

REPORT OF THE THEATER ENGINEERING COMMITTEE*

In the Report of this Committee, presented at the Hollywood Convention last October, and published in the December, 1940, issue of the JOURNAL, the growth of the Society's activities in the various phases of theater engineering was described. It was pointed out also that many phases of theater design, particularly from the projection viewpoint, had been considered by the Committee and had resulted in a number of recommended practices and procedures in general acceptance by the industry. Nevertheless, there were other phases that had not yet received adequate consideration—these phases referring more particularly to the theater structure rather than to the process of projection.

Accordingly, by action of the Board of Governors, on July 13, 1939, what was formerly known as the Projection Practice Committee was dissolved, and a new Committee was established, known as the Theater Engineering Committee. This new Committee originally functioned primarily through two sub-committees, namely, the Sub-Committee on Projection Practice and the Sub-Committee on Theater Design.

For a long time, the original Projection Practice Committee had been studying the question of picture brightness and its measurement. Some years ago, another Committee of the Society, known as the Screen Brightness Committee, had done considerable work on this subject and had published a noteworthy report and accompanying symposium on various features of screen brightness in the May and August, 1936, issues of the JOURNAL. With the publication of this material, the Screen Brightness Committee became relatively inactive since the information then at their command did not permit further constructive analysis.

In the interim, the study was continued to some extent by the then existing Projection Practice Committee, and during the past year it became increasingly evident that further active work could be done on the subject. Accordingly, it was decided to establish a third sub-committee of the Theater Engineering Committee, to be known as

* Presented at the 1941 Spring Meeting at Rochester, N. Y.; received May 1, 1941.

the Sub-Committee on Screen Brightness, which was to include in its scope, not only the actual specifications of screen brightness in theaters, but also the problem of devising appropriate means of measuring screen illumination and brightness, and of discovering or devising suitable meters for the purpose. Since this new sub-committee has been functioning only a short time, its work has not progressed to the point at which it can make definite recommendations to the industry. However, some progress has been made during the past few months, and the Theater Engineering Committee is pleased to include in this report the first report of the new Sub-Committee on Screen Brightness.

The personnel of the Theater Engineering Committee, sub-divided into its three sub-committees is given below. Each sub-committee also has its subordinate working committees.

THEATER ENGINEERING COMMITTEE

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H. E. WHITE
A. T. WILLIAMS

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Screen Brightness Sub-Committee

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PROJECTION PRACTICE SUB-COMMITTEE

Much of the work undertaken by the Sub-Committee on projection practice is at the present time incomplete, so that definite reports are not appropriate at this time. Work is continuing on the fourth revision of the Projection Room Plans, and it is hoped that a new report on this subject may be available in the near future.

Tools, Tolerances, and Safety Factors.—The Working Committee on Tools, Tolerances, and Safety Factors has held a number of meetings and has made a number of tests on projection equipment.

The purpose of the Committee is to conduct a study of the motion picture projector mechanism from the servicing and operating viewpoint, and to determine the degree of wear at various points that may be tolerated with safety, and to find or devise tools or gauges that may assist the projectionist in checking the degree of wear, and the corresponding departure of the mechanism from suitable operating conditions. Several meetings of the Working Committee have been held and a number of tests have been conducted on projection equipment to determine the relation between the pressure of the film shoe and the spacing between the shoe and the surface of the film-gate. This relation has been found to be linear, being approximately 0.0005 inch per gram of pressure. Slight variations in the positions of the gates apparently make little noticeable difference in the picture jump. However, it is the intention to check this matter more accurately and to determine the minimum pressure required for steady operation. In addition, further tests will be made to determine the relation between shoe pressure and wear on the film perforations, and the relation between the shoe pressure and the wearing of the sprocket-teeth.

This report should be regarded as preliminary, and it is hoped that a comprehensive report will be available at the next Convention.

Sub-Committee on the Power Survey.—In the last report of the Theater Engineering Committee was included a preliminary report of the Working Committee on the Power Survey, in which it was pointed out that numerous data had been accumulated through questionnaires distributed among 1600 theaters of the country. The purpose of these questionnaires was to secure a cross-section of data in relation to (1) the trend in current consumption for the various electrical units used in theaters throughout the country, (2) the total cost of electrical current, (3) energy consumption charges, and (4) the average proportions of power used for projection, air condi-

tioning, lighting, *etc.* The previous report included a brief table of data pertaining to these factors. Insufficient time has been available to complete the tabulation, and it is hoped that a complete report will be available by the Fall of this year.

Carbon Arc Terminology.—It had been noted that some confusion existed in the motion picture industry with regard to the terms applied to various types of arc. In particular, specific definitions of the terms “high intensity” and “low intensity” were not available. The Projection Practice Committee, therefore, submits the following definitions of these terms:

The fundamental distinction between the high intensity and low intensity carbon arcs is based upon the origin and character of radiation. The chief contributing factors and associated characteristics are composition of the carbons, current density, and brilliancy.

Low Intensity

The *low intensity* carbon arc is one in which the principal light source is incandescent solid carbon at or near its temperature of volatilization. In the case of the direct current low intensity arc, as used for projection, this is the crater face of the positive carbon. The maximum brilliancy of this crater face is limited by the vaporizing temperature of carbon to a value of about 175 candles per square millimeter. This crater brilliancy varies but little with changes in current within the usual operating range, but the crater area increases considerably with increasing current. Current density in the positive carbon for the familiar commercial lamps ranges from approximately 50 to 200 amperes per square inch.

High Intensity

The *high intensity* carbon arc, as used for projection, is one in which, in addition to the light from the incandescent crater surface, there is a significant amount of light originating in the gaseous region immediately in front of the carbon in an atmosphere containing flame materials (materials which become highly luminescent when volatilized in the arc stream). In the case of the direct current high intensity arc this light comes from within and near the crater of the positive carbon. The maximum brilliancy of the crater obtained in various types of direct current high intensity carbon arcs used in common commercial lamps ranges from 350 to 1200 candles per square

millimeter with current densities in the positive carbon ranging from about 400 to well over 1000 amperes per square inch. Increase of current increases the crater area only slightly, but produces marked increase in brilliancy.

Symposium on Projection Practice.—One of the aims of the Projection Practice Sub-Committee is to make available to the projectionists of the country technical data in such form as it may be easily applied in practice. With this thought in mind the Committee has formulated a brief symposium on projection practice for presentation at this Convention. Following the presentation of this Report of the Theater Engineering Committee, there will be four papers prepared by members of the Projection Practice Committee dealing with "Projection Room Equipment Requirements," "The Projection Room—Its Location and Its Contents," "Factors Affecting Sound Quality," "Factors to Be Considered in a Sound Screen."

REPORT OF THE THEATER DESIGN SUB-COMMITTEE

The Glossary compiled by this Sub-Committee is intended for use for all those interested in motion picture theater design. The Glossary will be submitted to the SMPE Standards Committee for possible inclusion in the General Glossary of Motion Picture Terms, which is under preparation by them, and will be called to the attention of other interested organizations or groups, including the American Institute of Architects and various architectural periodicals and trade papers.

One of the chief benefits which it is hoped will be derived from this work will be to help in the writing of a uniform Code, which will govern the functional design of motion picture theaters. The present non-uniformity and confusion which exist in the large number of Building Codes both as to legal requirements and terminology has been brought to the attention of this committee through the study of a large number of existing Building Codes throughout the United States.

It is realized that it would be an almost impossible task to bring about a major change in the existing codes, particularly as regards uniformity. However, it is felt that this Committee can start with an attempt at standardization of terminology and the fixing of uniform viewing and hearing requirements in auditoriums. This would enable such authorities as are contemplating changes in existing Codes or writing new Codes for motion picture theater construction

to be guided by the important visual and auditorium requirements in the theater.

In addition to the Glossary, the Committee is first giving consideration to the lighting of theater auditoriums. It is recommended that the wall and ceiling surfaces within the spectators' field of vision, while viewing the picture, should appear to the spectator as a uniformly and uninterruptedly illuminated surface. Anything in the lighting that would tend to distract the viewer's attention from the screen picture should be avoided if possible. It is very important for best results in the projection of colored pictures that the color of the lighting and wall surfaces be neutral. No departure from uniformity should be made unless the changes of intensity are gradual.

The Committee is not prepared to specify actual values of illumination but does stress, for the time being, uniformity of illumination and the elimination of isolated islands of light in dark surroundings or dark voids in areas of light.

This recommendation very definitely affects the style of architectural ornamentation and the design of the auditorium interior. The surfaces employed must be of such texture and color over large areas

as will make possible this uniform illumination. Ornamental projections or cavities which cast shadows, and painted decorations in various colors and intensities are objectionable. The fact must not be overlooked that the motion picture screen is a source of light and may cause undesirable and objectionable illumination of auditorium surfaces or ornaments if the latter are improperly designed.

In connection with illumination, it is important that the arrangement of walls and doors of the outside lobby, the main lobby, the foyer, and so forth, be so arranged as to entrap the light coming from the street. If the line of traffic from the street to the auditorium is straight, this problem is difficult to solve unless extra sets of doors are used at intervals to block the light. A more efficient method of an intimate form can be successfully evolved by so arranging doors and

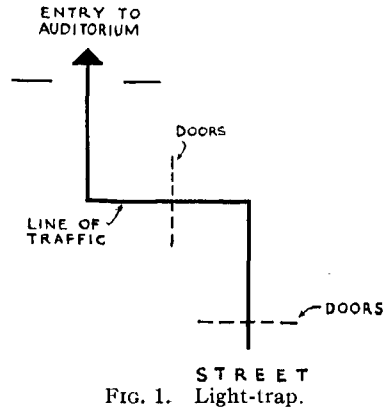


FIG. 1. Light-trap.

walls that the line of traffic follows a zee shape (Fig. 1). This is helpful also in eliminating objectionable drafts and in reducing the infiltration of street noises.

Glossary of Terms Used in Theater Design

Aisle.—A passageway in a seating area.

Center aisle.—An aisle on the longitudinal axis of the theater.

Wall aisle.—An aisle along one of the side walls of a theater.

Intermediate aisle.—Any longitudinal aisle that is not a center aisle or wall aisle.

Cross-over.—A transverse aisle.

Balcony.—An area of seats, part, or all of which overhangs another seating area.

Orchestra Floor.—The lowest seating area of a theater.

Stadium.—An area of seats higher than and to the rear of the standee rail or partition, accessible directly from the standee space.

Stepped Platform Seating.—Stepped platforms, one above the other upon which seats are placed. The amount of rise from one platform to another being determined by the sight clearance factor.

Uniformly Pitched Auditorium Floor.—A floor having an equal rise or fall for each row of seats.

Variably Pitched Auditorium Floor.—A floor incline having a changing pitch for every row, or groups of rows of seats to obtain proper sight clearance.

Auditorium Bowl Floor.—A floor incline for curved rows of seating in which the change of pitch takes place by keeping all of the seats of each respective row on one level.

Concentric Arcuated Seating Rows.—Seats placed in curved rows, the radii of which increase for each row, placed farther from the auditorium front wall.

Down Pitch Auditorium Floor.—A floor which pitches in part or whole downward toward the auditorium front wall to provide sight line clearances.

Reverse Pitch Auditorium Floor.—A floor which pitches upward in part or whole toward the auditorium front wall to provide raised seating levels located near to a motion picture screen to bring these seating levels as close to the screen level as possible.

Combination Pitch Auditorium Floor.—A floor which pitches downward toward and then upward toward the front wall of the auditorium.

Auditorium Lighting.—Any auditorium lighting in use when the motion picture show is not in progress.

Projection Period Lighting.—Any lighting of the auditorium that may be necessary or desirable during the projection of the motion picture.

Transition Lighting.—The gradation of illumination from outdoors to the auditorium.

Light Trap.—An arrangement of wall and doors designed to exclude undesired light from the auditorium.

Re-reflected Screen Light.—Light reflected from the screen and re-reflected from any other surface in the auditorium.

Atmospheric Light Reflection.—Reflection of light by particles in the atmosphere of the auditorium.

- Auditorium.*—The space in a theater from any point of which the performance may be viewed.
- Standee Partition (or Rail).*—A partition (or rail) separating a last row of seats from a cross-over.
- Standee Space.*—A space in a theater in which patrons are permitted by law to stand and view the performance.
- Lobby.*—The space between the first and second sets of doors of a theater.
- Foyer.*—A gathering place between the auditorium and the lobby.
- Outside Lobby.*—A partially enclosed space in front of the first set of entrance doors. (Sometimes called "Vestibule.")
- Soffit.*—Generally used to refer to the ceiling under the balcony.
- Right Side (of auditorium).*—The right-hand side, looking toward the screen.
- Left Side (of auditorium).*—The left-hand side, looking toward the screen.
- Mezzanine.*—An intermediate level between seating levels.
- Auditorium Front Wall.*—False wall or structural wall at the front of the auditorium on the audience side of the screen.
- Exit Court.*—A space for egress open to the sky.
- Exit Passage.*—A space for egress entirely enclosed.
- Auditorium Rear Wall.*—The wall at the opposite end of the auditorium from the screen.
- Auditorium Side Walls.*—Walls other than the front or rear walls of the auditorium.
- Proscenium Opening.*—The opening in the auditorium front wall through which the screen is viewed.
- Rear Screen Space.*—The space on the side of the screen away from the audience.
- Traffic Control.*—Physical or suggestive. Any device (architectural lighting or decoration, signs, door controls, barriers, *etc.*) used to control the direction of the passage of people in the public spaces of the theater structure.
- Vomitory.*—A walled in passage used for circulation to seating areas usually cut through a raised inclined seating level.
- Balcony or Stadium Fascia.*—The surface facing the motion picture screen which forms part of the protective wall and rail in front of a balcony or stadium.

REPORT OF SUB-COMMITTEE ON SCREEN BRIGHTNESS

The recently appointed Sub-Committee on Screen Brightness has held its first meeting.

Reflection characteristics of the usual screen materials and their response under given conditions are for the most part appreciated only in a general way, or take on only academic significance. Most people, who have to do with the specification of screens and projectors and the other factors of theater design and operation which affect the basic fundamentals of motion picture exhibition, have lacked the means to acquaint themselves with the values of brightness actually experienced by the audience. An appropriate correlation of the

physical factors with the physiological and psychological elements involved has therefore been difficult.

It is axiomatic that progress on a technical problem is limited until one can deal with it quantitatively and do so conveniently. The first objective of the Sub-Committee, therefore, is to develop measurement procedures and facilities of such low cost and convenience that, on the one hand, specialists will be encouraged to amplify the information they now have, and on the other, that knowledge and experience of these matters may be widely diffused among those who control the conditions under which pictures are viewed.

Brightness meters presently available have limitations as to cost or convenience in use by others than specialists. Accordingly, as its first step, the Sub-Committee has formulated provisional specifications for instruments which would facilitate attainment of its objective, and is placing these before instrument manufacturers to determine the feasibility of having them made available.