Drive-In Theater Screen Luminance

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In the decade since papers on drive-in theaters were first published in the *SMPTE Journal*, there have been many vital improvements in the relevant parameters for theaters, including screens, projection equipment, light sources, etc. This report indicates the extent and nature of those improvements. (See Proposed SMPTE Recommended Practice on Screen Luminance for Drive-In Theaters, RP 12, on page 768 of this issue.)

Screen Size

Screen sizes have been decreasing due to the currently popular concept of multiple screens on a single theater site. In the past, screens were consistently 110 × 55 ft; today, the majority of screens in multiple locations may be as small as 60 × 30 ft. There are, however, very large single-screen theaters with screens as large as 180 × 90 ft.

Screen Surfaces

Typical screen surfaces include materials such as gunite, plaster, flat-sheet steel, corrugated aluminum, plywood, masonite, and several extruded steel and aluminum patterns. These materials are either factory finished or job painted *in situ*. In areas with heavy rainfall, cement shingles are popular because they require no finishing.

The screen surface is generally repainted at three-to-five year periods by spraying or rolling on a heavily pigmented flat white acrylic paint. At shorter intervals, the surface is hosed down or washed — often with the assistance of the local fire department, which uses this as an exercise and training function. In areas experiencing high winds, especially inshore winds which are heavily salt-laden, washing is more frequent to minimize erosion of structural steel frames.

Screen Position

Viewing surfaces of screens are generally vertical, the ones which are tilted are forward 3 to 5° and are generally flat. Horizontally curved screens are on the decline in favor of flat screens with a matte finish that uniformly reflects projected light. The degree of tilt is determined by the direction of reflected light needed in particular viewing areas. The practice also tends to minimize drips and stains from rain.

Light Sources

In general, there is a trend toward conversion from carbon arcs to xenon lamp houses due to the escalation of kW hour rates, difficulty in obtaining carbons and spare parts for the lamp houses, and the increased degree of safety in the operation of xenon lamps.

Currently, theaters with screens up to 50 ft in width are equipped with 300 kW lamps; those with screens in excess of 50 ft use 4000 to 4500 kW lamps. Experience has shown that the average xenon bulb life expectancy, with a normal use of six hours nightly, has increased to 800–1000 hours before replacement is required.

General Projection Practices

Projection distances vary from 300 to 1100 ft, giving luminance readings from 8 fL (27.4 cd/m^2) under optimum conditions to 3 to 5 fL (10.3 to 17.1 cd/m^2) with less than ten percent fall-off at the corners.

The 16- and 18-in concave glass mirrors used for so many years are being replaced by dichloric "cold" mirrors having complicated ogive curvatures which provide maximum color control and truer skin-tone reproduction.

In the average Australian drive-in theater, we might find the following:

Screen width: 25 to 30 m (approximately 80–100 ft).

Screen aspect ratio: Between 2:1 and 2.4:1.

Surface material: (a) Fibrous (asbestos) cement flat sheets painted matte white. (b) Zinc annealed steel, corrugated-sheeting painted matte white, or flat sheeting painted stipple matte white to eliminate glare from wet screen surfaces.

Projector: Century DA, Cinemeccanica Vic. 8, Toshiba TP 10, Philips DP 70 and DP 75, Gaumont Kalee 21.

Arclamp: Xenon — Strong X60, Eprad, Xebex. Most use 4 kW bulbs except a few Strong (4.5 kW) and Xebex (5 kW).

Carbon — Ashcraft Super-Corelite, Cinemeccanica Super Zenith 450, and a few assorted 16-in Japanese and Australian arclamps.

Arclamp carbons: Smallest 10-mm C.C. nonrotating positive at 100 A; largest 13.6-mm black rotating positive; most at 160A, a few at 180 A.

Lens: All in *f*1.6 to *f*2.0 range of the most popular makes. Screen results (measured) highest reading any format:

Best	22 cd/m^2
Average xenon	17 cd/m^2
Average carbon	14 cd/m^2
Lowest acceptable	9 cd/m^2
Below average	5 cd/m^2

General Observations

Some American and Australian theaters also suffer from minimum maintenance. Spare-part replacements because of wear, accident, obsolescence, or age are ordered too late. Lenses are allowed to discolor resulting in loss of light. Maintenance of screen surfaces is far too often relegated to the lowest priority. In many cases, projector ports are plain plate glass and are allowed to become streaked and scratched, which results in light loss.

Ambient light is a serious problem in most drive-in theaters. Even with perimeter fences, light outside the theater and the driveway competes to some degree with the light on the screen. Car lights, even though they are dimmed and aimed away from the screen, throw enough spill light onto the screen to affect the contrast and color of the projected image.

Ultimate quality of the screen presentation depends upon the ability and constructive attitude of key personnel — theater owner, projectionist, and manager. It is well known that apathy by those responsible is devastating to the satisfaction of the ticket-buying customer.

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