

PACKAGE ID - 000761IBMPC00 SOLAR5

KWIC TITLE - Passive Energy Building Design Tool

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LIMITATION CODE -UNL **AUDIENCE CODE** - UNL

COMPLETION DATE - 04/01/1988 **PUBLICATION DATE** - 03/13/1984

DESCRIPTION - SOLAR5 is a computer aided design tool to help architects design better, more energy efficient buildings. It is intended for use at the beginning of the design process. To get started, only four pieces of information are necessary to compute the energy needed: the square footage, the number of stories, the kind of building (such as school, home, hotel, or any one of 20 types), and its location (the program stores the temperature ranges for forty major cities). Additional information may be given later to fine tune the design. An expert system using heuristics from a wide range of sources, automatically creates a passive solar baseline building from the four facts specified for that project. By modifying and adapting prior designs the user can create and work upon as many as nine schemes simultaneously. SOLAR5 can analyze the buildings thermal performance for each hour of each month and plot its total heat gain or loss as a three-dimensional surface. After reading the plot, the user can immediately redesign the building and rerun the analysis. Separate heat gain/loss surfaces can be plotted for each of the different parts of the building or schemes that add together to make up the total, including walls, roof, windows, skylights, floor, slab on grade, people, lights, equipment, and infiltration. Two different schemes can be instantly compared by asking for a three-dimensional plot showing only the difference in their performances. The objective of SOLAR5 is to allow the designer to make changes easily and quickly with detailed instantaneous pictorial feedback of the implications of the change.

PACKAGE CONTENTS - NESC Note 88-52; Software Abstract; User's Manual;
Media Includes Source Code, Executable, Machine Readable
Documentation, HELP Files, Control Information;

SOURCE CODE INCLUDED? - Yes

MEDIA QUANTITY - 5 5.25 Diskettes

METHOD OF SOLUTION - The standard method for calculating the building's heating load assumes that outdoor temperature remains constant at the design winter low at night with no occupants, no interior loads, and no solar radiation gains. It further assumes steady-state conditions which means that any thermal mass in the buildings envelope or interior no longer plays a role. The total heat loss is the sum of the heat loss of each component of the

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METHOD OF SOLUTION - (CONT) envelope plus the sensible heat loss due to ventilation and infiltration. Latent losses are small enough to be ignored. The dynamic instantaneous heat loss or gain is calculated hour-by-hour inside the building envelope using a modification of the steady-state equations. The Sol-Air temperature is used to summarize the surface temperature of the opaque sections of the building envelope. The direct surface radiation falling on the glass is reduced by the geometric shading ratio of fins and overhangs. Hourly temperatures are simulated by constructing a sine wave from the daily low temperature, which is assumed to occur one hour before sunrise, to the daily high temperature, which is assumed to occur between 1 p.m. on the winter solstice and 3 p.m. on the summer solstice.

COMPUTER - IBM PC

OPERATING SYSTEMS - PC-DOS

PROGRAMMING LANGUAGES - Ryan-McFarland FORTRAN

SOFTWARE LIMITATIONS - Maxima of 10,000,000 square feet total floor area, 100,000 occupants, 40,000 heating degree days, 200 stories, 40 city climate data locations, 20 building types, 16 total loads components, 9 different schemes can be combined into one design. SOLAR5 is currently set up to analyze locations in the northern hemisphere only. At present, buildings with courtyards, i.e. U or O shaped, must be cut into separate L shaped buildings with null walls where they join to be handled by SOLAR5.

SOURCE CODE AVAILABLE (Y/N) - Y

UNIQUE FEATURES - SOLAR5 contains a built-in demonstration tutorial, which shows the user how to interpret SOLAR5's graphic output. HELP screens are also available to define terms and explain instructions.

OTHER PROG/OPER SYS INFO - SOLAR5 uses the FORTPAK/FORLIB PLUS graphic package to generate graphical output. Directives are included to overlay SOLAR5 with the Phoenix Software Associates' PLINK86-Plus linkage editor.

HARDWARE REQS - SOLAR5 requires an IBM PC, XT, or AT with at least 320 Kbytes of memory, a standard IBM graphics display, and a math coprocessor.

REFERENCES - M. Milne, SOLAR-5 User's Manual, A Friendly Computer-Aided Passive Solar Design Tool, UCLA Graduate School of Architecture and Urban Planning, March 1984.

ABSTRACT STATUS - Released AS-IS January 10, 1995.

SUBJECT CLASS CODE - T

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KEYWORDS -

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ENERGY EFFICIENCY
BUILDINGS
ENERGY AUDITS
SOLAR ARCHITECTURE
COMPUTER-AIDED DESIGN
ARCHITECTS
HEAT GAIN
HEAT LOSSES
PERSONAL COMPUTERS
COMPUTER PROGRAM DOCUMENTATION

EDB SUBJECT CATEGORIES -

990200 320100

SPONSOR - DOE/ER

PACKAGE TYPE - AS - IS