New Horizons in Exhibition

Editorial Note — *To give some attention to the challenge of better exhibition, the Society has sought some points of view from Ben Schlanger, Consultant for the new Colonial Williamsburg Theaters where, as reported by Bosley Crowther in the New York Times, spectators ". . . can sense the new horizons for exhibition that can be reached through new, imaginative design." Mr. Schlanger notes:*

Britain's National Film Theatre demonstrates notable advances in design over most motion-picture theaters which, incidentally, were built before the advent of the big, or wide-screen, picture; but it does not represent the ultimate in theater design which has not yet become static.

A worthy effort has been made in the National Film Theatre to neutralize the auditorium shape and interior surface treatment to permit projected pictures to dominate the view of the spectator but, unfortunately, the limited head room under the bridge controlled the size of picture; however, it would seem possible to have a 40-ft wide picture and, given good picture resolution and light, the projection throw could be increased to obtain a favorable focal length for the lenses. A 40-ft wide picture would dominate the scene for the viewer from this seating pattern and the side walls would be further out of range of the average viewer. As an alternate to the special screen curtain there might be an optical or other device for framing the various aspect-ratio pictures. A picture wider than 40 ft could be considered for films larger than 35mm.

This is a good and neat theater design and it succeeds in exhibiting pictures under conditions much less distracting than in most theaters. It has replaced the usual elongated seating pattern with the more nearly square pattern which is economical and essential for wide-screen viewing. We must, however, seek still further to exploit physical and psychological possibilities to attain the desirable design for theaters for today's films. — *Ben Schlanger.*

Great Britain's National Film Theatre

By R. F. SCOTT

It is almost two years since my first meeting with Frank Hazell, of the British Film Institute, and Norman Engelbach, of the London County Council, when Mr. Hazell outlined the project to build a national film theater and invited me to assist with the planning.

The mandate was simple: to build a theater embracing the whole of cinema engineering while providing for the foreseeable future — in short, a challenge, and an opportunity to design a "pure" cinema, unhampered by tradition (Fig. 1).

The choice of the site, under the southern arch abutment of Waterloo Bridge (Fig. 2), gave rise to many planning limitations, all of which have been effectively overcome by the architect.

After the site had been selected, tests were conducted within the bridge vault to determine the level of noise transmitted through the structure of the bridge. This was found to be negligible, so the next step was to study acoustics within the auditorium. The result was a ceiling for the auditorium lined on its upper surface to eliminate, as far as possible, any transmitted noise.

The first stage was to determine the various areas including the main auditorium, small preview theater, projection suite, offices, club rooms and general service areas. Each decision was made on a commonsense basis, uninfluenced by considerations of tradition or fashionable effect (see Fig. 3).

Simple geometry dictated the shape of the main auditorium. The height of the underside of the bridge and a sharply inclined floor under the screen would allow a picture no higher than 12 ft 6 in. The width of the widest ratio, therefore, must be CinemaScope, at 32 ft 6 in.

Experience gained during recent years indicates that the best viewing distance from a screen of these dimensions is between two and five times the height, thus making the front row at 24 ft and the rear row at 64 ft (Fig. 4). The ex-

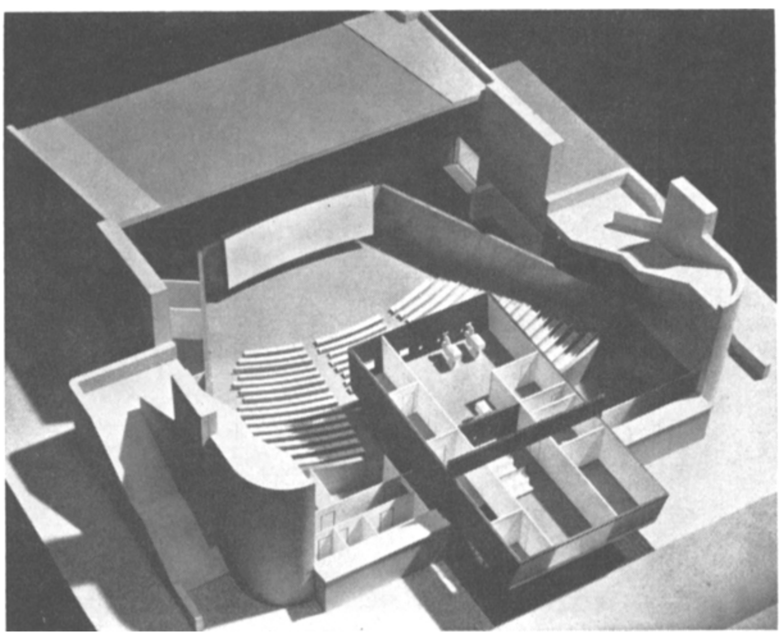

Fig. 1. Model of the National Film Theatre, showing the main auditorium, looking toward the screen. Projection booths in foreground contain equipment for both the main and the preview auditoriums. Preview theater, in foreground, overhangs entrance.

A contribution submitted on November 20, 1957, by R. F. Scott, Planning and Design Dept., G.B-Kalee Division of Rank Precision Industries Ltd., 37–41 Mortimer St., London W1.

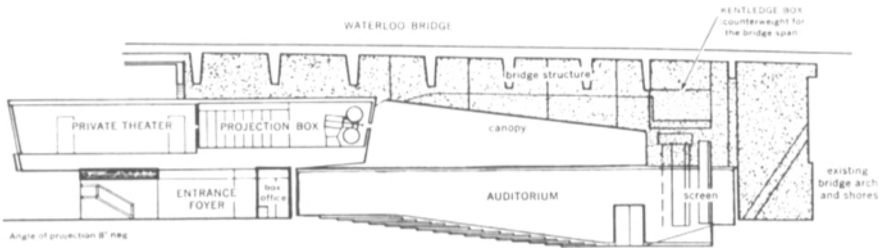

Fig. 2. Planning limitations imposed by the site under Waterloo Bridge.

treme sides of the seating area were determined at the maximum angle from the screen surface taken from the widest picture commensurate with good vision. This angle is 115°. The resulting seating capacity is 500 seats. To provide uninterrupted viewing, the floor of the auditorium was formed by excavation to give a 1 in 8 slope on curved steppings.

The floor is covered with a specially designed carpet in colors of green, black and gray in a nondirectional design. (As far as we know, this 1250-yd carpet is the largest ever laid in one piece on a curved step auditorium floor.) The ceiling and upholstery are a light green color. As a person advances through the foyer, there is a progressive reduction in the lighting to accustom his eyes to viewing conditions. The walls are treated with 3-in. wooden strips modified at certain points for absorption over 20% of the area. Tests and measurements in the auditorium show the volume per seat as 150 cu ft and reverberation times as 125 cycles/sec at 1.3 sec; 500 cycles at 1.0 sec, and 2000 cycles at 0.94 sec.

The screen (Fig. 5) had to provide for all known film systems, so no less than 10 ratios were required. To provide for future developments and give the greatest flexibility, it was decided to place the screen inside the auditorium.

A space frame of tubular construction standing on four 3-in. diameter tubes was designed to suspend the Harkness stereo screen. This screen has a widely diffusive surface and incorporates electrically operated magnascopic masking for varying the width of the picture. The height is common for all ratios, thereby giving an inter-ratio balance.

In order to present the program and to enhance the auditorium, the architect designed a panel of abstract shapes which was made into a two-leafed shutter as part of the screen space frame (Fig. 6). This shutter parts in the center and runs on special tracks to the rear of the screen where it remains during film presentation. The shutter consists of 340 separate panels of 9-mm ply, each surfaced with plastic paint treated to give a broken stucco effect and finished with gilt. The panels are separately hinged and suspended on steel rods.

The entire framework and picture format are covered with a suit of tailored black masking. This latter may be a debatable choice, but experiments have produced no evidence that there is any better color for surrounding the picture; and until the industry decides on one aspect ratio it will be impossible to eliminate masking altogether.

The screen equipment having now emerged from the gloom of back stage and from behind voluminous draperies, and having so to speak "come of age," we have, in keeping with other "scopes" and "isions", given it a name — The Gaumont-Kalee "Monovistal."

As the auditorium will be used for lecture purposes, a sectional staging has been supplied consisting of 15 sections on lightweight tubular beams which are supported in floor sockets over the sloping floor in front of the screen. A sectional box along the front houses lighting and microphone wiring. This staging can be erected or dismantled in a very short time.

The small preview theater, seating 25 people, is situated over the entrance and is unique in providing not only all the screening facilities of the large auditorium (10 ratios), but in addition, a rear-

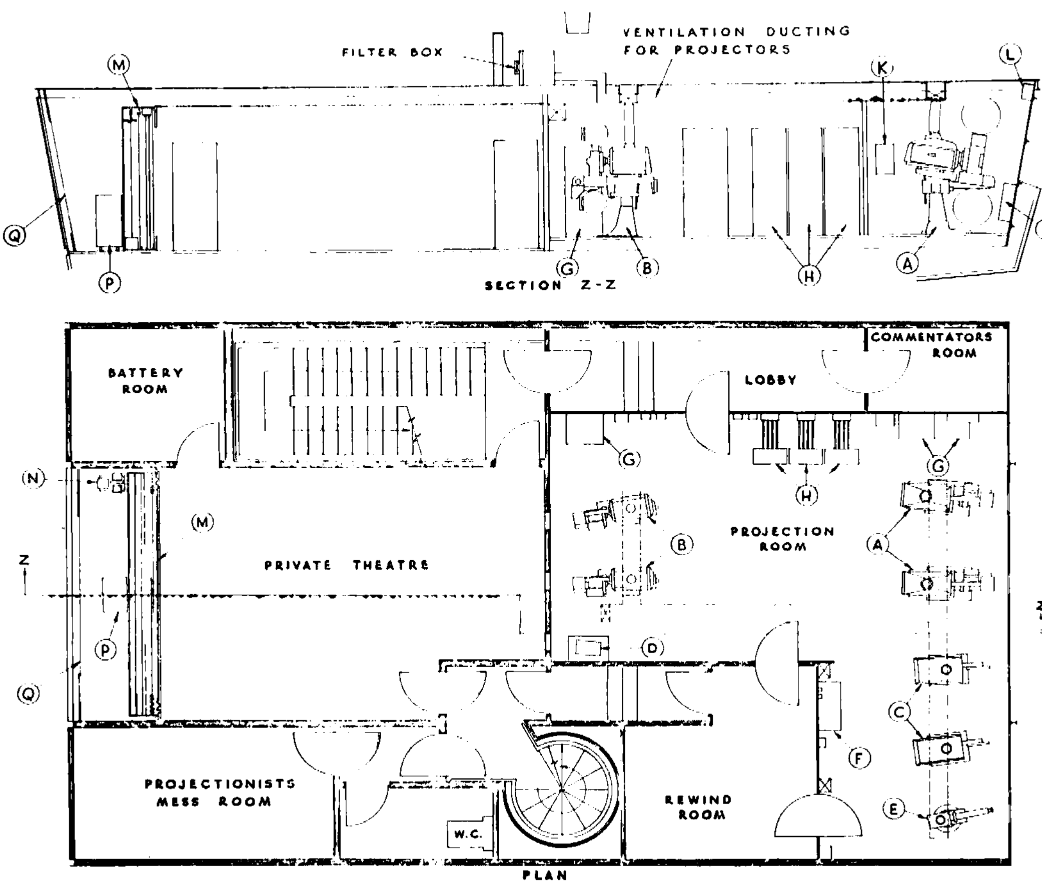

Fig. 3. Projection areas and equipment: A, Gaumont-Kalee "20" 35mm projectors; B, Gaumont-Kalee "18" 35mm projectors; C, G.B-Bell & Howell Model 609 16mm projectors; D, G.B-Bell & Howell Model 630 16mm projectors; E, slide lantern; F, Gaumont-Kalee nonsync record player; G, rectifiers; H, amplifier racks; J, voltage amplifier; K, effects control unit; L, magnetic preamplifier; M, roll-up screen and curtain frame; N, electric curtain controller; P, Type 717 loudspeaker; Q, rear-projection screen.

projection screen to the front of the theater. This could not have been done were it not for the fact that the building is beneath Waterloo Bridge, so that even on the brightest day the plate-glass facia is in shadow. This is of great value for advertising purposes.

This facility gave rise to many problems. In order to project onto the special Harkness rear-projection screen, the normal screen had to be removable. This was accomplished by designing a special tubular steel open-type frame with side electrically operated magnascopic masking. This has a Harkness pull-up roller screen operated by winch gear, with black plastic masking incorporated on the screen at the top and bottom. This framework also carries an orthodox velour curtain and dress legs.

The projection room is situated between the two theaters and serves both, but with completely separate installations. Serving the main theater are two Gaumont-Kalee "20" 35mm projectors, which will run at 16 and 20 frames/sec for silent films, and 24 frames/sec for sound films. They have series "S" lenses and Varamorph variable anamorphic lens for all ratios (Table I). The sound

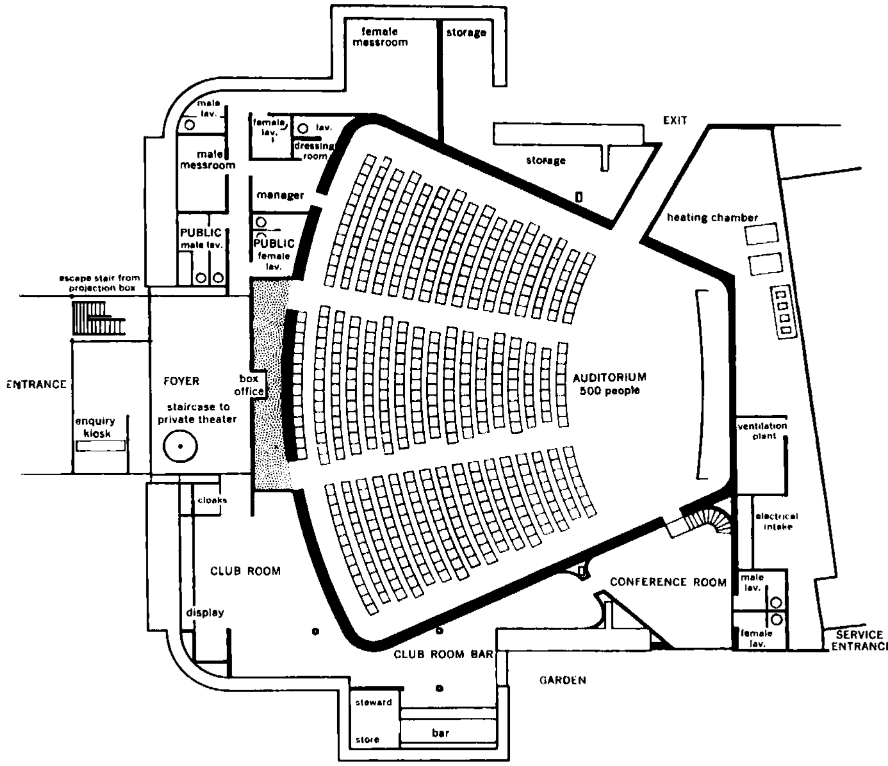

Fig. 4. The main floor plan.

Table I. Projection Data.

Aspect Ratio	Frames/ sec	System
	Main Theater, 35mm	
1.33:1	16*	—
1.33:1	20*	—
1.38:1	24	—
1.66:1	24	Wide Screen
1.75:1	24	Metroscope
1.85:1	24	VistaVision
	Anamorphic	
1.75:1	24	VistaVision
2.00:1	24	R.K.O. Scope
2.35:1	24	CinemaScope
2.55:1	24	CinemaScope
Three-dimensional projection		
Unmarried prints		
Sound System		
Optical track		
Magoptical		
Four-track magnetic stereophonic		
Single, double or treble magnetic tracks to CinemaScope track positions.		
	Main Theater, 16mm	
1.34:1	16*	—
1.34:1	24	—
	Anamorphic	
2.68:1	24	—
Sound System		
Optical track		
Half-stripe magoptical		
Full-stripe magnetic track		
Edge-stripe magnetic track		
	Preview Theater	
35mm as for main theater plus rear projection at 1.38:1 on one projector without stereophonic sound.		
16mm as for main theater plus recording facilities for all magnetic tracks.		

* Silent.

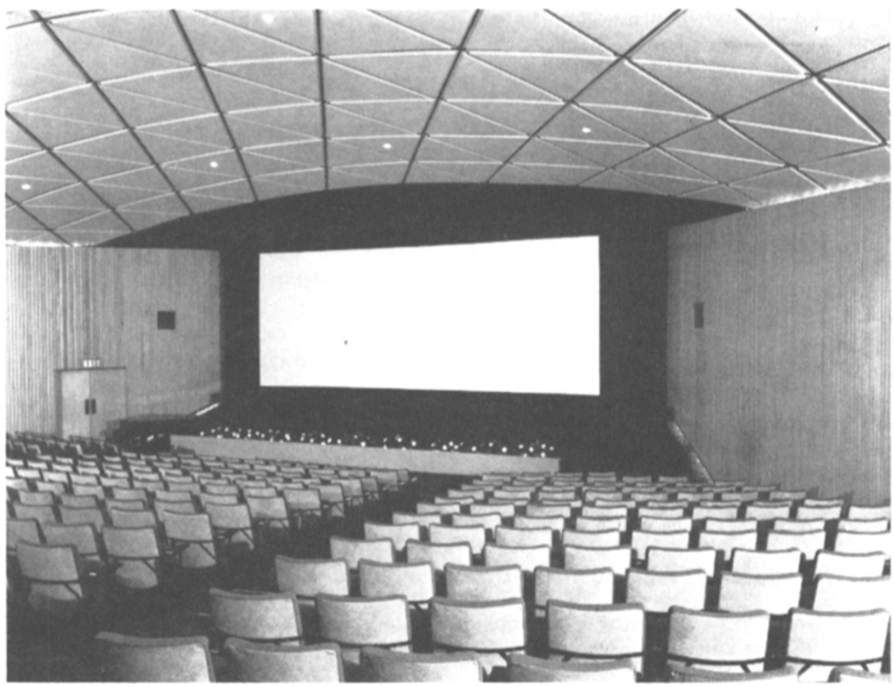

Fig. 5. View of screen in full CinemaScope size of 32 ft 6 in. by 12 ft 6 in. The decorative screen shutter is completely out of sight round the back of the screen frame.

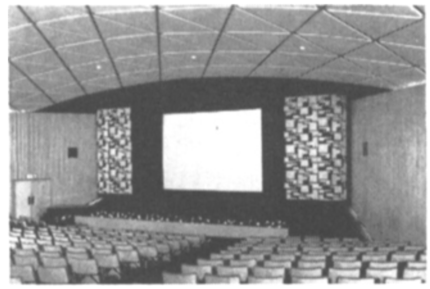

Fig. 6. Ordinary ratio screen with Monovistal decorative shutter forming a "setting" for a film.

system is Gaumont-Kalee "21" dual 30-w optical reproducer equipment with the addition of a four-track magnetic stereophonic system, with 10 auditorium-effects speakers and three main speakers behind the screen. Provision has been made for future installations of multi-magnetic/optical track follower heads and interlocks. The arc lamps are Gaumont-Kalee Presidents. The projectors are interlocked for projecting three-dimensional films and unmarried prints, and allowance has been made for future developments in new film presentations as far as is possible.

At the side of the 35mm machines are two G.B-Bell & Howell Model 609 arc 16mm projectors equipped to run at sound and silent speeds and either optical or magnetic track sound reproduction.

The preview theater is served by two Gaumont-Kalee "18" 35mm projectors and dual 18-w sound-film reproducer with Universal arcs; one machine is equipped for rear projection. To provide 16mm projection facilities, a single G.B-Bell & Howell Model 630 equipment specially adapted for long running with both optical and magnetic sound systems and recording facilities on magnetic track is installed.

In determining the position of the projection room, the length of throw and angle to the main screen were the main considerations in order to allow lenses of the most advantageous focal length, which falls within the range of focal lengths of backing lenses that will give the best coverage and sharp focus over the whole picture area. It is possible that some form of television projection may be required in the future.

The angle of projection is slightly negative so that there is no distortion of the projected picture.

Design Improvements in High-Wattage Tungsten Filament Lamps for Motion-Picture and Television Studios

By LEROY G. LEIGHTON and ALFRED MAKULEC

The development of a special-type collector grid for use in high-wattage incandescent lamps used for motion-picture studio lighting is discussed. The collector grid is designed to maintain the beam lumen output of such lamps at a high level until filament failure occurs. Causes and effects of lamp blackening are explained.

SPECIAL PROBLEMS relating to the needs of motion-picture and television studios have long been of interest to designers and manufacturers of tungsten filament lamps. Color film and wide-screen processes have created new requirements, and the advent of color television has resulted in increasingly complex lighting problems. The demands for large quantities of controllable light in compact and quiet packages have been met with a series of studio lamps of high wattage. At General Electric, more than 65% of the incandescent lamps of 2000 w or more are designed for studio lighting or related service.

Studio Performance Problems

Increased use of high-wattage lamps has brought about extensive research aimed at improving quality and performance. Recently, efforts have been directed toward two problems: (1) reducing bulb blackening, thereby improving the lamp beam lumen maintenance and reducing the tendency of bulbs to blister in service; and (2) lessening the amount of audible noise produced by studio lamps on a-c circuits.

Presented on December 10, 1957, at the Hollywood Section Meeting by Leroy G. Leighton and F. E. Carlson, Large Lamp Dept., General Electric Co., Nela Park, Cleveland 12, Ohio. (This paper was received on February 20, 1958.)

Lamps designed for spotlight service have high-wattage, concentrated filaments in relatively small bulbs. The studio lamps are much more heavily loaded than the lamps made for general lighting purposes. In addition, color film requirements demand high filament temperatures to produce light of satisfactory color characteristics. These design parameters tend to contribute to reduced lamp performance. First of all, the rate of evaporation of a tungsten filament increases greatly as its temperature rises. The high filament wattage results in a larger filament surface from which the tungsten evaporates, and this more rapidly evaporated tungsten is deposited on the bulb wall by the convection stream of the inert gas in the lamp. Bulb blistering and depreciation in beam candlepower are caused primarily by this black deposit. The relatively small bulb sizes required for studio lamps also contribute to poor beam maintenance, first, by the concentration of blackening on the bulb decreasing the amount of light reaching the lens and the mirror, and second, by the blackening absorbing radiation from the filament and causing the already very hot bulb to get even hotter.

When the bulb is in the base down position, the gas stream rises to the top of the bulb and deposits the blackening in a region where, because of the design of the filament, relatively little filament radiation impinges, but as the bulb is tilted, the gas stream still rises vertically and deposits tungsten in an area of greater filament irradiation; the spotlight reflector redirects the energy through the blackened zone. Thus, when a spotlight is aimed down at about 45°, the gas stream in the lamp carries the blackening to an area of the bulb where it obstructs light that would ordinarily contribute to the spotlight beam. As a result, beam lumens are decreased and the bulb temperature is increased.

This increase in bulb temperature due to blackening can, and frequently does, cause a vicious cycle to begin. It is characteristic of many glasses that they will give off small amounts of moisture when heated to high temperatures. When this moisture is released inside the bulb, a "water cycle" is started, causing a more rapid rate of blackening than would occur due to normal filament evaporation. This increased blackening absorbs more radiation, which in turn causes localized bulb temperatures to increase. Soon a point is reached at which part of the glass bulb becomes sufficiently plastic that the internal gas pressure blows a "blister" on the bulb. Spotlight lamp bulbs are heated to the highest practicable temperature during manufacture to remove much of the moisture from the glass. However, after blackening begins in confining spotlights, bulb temperatures may rise high enough to initiate the so-called "water cycle." This situation is at its worst in the 10,000-w lamp. Blistering is often so severe that the bulb glass may touch the spotlight reflector,