

PACKAGE ID - 000824IBMPC00 SUPERLITE2.0

KWIC TITLE - Daylighting and Electric Lighting Analysis for
Complex Spaces

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LIMITATION CODE -COPY **AUDIENCE CODE** - LIM

COMPLETION DATE - 03/01/1995 **PUBLICATION DATE** - 03/01/1995

DESCRIPTION - SUPERLITE is a powerful lighting analysis program designed to accurately predict interior illuminance in complex building spaces due to daylight and electric lighting systems. The program enables users to model interior daylight levels for any sun and sky condition in spaces having windows, skylights or other standard fenestration systems. SUPERLITE Version 2.0 includes the capability to calculate electric lighting levels in addition to the daylighting prediction, allowing lighting performance simulation for integrated lighting systems. The program calculates lighting levels on all interior surfaces, as well as on planes that can be arbitrarily positioned to represent work surfaces or other locations of interest. SUPERLITE is intended to be used by researchers and lighting designers who require detailed analysis of the illuminance distribution in architecturally complex spaces.

PACKAGE CONTENTS - Media Directory; Software Abstract; User's Manual; Media Includes User Guide, Executable Module, Sample Problem Input and Output Data, Sample System Configuration Files;

SOURCE CODE INCLUDED? - No

MEDIA QUANTITY - 1 3.5 Diskette

METHOD OF SOLUTION - The daylight illuminance on an arbitrary work surface inside a room depends on three quantities: the direct illumination from the sky and sun, illuminance from external reflections, and illuminance from internal reflections. SUPERLITE uses three dimensional modeling of trapezoidal surfaces to describe a room and its external obstructions. Visual obstructions between interior surfaces are determined using a Monte Carlo method. Sky and sun luminance distributions are calculated using standard CIE

PACKAGE ID - 000824IBMPC00 SUPERLITE2.0

METHOD OF SOLUTION - (CONT) (Commission Internationale de l'Eclairage) formulae. Light exchange factors between large external surfaces and the sky are estimated by the Monte Carlo method. Numerical integration is then used to determine the luminance of all exterior surfaces. Interior surfaces are divided into a grid of subsurfaces represented by nodal points. The luminance of each of these nodes is determined by integrating the contributions from sky, sun, ground and external obstructions and attenuated by window transmittances. The illuminances of interior surfaces and work surfaces are then determined using the radiosity method of calculating interreflected light levels within a space. Initial luminance contributions at each interior node, from electric lighting sources, is determined from the input candlepower distribution for the light source is then calculated using the same radiosity method used for daylight.

COMPUTER - IBM PC

OPERATING SYSTEMS - Microsoft DOS operating system and its derivatives.

PROGRAMMING LANGUAGES - FORTRAN 5.1

SOFTWARE LIMITATIONS - SUPERLITE is limited by the following features: all surface reflection of light is assumed to be perfectly diffuse, input and output are accomplished only through ASCII text files, complex fenestration systems such as venetian blinds and specularly reflecting light shelves cannot be modeled, and the maximum number of surfaces (30), windows (5), and nodes per surface (200) can be restrictive for some complex spaces. The program currently uses only the standard 640K of RAM and since the executable is fairly large this limitation can also be restrictive.

SOURCE CODE AVAILABLE (Y/N) - N

UNIQUE FEATURES - SUPERLITE is distinguished by the following features: geometrically complex spaces can be modeled using trapezoidal surfaces, windows, interior partitions and external obstructions; window glazing can be clear or diffusing glass or clear glass with a diffusing sheer curtain; daylight calculations can be performed for a variety of sky conditions, for a given sun position or geographic location, or for user defined exterior irradiance data; illuminance data are calculated for nodal points on user positioned planes; and electric lighting fixture data is flexibly entered as candlepower distribution files that are external to the program.

RELATED SOFTWARE - SUPERLITE is primarily used as a stand alone software package. However, its calculation engine has been integrated into a software package developed by the International Energy (IEA) called ADELIN which links 3-D solid modeling software to SUPERLITE and RADIANCE (a ray-tracing software package also developed by LBL).

PACKAGE ID - 000824IBMPC00 SUPERLITE2.0

RELATED SOFTWARE - (CONT)

OTHER PROG/OPER SYS INFO - SUPERLITE requires the use of a text editing program capable of saving files to disk in standard ASCII format (generally, any word processor has this capability). The User's Manual documentation that is included on the distribution diskette requires Microsoft Word for Windows 2.0 (or later) for viewing and/or printing.

HARDWARE REQS - SUPERLITE requires MS-DOS version 3.1 or higher. The program runs only within the standard 640K RAM. It is highly recommended that the program be run on a computer with an Intel compatible math coprocessor.

TIME REQUIREMENTS - The runtime for SUPERLITE varies significantly depending on the complexity of the space geometry, the number of nodes defined for each surface and the number of windows in the model. The program can also be run for a single time and sun position or for all sunlight hours for each month of the year. A single time and sun position for a simple room (6 surfaces) with one window and one electric luminaire group will execute in under 15 seconds on a 486DX/66MHz computer.

REFERENCES - User's Manual on Media.

ABSTRACT STATUS - Submitted 4/12/95. Released screened 6/7/95. Program completed without errors.

SUBJECT CLASS CODE - T

KEYWORDS -

COMPUTER PROGRAM DOCUMENTATION
S CODES
LIGHTING SYSTEMS
DAYLIGHTING
ILLUMINANCE
BUILDINGS
DATA ANALYSIS

EDB SUBJECT CATEGORIES -

990200 320107

SPONSOR - DOE/CE

PACKAGE TYPE - SCREENED