LBL-18683
UC-95c

AN EXPERIMENTAL METHODOLOGY FOR DETERMINING THE SYSTEM PERFORMANCE OF FLUORESCENT LAMP, BALLAST, FIXTURE COMBINATIONS OPERATING UNDER REALISTIC APPLICATION CONDITIONS

M.J. Siminovitch, F.M. Rubinstein, and
R.R. Verderber

November 1984

Prepared for the U.S. Department of Energy under Contract DE-AC03-76SF00098

LBL-18683
EEB-L 84-14
L-96

AN EXPERIMENTAL METHODOLOGY FOR DETERMINING THE SYSTEM PERFORMANCE OF FLUORESCENT LAMP, BALLAST, FIXTURE COMBINATIONS OPERATING UNDER REALISTIC APPLICATION CONDITIONS

M. J. Siminovitch, F. M. Rubinstein, and R. R. Verderber

Lighting Systems Research Group
Lawrence Berkeley Laboratory
University of California
Berkeley CA 94720

November 1984

Objective

Designers who wish to compare and select lighting systems and to design lighting layouts that meet both illuminance and energy code requirements require accurate data documenting the combined performance capabilities of fluorescent lamp, ballast, and fixture systems operating under realistic application conditions. These application conditions may differ significantly from the standard ANSI conditions under which routine photometric tests are performed, introducing temperature-dependent errors into the lighting design calculation procedure.

To meet the need for accurate performance data, we plan to develop and demonstrate an experimental method for determining the performance of lamp, ballast, and luminaire combinations operating under a broad range of realistic conditions.

Methodology

The methodology employs a two-part experimental procedure. The first part uses a temperature-controlled luminous flux integrator to characterize the thermal performance of each lamp/ballast combination. This performance characterization is expressed in terms of light output and efficacy as a function of variations in minimum lamp wall temperature (MLWT) and is generated for the range of temperatures typically encountered in interior lighting applications.

The second procedure uses a luminaire/plenum simulator to determine the specific MLWT that exists in a particular luminaire application as a function of luminaire type, mounting configuration, plenum integration, and room air temperature. The MLWTs thus measured may be used in conjunction with the lamp/ballast performance data to determine application-specific values of light output and efficacy for a given lamp/ballast/luminaire system.

Experimental Apparatus

Two instruments have been developed for this research:

1. Temperature-controlled luminuous flux integrator.

2. Luminaire/plenum simulator.

The temperature-controlled luminous flux integrator, with associated support equipment, fulfills two major functions:

- It permits the ambient air temperature surrounding the lamps to be carefully monitored and controlled between 10 and 60°C, the range of most interior lighting applications.

- It permits the precise measurement of luminous output, system power, and minimum lamp wall temperature.

Figure 2 shows a cross section of the temperature-controlled integrating chamber, indicating the relative scale and position of major components.

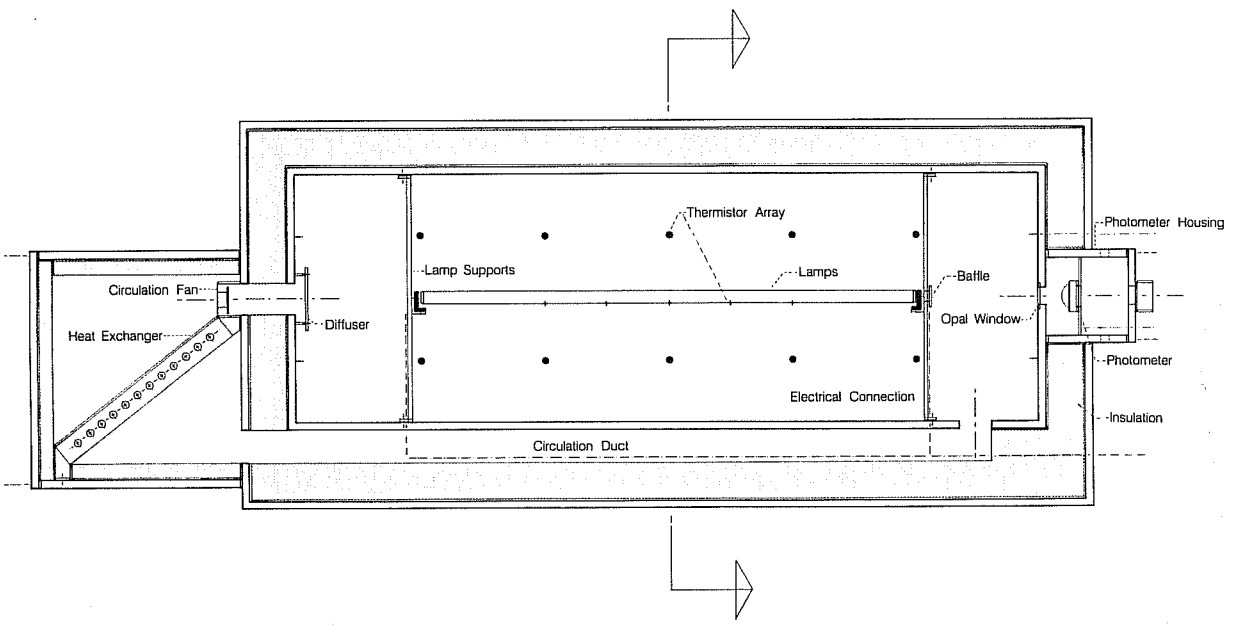

Figure 2

The luminaire/plenum simulator, with associated support equipment, fulfills the following functions:

- It permits the simulation and testing of a wide range of application conditions as a function of luminaire type, mounting configuration, air flow technique, and room air temperature.

- It permits precise measurement of MLWT for each application condition tested.

Figure 3 shows a cross section through the luminaire/plenum simulator, indicating scale and the principal components.

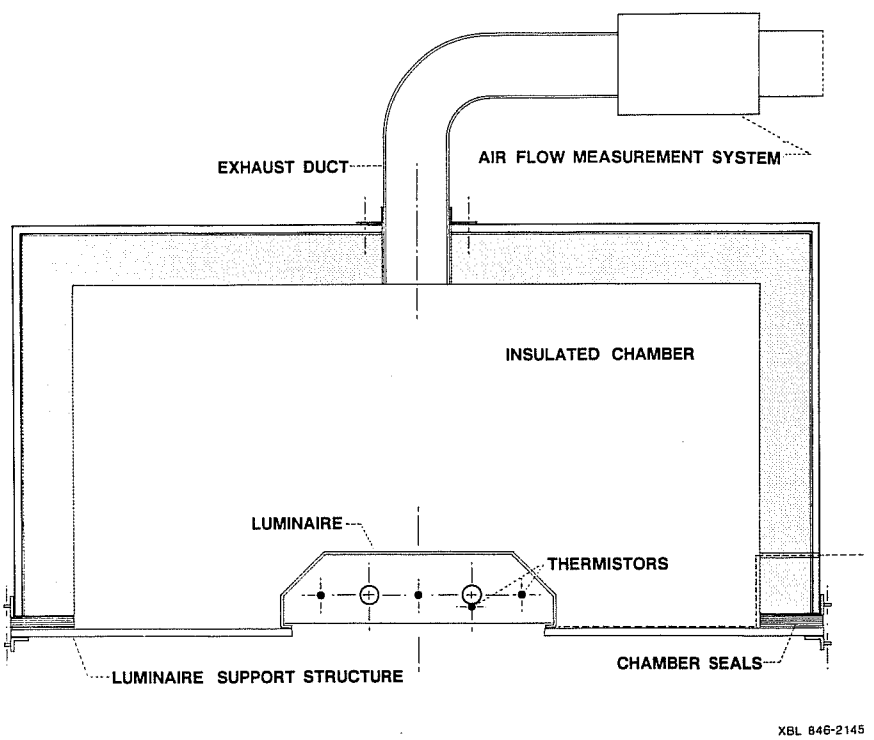

Figure 3