

DOE-2 USER NEWS

A COMPUTER PROGRAM FOR BUILDING ENERGY USE ANALYSIS

PUB-439

Vol. 6 No. 2

SUMMER 1985

Building Energy Simulation Group
Applied Science Division
Building 90, Room 3147
Telephone: (415) 486-5711
FTS: 451-5711

Table of Contents

Bugs Discovered and Interim Solutions	2
Among the Honolulu Papers	3
Five-Year Index to the Newsletter	4

BULLETIN BOARD

Item: The DOE-2.1C version of the program is now available. Please call or write to us at LBL for details on obtaining the new program. Articles describing the new features have appeared in the last 4 issues of the User News. Check the newsletter index in this issue for individual topics.

Item: The new DOE-2.1C documentation update package consists of a revised *DOE-2 Supplement* incorporating material for both 2.1B and 2.1C, a new *BDL Summary*, which now includes a listing of the Materials Library for easy reference and, for the first time since the basic 2.1 manual set in 1980, an updated and improved *Sample Run Book* (see the article in the next column).

Copies of the documents may be obtained from the National Technical Information Service, U.S. Department of Commerce, Springfield, VA 22161. (703) 487-4650, order numbers DE85012580, -81, and -82, respectively.

Item: A Cross Index by Abbreviation of all commands and keywords in DOE-2 has recently been developed by this office. It is designed to facilitate the job of reading input created by those who make extensive use of the abbreviations supplied by BDL. We will begin publishing this index, in installments, in upcoming issues of the newsletter. Anyone in immediate need of a copy of the complete index may write or call us at the above address and we will mail you one.

DOE-2.1C SAMPLE RUN BOOK

The *Sample Run Book* serves multiple purposes and should be of use to beginning as well as experienced DOE-2 users. First, the sample inputs and corresponding outputs act as a check set which are used to compare results on the user's computer system against the results from the system on which the program was initially developed. The second purpose is instructional: a) the user is led through a series of typical simulations which illustrate the capabilities of the program, b) various input styles are displayed, including the use of defaults and abbreviations, free formatting of input, nesting of sub-command keywords within the command itself, and c) it acts as a vehicle to demonstrate the relationships between the inputs to LOADS-SYSTEMS-PLANT-ECONOMICS, for instance, the effect of peak shaving on operating costs for a time-of-day electric rate structure.

The new volume contains upgrades of the original Simple Structure runs, the 31-Story Office Building, the Medical Building, and the Residential Example. In addition, it includes the Daylighting Example and a Residence with an Attached Sunspace. Each sample run is preceded by a sketch of the building showing the zoning used in the input and the general appearance of the building. Descriptive material has been imbedded as comments in the input itself. All of the major new features since 2.1 are demonstrated, and an index has been included to easily locate them. Among the examples that illustrate special features or those requiring complex inputs are:

- Parametric input
- Sunspaces
- Daylighting
- Overhangs and fins
- Hourly reports
- Three-dimensional building geometry
- Altering DOE-2 code (functional values)
- Powered induction units
- Chilled water storage
- Peak shaving electric demand
- Sell-back to utility
- Electric utility rates; seasonal, time-of-day demand ratchets

BUGS DISCOVERED IN DOE-2.1C AND INTERIM SOLUTIONS

The following is a list of bugs discovered to date in the new version of the program. We encourage users to document suspected bugs, and report them to their computer service bureau, or to us.

NOTE: These bugs exist *only* in copies of DOE-2.1C distributed before July 1, 1985. If your installation received the tape prior to that date, please drop us a line and we will send you a paper copy of the modifications needed to correct these bugs.

CLASSIFIED INDEX

Daylighting: 3, 6	Shade management: 2
Heatpumps: 10	SS-H Report: 10
Hourly Reports: 1	Subroutine SSFCOR: 9
INTERIOR-WALL: 7, 8	Sunspaces: 4, 5, 7, 8, 9
Metric option: 1	WINDOW: 2, 3, 4, 5

HOURLY REPORT PROGRAM

- [1] In the hourly reports, the values reported for the SUM and AVERAGE summary variables, for temperatures only, will be incorrect if metric units are input and English units output, or vice versa. The conversion between English and metric units is not made correctly when the variable is a sum of temperatures.
Interim solution: None.

LOADS

- [2] When using window shade management with the MAX-SOLAR-SCH keyword in conjunction with SHADING-COEF instead of GLASS-TYPE-CODE, the calculation of the transmitted solar gain will be incorrect if the SHADING-COEFs differ from window to window. This problem occurs in DOE-2.1B as well as in DOE-2.1C.
Interim solution: Use GLASS-TYPE-CODE on all windows if MAX-SOLAR-SCH is being used on any windows.
- [3] In the daylighting calculation, windows in exterior walls with SHADING-SURFACE = YES are incorrectly taken to be completely shaded, so that no light from the sky or ground enters the windows. Direct light from the sun is not affected.
Interim solution: For daylit spaces (DAYLIGHTING = YES), do not use SHADING-SURFACE = YES on exterior walls with windows.
- [4] If a sunspace (i.e., a SPACE with SUNSPACE = YES) has no interior windows, the solar gain calculation is not functioning correctly.
Interim solution: None.
- [5] In sunspaces with more than one exterior window, the solar gain calculation is not functioning correctly.
Interim solution: None.
- [6] If a space has DAYLIGHTING = YES but no LIGHTING-SCHEDULE assigned to it, then the values reported in the LS-G Report for AVERAGE and PERCENT ILLUM and GLARE will be incorrect. This problem occurs in DOE-2.1B as well as in DOE-2.1C.
Interim solution: Assign a LIGHTING-SCHEDULE to each space with DAYLIGHTING = YES. If the space has no electric lights, specify LIGHTING-KW or LIGHTING-W/SQFT = 0 and use a LIGHTING-SCHEDULE with values of 1 0 for all hours of the run.

BUGS DISCOVERED IN DOE-2.1C (Continued)

SYSTEMS

- [7] For a sunspace with more than one interior wall, the following quantities are incorrectly calculated for the second and subsequent interior walls if these walls are delayed: absorbed solar radiation, window conductance, and transmitted solar radiation
Interim solution: None
- [8] For a sunspace with a delayed interior wall, the inside surface heat flux is calculated incorrectly.
Interim solution: None
- [9] If a sunspace and its adjacent spaces are served by different system types, the program will abort in subroutine SSFCOR.
Interim solution: None.
- [10] For systems using a heatpump (HEAT-SOURCE = HEAT-PUMP), the electric heating energy reported in SS-H varies significantly depending on what computer system is being used. The values reported can be as much as a factor of 3 too high in spring or fall months. The problem is caused by a very small, unphysical heating load (<< one Btuh) which turns on the heatpump, and causes it to consume electricity. On some machines, these small numbers are rounded to zero, and the heatpump remains off. On other machines, typically those having word lengths greater than 32 bits, the numbers remain non-zero, and the heatpump turns on.
Interim solution: None.

AMONG THE HONOLULU PAPERS

The following technical and symposium papers presented at the ASHRAE Annual Meeting, held in Honolulu June 23-26 describe various applications of DOE-2. Copies of these papers can be purchased from the Publication Sales Department, ASHRAE, Inc. (404) 636-8400. Order numbers appear at the end of each citation.

- *Characterization of Zone Dynamic Response for CLF/CLTD Tables*, by Sowell, E.F. and Chiles, D.C., (2898)
- *Zone Descriptions and Response Characterization*, by Sowell, E.F., (2899)
- *A Counter-Intuitive Effect of Mass on Zone Cooling Load Response*, by Chiles, D.C. and Sowell, E.F., (2900)
- *Energy Performance Analysis of Fenestration in a Single-Family Residence*, by Sullivan, R. and Selkowitz, S., (2910)
- *Commercial Building Energy Performance Analysis Using Multiple Regression Procedures*, by Sullivan, R., Nozaki, S., Johnson, R.L. and Selkowitz, S., (2911)
- *Comparisons of Four Computer Models with Experimental Data from Test Buildings in Northern New Mexico* by Robertson, D.K. and Christian, J.E., (HI-85-11.1)
- *Energy Performance of an Architectural Fabric Roof: Experimental and Analytical Results*, by Gridley, R.B., Hart, G.H., and Goss, W.P., (HI-85-11.4)
- *Validation of Hourly Building Energy Models for Residential Buildings*, by Sorrell, F.Y., Luckenback, T.J., and Phelps, T.L., (HI-85-13.2)
- *User-Effect Validation Tests of the DOE-2 Building Energy Analysis Computer Program*, by Hunn, B.D., Cappiello, C.C., and Diamond, S.C., (HI-85-13.3)

INDEX TO THE DOE-2 USER NEWS

A regular Summer feature of the newsletter is the cumulative subject/title index to all articles published herein.

Article/Topic	Date	Vol: No.	Page
ASHRAE Standard 90	Spring 1985	6:1	3
BES Inquiry Form	Fall 1984	5:3	5
Bibliography	November 1980	1:2	5
Bibliography-Update	May 1982	3:2	3
Bibliography-Recent LBL Publications	Summer 1984	5:2	3
BLAST/DOE-2 Comparison	August 1982	3:3	1
Bugs			
2.1 Bug List (1-117)	February 1981	2:1	2
(118-133)	May 1981	2:2	9
(134-139)	August 1981	2:3	5
2.1A Bug List (1-26)	February 1982	3:1	9
(27-32)	May 1982	3:2	5
(33-35)	August 1982	3:3	3
(all)	November 1982	3:4	3
2.1B Bug List (1-12)	Winter 1983	4:4	5
(1-20)	Spring 1984	5:1	4
(all)	Winter 1984	5:4	3
Bug Reporting	August 1980	1:1	2
	February 1983	4:1	1
CERL/DOE-2 Comparison	May 1982	3:2	3
CIRA: Computerized Instrumented Residential Audit	May 1982	3:2	2
Computer Service Bureaus	May 1983	4:2	6
Computer Service Bureaus — Update	Spring 1984	5:1	1
Computers, at LBL	Spring 1985	6:1	1
Custom Weighting Factors			
Automatic Custom Weighting Factors	May 1981	2:2	2
Caution and Error Messages	November 1980	1:2	2
Guidelines for Preparing Input	August 1980	1:1	15
Daylighting Network (DNNA)	Spring 1985	6:1	1
Design Process, Using DOE-2 in	May 1982	3:2	4
Direct Cooling in PLANT	February 1982	3:1	2
Documentation Updates			
for DOE-2.1	February 1981	2:1	15
	November 1980	1:2	9
	August 1980	1:1	11
for DOE-2.1A	February 1983	4:1	4

Article/Topic	Date	Vol:No.	Page
for DOE-2.1B	Winter 1983	4.4	3
	Spring 1984	5.1	3
	Winter 1984	5.4	7
DOE-2.1A			
Availability	February 1982	3.1	1
<i>Engineers Manual</i>	May 1983	4.2	1
Features, general	May 1981	2.2	1
	February 1981	2.1	1
Support of	February 1983	4.1	1
DOE-2.1B			
Availability	August 1983	4.3	1
Documentation Update Package	November 1982	3.4	1
	May 1983	4.2	1
DOE-2.1n and LBL Research	May 1982	3.2	1
Electrical Generation Strategies	May 1983	4.2	1
Features, general	August 1982	3.3	1
Metric Option	August 1983	4.3	1
Upgraded Reports	Winter 1983	4.4	1
DOE-2.1C			
Availability	Winter 1984	5.4	1
Developments in SYSTEMS	Fall 1984	5.3	3
Documentation	Summer 1984	5.2	12
Electrical Rate Structure in ECONOMICS	Fall 1984	5.3	1
Features general	Summer 1984	5.2	12
Functional Values	November 1982	3.4	1
Powered Induction Units	February 1983	4.1	2
Powered Induction Units — Update	Fall 1984	5.3	3
Sunspace Atrium Model	Winter 1984	5.4	1
Support of	Spring 1985	6.1	3
DOE-2.1D, From Here To	Summer 1984	5.2	1
DOE-2.1n and LBL Research	May 1982	3.2	1
DOE-2 Users Group	Spring 1985	6.1	1
Economic Evaluation Methods	February 1982	3.1	3
Electrical Generation Strategies	May 1983	4.2	1
Elevated Supply Air Temperatures for VAV Systems	August 1983	4.3	2
Functional Values	November 1982	3.4	1
Glazing Optimization Study	August 1982	3.3	4
THE HEAT EXCHANGER			
Bypass System	Spring 1985	6.1	3
Capacities in Zonal Systems	November 1980	1.2	13
Cooling Tower	May 1981	2.2	12
Daylighting	Winter 1984	5.4	7
DIAGNOSTIC	February 1981	2.1	21
	August 1980	1.1	19

Article/Topic	Date	Vol:No.	Page
<i>THE HEAT EXCHANGER</i> — Cont.			
Domestic Hot Water	May 1981	2:2	12
	February 1981	2:1	22
Dual-system Zone Simulation	November 1982	3:4	7
GLASS-TYPE	August 1980	1:1	18
Ground Water Heatpump	May 1982	3:2	6
Hourly Report Variables	February 1983	4:1	5
IBM version	February 1982	3:1	13
Ice-Storage System	Winter 1984	5:4	7
Keyword Value Ranges			
Default Values of Zero	November 1980	1:2	13
Limits on Mins & Maxs	August 1980	1:1	19
Limits			
Limits on Mins & Maxs	August 1980	1:1	19
U-names & Commands	August 1980	1:1	19
	February 1981	2:1	19,21
Minimum PLANT Input	August 1980	1:1	20
Outside Air	August 1980	1:1	19
Perimeter Fan Coil Unit	Winter 1984	5:4	6
Radiant Panel Systems	May 1983	4:2	5
Reports			
BEPS	February 1982	3:1	13
	August 1981	2:3	6
	August 1980	1:1	20
	Winter 1984	5:4	6
ES-C	May 1981	2:2	13
Hourly Report Variables	February 1983	4:1	5
Loads Passed to PLANT	August 1980	1:1	17
LOADS Verification Reports	August 1980	1:1	18
PV-A	May 1981	2:2	12
SS-F	February 1982	3:1	13
	February 1981	2:1	21
Restaurant Kitchens	May 1983	4:2	5
Schedules			
COOL-TEMP-SCH	February 1982	3:1	13
Defaults in LOADS	November 1980	1:2	14
Supply Air Scheduling	November 1980	1:2	13
System Start-up	November 1982	3:4	7
U-names in Symbol Table	February 1981	2:1	21
School Buildings	May 1983	4:2	5
Shading	August 1981	2:3	6
	August 1980	1:1	18
Sizing			
In SYSTEMS	February 1981	2:1	22
In PLANT	May 1981	2:2	12
Steam Heat	November 1980	1:2	13
Steam Radiators	May 1983	4:2	5
Steam Turbine & Chiller	May 1982	3:2	5

Article/Topic	Date	Vol:No.	Page
THE HEAT EXCHANGER — Cont			
Supply and Return Air			
Bypass System	Spring 1985	6 1	3
Return Air	November 1980	1 2	13
Return Air Duct Thermostat	November 1980	1 2	14
Sizing of	February 1981	2 1	22
Supply Air Scheduling	November 1980	1 2	13
Weather Tapes			
On-site Data	August 1980	1 1	17
Types and Procurement	August 1980	1 1	17
Intermediate File Structures	February 1982	3 1	6
Metric Option, The New	August 1983	4 3	1
Microcomputers			
DOE-2	August 1981	2 3	1
DOE-2 - Update	Spring 1985	6 1	2
CIRA	May 1982	3 2	2
MULTIPLIER, Problems with	November 1982	3 4	2
Natural Ventilation	November 1980	1 2	9
NESC Licensing	Winter 1983	4 4	1
NESC Software Package	February 1983	4 1	1
Output Reports			
DOE-2.1B Reports	May 1981	2 2	4
DOE-2.1B Reports	Winter 1983	4 4	1
Powered Induction Units	February 1983	4 1	2
Powered Induction Units - Update	Fall 1984	5 3	3
Radiant Panel Heating System — RAMSES Group, France	May 1983	4 2	2
Schedules, Preparation of	February 1983	4 1	3
Schedules, Program Use of	May 1983	4 2	4
Singapore, Energy Efficiency in	Spring 1984	5 1	1
Sizing of Fans for VAV Systems	May 1981	2 2	7
SIZING-OPTION at ZONE Level	August 1981	2 3	3
Sky Simulator at LBL	May 1983	4 2	3
Stud Wall Construction	August 1981	2 3	4
Sunspace/Atrium Model in DOE-2.1C	Winter 1984	5 4	1
SUPERLITE	May 1983	4 2	3
Weather Tapes — WYEC	Summer 1984	5 2	1
WRISC: A Computerized Search Service	November 1980	1 2	4