Rather it looks to the continuing work of the same organization which has produced so many lamp developments to date.



PHYSICISTS, chemists, electrical engineers, mechanical experts, and lamp production men of the Lamp Development Laboratory Staff, constantly work to improve present lamps and develop new ones that will provide new lamp services.

LIFE TEST for lamps. Selected at random from each day's production of lamps in each factory, lamps are put on life test. Periodic checks for voltage, watts, light output, etc., keep constant check on standards and help to determine even better methods of manufacture.



SOUND SLIDE FILM DEPICTS TOUR THROUGH G-E LIGHTING INSTITUTE

Most everyone who visits the General Electric Lighting Institute expresses the wish that friends and associates might also see and hear the benefits of planned lighting as illustrated there.

Now that you've seen the magazine describing it, you will be glad to know that a sound slide film is available covering the Institute; a full-color, thirty-minute trip through this interesting and educational building, showing over seventy views, with narration by the celebrated radio commentator, Arthur Godfrey, in his delightfully crisp manner.

The film may be procured, for showing to certain groups, by arrangement with any General Electric Lamp Sales District Office.

SAY IT WITH LAMPS. The striking beauty of lamps is expressed in this display of lamps in clusters simulating a floral bouquet. Scene is one of the show window areas of the G.E. Lighting Institute at Nela Park, Cleveland.

PRINTED IN U. S. A.