Theater Engineering Conference

Lighting

New Circlarc Fluorescent Lamp*

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Summary—The 18-watt, 12-inch, T8 Circlarc fluorescent lamp is a standardized curved fluorescent lamp made in the form of a half circle 12 inches in diameter. Used singly or in multiple arrangements, it provides a flexibility of application not obtainable with the full-circle (Circline) lamp. The arc stream of each lamp is short so it may be operated directly from the 110- to 125-volt alternating-current lighting circuit with a small low-cost choke as a ballast or from 110- to 125-volt direct-current circuits with special auxiliaries. The semicircular shape makes it possible to obtain, with a curved fluorescent lamp, the advantages of mass-production machinery previously available only with straight-tube lamps.

The lampholders required must provide a preheat and an operating circuit and must allow a tolerance for variation in lamp diameter and base-pin location. A spring support at the center of the lamp holds it in place. The ballasts must develop proper electrical values to operate the lamps at designed wattage without excessive loss or overheating.

Lamps mounted on walls and ceilings provide pattern lighting using a production lamp. Bare-lamp clusters provide new novelty for suspended fixture design. The half circle simplifies design, installation, and maintenance of built-in lighting with curved fluorescent lamps. Portable lamps and other fixtures with several Circlarc lamps now can be provided with multilevel fluorescent lighting.

With the advent of the newly standardized half-circle fluorescent lamp, known as the "Circlarc," manufacturers have broken with the traditions of the past and now provide a production lamp that can be incorporated in bare-lamp installations to provide a flowing pattern of light on walls or ceilings. The half-circle design also releases the architect or lighting designer from many of the restrictions imposed by straight tubes or the full-circle lamp known as the Circline. It is too early now to predict the extent to which this new half-circle lamp will be used in theater lighting but there is little doubt that this field of application will be one of the more important ones in which it is applied.

The 18-watt, 12-inch, T8 Circlarc fluorescent lamp is a curved

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fluorescent lamp made in the form of a half circle 12 inches in diameter (Figs. 1 and 2). Used singly or in multiple arrangements, it provides a flexibility of application not obtainable with the full-circle lamp. The arc stream of each lamp is short so it may be operated

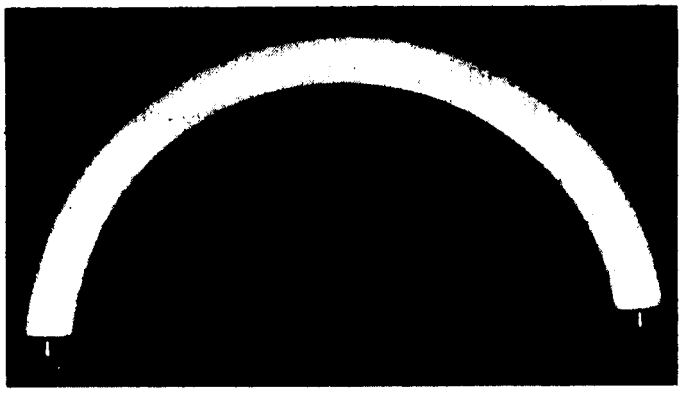

Fig. 1—The 18-watt T8 Circlarc fluorescent lamp, a newly standardized shape available to widen the field of use for fluorescent lamps.

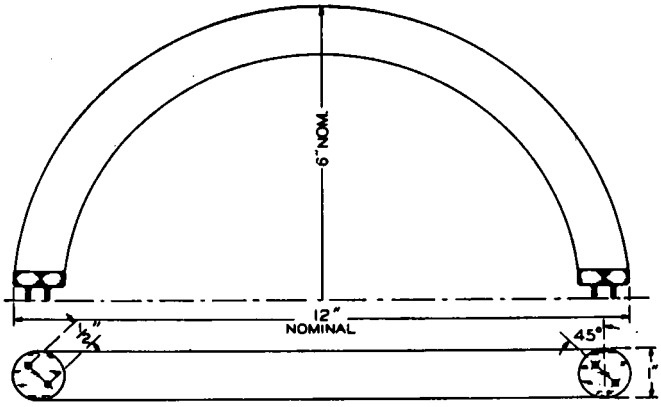

Fig. 2

directly from the 110- to 125-volt alternating-current lighting circuit with a small low-cost choke as a ballast. Also, the semicircular shape makes it possible to obtain, with a curved fluorescent lamp, the advantages of mass-production machinery previously available only with straight-tube lamps.

The 18-watt Circlarc lamp operates on a simple reactor-type ballast

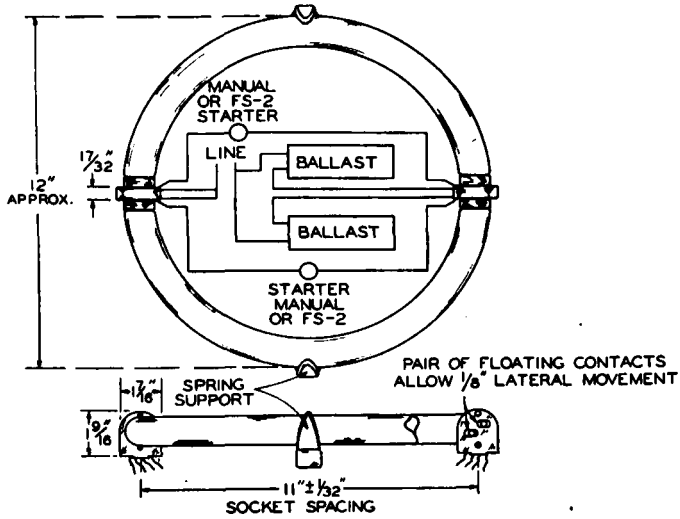

Fig. 3—A pair of 18-watt Circlarc lamps may be mounted to form a 12-inch circle.

TABLE I
ESSENTIAL TECHNICAL DATA

Designation	Circlarc
Service	General lighting
Watts (lamp only)	18 (approx.)
Bulb shape	Semicircle—12″ nominal diameter
Lamp dimensions:	
Diameter of tube	1″ (T8)
Outside radius of lamp	6″ ± 1/8″
Center-to-center spacing of bases	11″ ± 3/32″
Operating ampere	0.380
Operating volts	54.5
Open-circuit volts	110–125
Preheat ampere (center value)	0.55
Base	Medium bipin
Color	White
Initial lumens	710
*Rated life (at 3 hours per start)	2500 hours
†List price	$1.25

* 4000 hours at 6 hours per start and 6000 hours at 12 hours per start.
† Subject to change.

with the regular manual or the FS2 glow switch starter used for 15- and 20-watt standard fluorescent lamps (Fig. 3). Ballasts used with

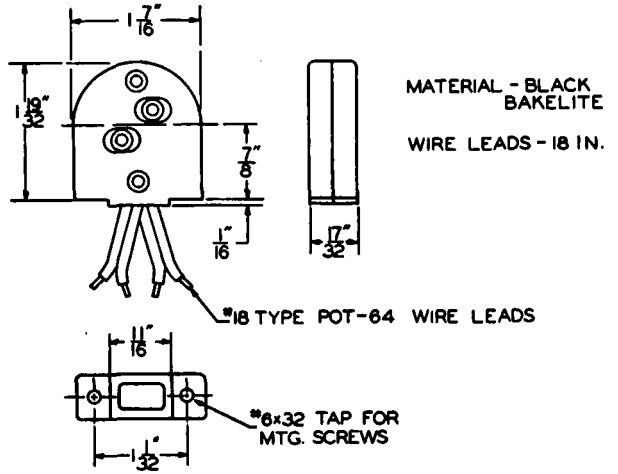

Fig. 4—Circlarc lampholders are arranged for base pins to be pushed into easy "finding" tapered openings. Lateral play allows for small tolerance in lamp dimensions.

the 18-watt Circlarc lamp should be suitable to carry the 0.380 operating ampere without overheating.

The Circlarc base pins are located at 45 degrees to the plane of the lamp which allows the pins of the two opposing lamp bases to overlap and reduces the thickness of a 2-lamp holder to a minimum. Holders

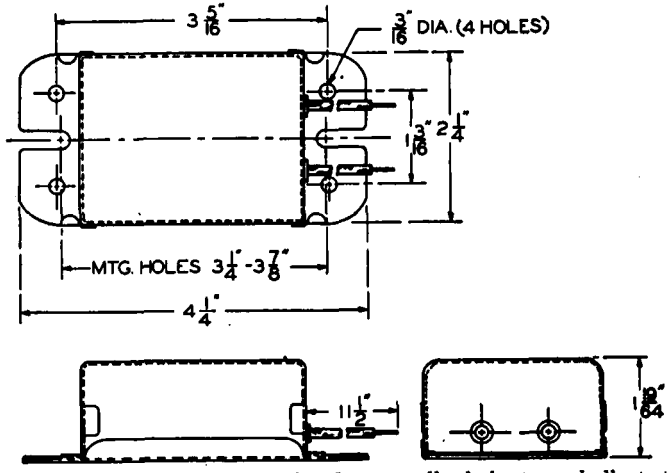

Fig. 5—Circlarc lamps need only a small choke-type ballast to operate the lamp at the proper electrical values.

should provide good electrical contact with the pin receptacles arranged to float laterally about $^1/_8$ inch so as to allow for the lamp manufacturing tolerances in diameter required (Figs. 4 and 5).

PATTERN AND BUILT-IN LIGHTING

The Circlarc lamp provides a fluorescent shape that is badly needed for new type lighting throughout the theater. For example, this semicircular lamp can be used to form a pattern of light on the ceilings and walls and, in warm climates, on the marquee and the theater sign. Built-in lights for the niche over the water fountain, an arch of

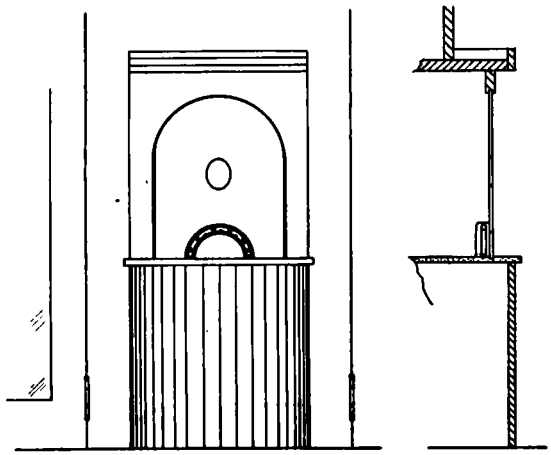

Fig. 6—Ticket sales beneath an archway of light. The Circlarc provides luminescent tubing around the opening in the ticket window placing light at the spot where it is needed.

light over the ticket window, pedestal lighting beneath or above flowers or statuettes, Figs. 6 and 7, and a diadem of light over small exhibits, such as costume jewelry, all represent new and interesting uses of fluorescent lamps which require a semicircular shape of lamp.

Pinup-type wall fixtures with the half-circle lamp in the horizontal position extending out from the wall provide downward or upward light where needed on or near the wall. For example, beneath a small picture, Fig. 8, the Circlarc is better than a straight tube against the wall because the center of the luminous tube is automatically extended from the wall by the graceful curve of the fixture and this makes it possible to throw a greater intensity of light to the top of the picture. Similarly, where a wall fixture is inverted to throw light downward,

this provides an excellent illuminant for growing plants or vases of flowers mounted on tables or against the wall in the lobby or elsewhere in the theater building.

Naturally, appearance of lighting equipment is of great importance in the theater. Aside from the technical advantages of the Circlarc lamp, there is also the basic fact that the curved form is interesting and attractive in contrast to the straight rodlike shapes of most standard fluorescent lamps in general use today. Where single lamps are used in desk, wall, and other types of fixtures, this curved shape is perhaps the most important contribution offered by the new Circlarc lamp.

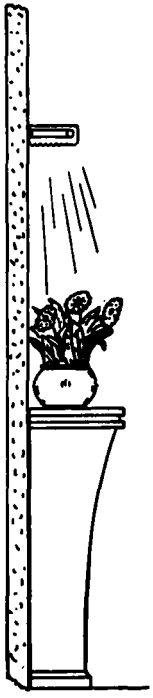

Fig. 7—Half circle of light highlights a vase of flowers in the theater lobby.

SIMPLIFIED MAINTENANCE

The half-circle lamp makes replacement of "burnouts" a simple and practical operation even in fixtures using more than one complete circle of fluorescent tubing. Such relatively elaborate units are commonly required in large areas as theater buildings where a single Circline lamp would be inadequate. Two of these tubes form a complete circle and produce lighting results comparable to the Circline lamp. A circle of light built up with two Circlarcs can be taken apart and a burned-out lamp readily replaced whereas it is difficult to relamp a Circline fixture using more than one lamp since these ring-shaped lamps cannot be threaded through one another. It is this flexibility in the use of the Circlarc lamp that will recommend it for larger multiple lamp fixtures in the theater.

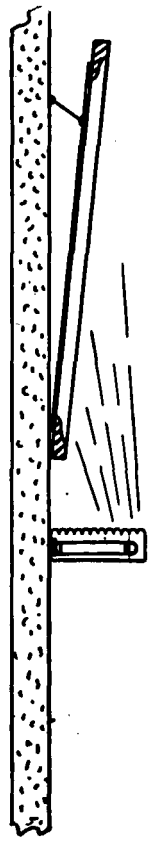

Fig. 8—Small graceful wall bracket with half-circle lamp lights wall-hung painting.

In the design of ceiling fixtures of the conventional type, we have become accustomed to square ends or continuous runs in our design.

Architects and designers, however, have not been pleased with this condition but have always wanted a rounded end of the fixture (Fig. 9). The Circlarc lamp can now be used to provide this improvement, particularly desirable where the appearance of the room is important as is the case in the lighting of theaters or their associated buildings and areas. The Circlarc lamp not only rounds off the fixture making it more attractive but introduces luminosity at the end which is desirable to avoid shadows. This rounded end also makes it possible to nest downlights using the reflector-bulb lamp mounted inside the curve without loss of beauty in the fixture.

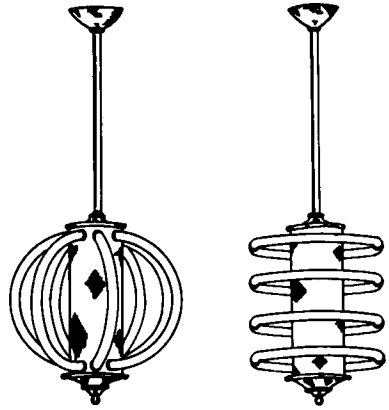

Fig. 9—Multi Circlarc lamp ceiling fixtures are practical to make and to relamp due to semicircular shape of lamp with push-in base pins.

DIRECT-CURRENT OPERATION

The 18-watt Circlarc lamp is designed basically for operation on alternating current but it may be operated on direct current with quite satisfactory results if the proper auxiliaries are used and the line voltage is between 110 and 125 volts. Under these conditions, the lamps can be expected to give about 80 per cent of the normal alternating-current life performance. The end blackening of the tube will be a little more severe than on alternating current resulting in a somewhat lower lumen maintenance throughout life.

To assure dependable lamp starting, an inductive ballast as well as the regular direct-current resistance ballast must be used. This provides the necessary voltage surge that establishes the arc between the electrodes at each end of the tube. The inductive ballast used may be the standard ballast used for alternating-current operation and it may be installed as for normal alternating-current service. A suggested arrangement of the resistance ballast is at the baseboard outlet with a provision for plugging in a complete standard alternating-current fixture with its complete alternating-current circuit and auxiliaries.

It may be necessary to reverse the flow of current periodically through the lamp to prevent dimming at one end caused by migration

of the mercury vapor. This is a characteristic of direct-current operation of fluorescent lamps. If the lamps operate continuously or for several hours at a time, some of the mercury will become concentrated at one end of the lamp and cause the other end to become dim. The use of a polarity-reversing switch or simply reversing the base-plug terminals in the baseboard outlet once or twice a day will serve to eliminate this condition.

The recommended values of series resistance and other technical data of interest in connection with direct-current operation of these lamps are given in Table II.

TABLE II

Direct Lamp Current (Amperes)	*External Resistance Required (Ohms) 110 Volts	120 Volts	†Ohms per Volt	Approximate Auxiliary Watts Loss per Lamp (Resistance plus Inductance)
0.32	148	180	3.2	21

* These values of resistance must be used in series with the regular alternating-current inductive ballast used with this lamp. This resistance is in addition to the 24 ohms internal resistance of the inductance. Resistors must be capable of carrying the lamp current without overheating and should be within about 10 per cent of the values shown.
† For other line voltages, the resistance required may be corrected by adding or subtracting the number of ohms indicated for each volt difference.

The Circlarc lamp is now available in one size, an 18-watt T8 curved fluorescent lamp in the form of a half circle 12 inches in outside diameter. It is provided with the standard bipin base at each end but the base pins are located at an angle of 45 degrees to the plane of the lamp so that two lamps can be mounted to form a 360-degree circle with a minimum of dark space. The use of the preheat hot-cathode design permits operation of the lamp on a very small, simple, choke-type ballast directly from the 120-volt alternating-current lighting circuit. This reduces the space occupied by the auxiliaries required for the lamp's operation and also, of course, minimizes the initial investment in this type of lighting.

Ultimately it is quite possible that the Circlarc lamp will be made available in other sizes and in other colors beside the present standard white (3500-degree Kelvin color temperature). At present, however, the lamp will be available in only one size and one color. Since the new lamp was introduced largely because it can be adapted to manufacture on automatic machinery, this one size and the machines to make it in volume will be perfected before other sizes are introduced.

It is hoped that the 18-watt 12-inch Circlarc lamp will be found in practice to be as important as it would appear to be. Its designers and makers will feel that their efforts are well repaid if it does help extend the use of fluorescent lighting in the American theater.