THE DOE–2 USER NEWS

PUB-439

DOE-2: A COMPUTER PROGRAM FOR BUILDING ENERGY SIMULATION

Vol. 14, No. 1

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The Simulation Research Group
Energy and Environment Division
Lawrence Berkeley Laboratory
One Cyclotron Road
Berkeley, California 94720

Editor: *Kathy Ellington*
Bldg. 90 — Room 3147

Table of Contents

☞ CALENDAR ☜

Jun 26-30 — *ASHRAE Annual Meeting*

to be held in Denver, Colorado.
Sponsor/Contact: ASHRAE Meetings Section, 1791 Tullie Circle N.E., Atlanta, GA 30329 — Ph: (404) 636-8400, Fx: (404) 321-5478.

Aug 16-18 — *Building Simulation '93*

to be held in Adelaide, Australia. Sponsor: International Building Performance Simulation Association (IBPSA). Contact: Terry Williamson, Building Simulation '93, Univ. of Adelaide, GPO Box 498, Adelaide 5001, Australia.

Aug 23-27 — *Sixth International Conference on Energy Program Evaluation: Uses, Methods, and Results*

to be held in Chicago, IL. Sponsor: American Council for an Energy Efficient Economy, Electric Power Research Institute, and U.S. Department of Energy.
Contact: G. Ettinger, G.A. Ettinger & Associates, 309 Davis Street, Evanston, IL 60201. Fx: (708) 834-7535.

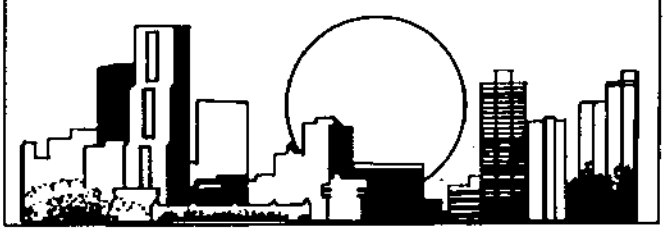
Oct 24-27 — *New Construction Programs for Demand-Side Management*

to be held at the Loews Coronado Bay Resort in San Diego, California.
Contact: Elisa Herrera, ADM Associates, Inc., 3239 Ramos Circle, Sacramento, California. Ph: (916)363-8383, Fx: (916)363-1788

Nov 1-3 — *CLIMA 2000*

to be held at the Queen Elizabeth II Conference Centre, London, England.
Contact: Anne Gibbins, CIBSE Headquarters, 222 Balham High Road, London SW12 9BS, UK. Fx: 011-44-1/675 5449.

 This work is supported by the Assistant Secretary for Energy Efficiency and Renewable Energy, Office of Building Technologies, Building Systems and Materials Division of the U.S. Department of Energy under Contract DE-AC03-76SF00098.



$$$$$$ The Energy FinAnswer $$$$$$

One Utility's Solution to the Problem of Diminishing Resources

The next decade in the U.S. will be critical in establishing schemes to conserve our existing resources; one utility company has taken a bold step in that direction. Because the electric supply in the Pacific Northwest is steadily diminishing, Pacific/Utah Power (P/UP) in Portland, Oregon, has instituted an energy saving program for new commercial building construction. Their "Energy FinAnswer" program provides 100% up-front funding for Energy Conservation Measures (ECMs) installed in new commercial buildings. These measures may include windows, lighting, insulating, heating/cooling systems, or other measures that save electricity beyond state code requirements. Special energy engineering services also accompany this funding for the benefit of FinAnswer users. Payback to P/UP is achieved through a special energy service charge on the building's electric bill over, typically, 10 to 20 years.

Commercial customers, especially owners of buildings over 12,000ft^2, who are building new structures in Oregon, Idaho, Utah and California qualify for the Energy FinAnswer. What makes the Energy FinAnswer so attractive for building owners is that the end product is a more energy efficient building with lower operating costs and an immediate positive cash flow. This translates into a property with higher resale and asset value. Another important, but intangible benefit, is the public recognition generated from the construction of a state-of-the-art energy-efficient building.

Here's how the Energy FinAnswer program operates: P/UP works closely with the building owner and planning team in the early stages of the structure's design to help identify ECMs that are appropriate and cost effective. Then, using DOE-2, estimated energy savings are calculated and various ECMs are suggested from a list of proven technologies and manufacturers. Throughout construction, P/UP continues to work cooperatively with the design team and contractors; they also make sure that building managers and operators receive appropriate operations and maintenance training for the installed measures. After installation and start up, P/UP performs a Performance Verification to make sure all ECMs are installed properly and working effectively. The Performance Verification is then used to compare estimated energy savings from the initial design model with actual performance of the building.

For more information, contact Jim Haberman, The "FinAnswer" Program, Pacific/Utah Power, 920 S.W. 6th Avenue, Portland, OR 97204.

□ □ □ THE HEAT EXCHANGER □ □ □

Reading Measured Schedule Values from a File

Question:
I have some measured lighting/equipment electric power data that I want to use in my DOE-2 simulation. How can this be done?

Answer:
In applications where you want to reconcile the measured performance of a building with the DOE-2 simulation, it may be desirable to input measured profiles (such as for lighting) rather than try to replicate these profiles using the SCHEDULE command capabilities in DOE-2. This might be the case, for example, if the actual lighting profile is so variable that it cannot accurately be represented by a series of different DAY–SCHEDULEs and WEEK–SCHEDULEs.

The following example shows how to use input functions to read in 8760 hours of measured space lighting power and equipment power values into the LOADS simulation. The input function puts these values into the lighting schedule and equipment schedule, respectively, for the space.

To do this, we define "place-holder" schedules whose hourly values will be altered by the input function. We then refer to these schedules in the SPACE command.

Values are read at the beginning of every hour of the simulation using a building-level "before" function. We read the values at the beginning of every hour of simulation.

Example

```
$ Use Input Functions to Read Lighting and Equipment Profiles from a File $

INPUT LOADS ..
 ...
BUILDING–LOCATION

              FUNCTION = (*READER*,*NONE*)  ..    $ function reads schedule values
 ...

LIGHT–SC–1 = SCHEDULE  THRU DEC 31 (ALL) (1,24)(0)  ..  $ place-holder schedule
EQUIP–SC–1 = SCHEDULE  THRU DEC 31 (ALL) (1,24)(0)  ..  $ place-holder schedule
 ...
```

```
SP-1 =    SPACE
            .
            .
            LIGHTING-KW = 1.0   LIGHTING-SCHEDULE = LIGHT-SC-1
            EQUIPMENT-KW = 1.0  EQUIP-SCHEDULE =  EQUIP-SC-1  ..

          $ Above, LIGHTING-KW and EQUIPMENT-KW are set to 1.0 since the
          $ schedule values that are read in will contain the actual KWs.
          $ Alternatively, LIGHTING-KW and EQUIPMENT-KW could be actual
          $ peak KW values, and the schedule values could be fractions
          $ between 0 and 1.
END ..

$ The following function reads measured lighting and equipment power values
$ every hour from FORTRAN unit 50.  This unit gets assigned a default filename
$ by the operating system (e.g., fort.50 in SunOS, FOR050.DAT in VAX/VMS).
$ Thus, for example, if you are running VAX/VMS, your command file that runs
$ DOE-2 BDL and simulation should copy the data file (that you want the function
$ to read) to FOR050.DAT.  The file that is read contains 8760 lines of measured
$ data.  Each line contains lighting power (kW) in columns 1-10 and equipment
$ power (kW) in columns 11-20.

FUNCTION   NAME    =   READER  ..

ASSIGN     LS      =   SCHEDULE-NAME( LIGHT-SC )
           ES      =   SCHEDULE-NAME( EQUIP-SC )
           IHR     =   IHR     $ hour number
           IDAY    =   IDAY    $ day number
           IMO     =   IMO  ..  $ month number

CALCULATE ..

C--- We need to rewind the data file at the end of the warm-up period so that when the DOE-2
C--- simulation begins we are at the beginning of the data file.  We know we are at the end of
C--- the warm-up since at this time IHR and IMON will have been reset to 1.

      IF( IHR + IDAY + IMO .EQ. 3 )  REWIND  50
      READ( 50, 1 )  A, B
1     FORMAT( 2F10.1 )
      LS = A
      ES = B
      END

END-FUNCTION ..

COMPUTE LOADS ..
```

• DrawBDL •

A Graphic Debugging and Drawing Tool for DOE-2 Building Geometry

by

Joe Huang

DrawBDL is a simple graphics package running under Windows 3.1. It was designed to help DOE-2 users correct or generate presentation drawings from their building geometry input. **DrawBDL** reads a DOE-2 input file and then draws the building in various projections, from any angle, in either wire-frame or color-shaded rendering. To assist in debugging, you can use the mouse to highlight surfaces, including hidden ones, and identify their names, coordinates, and dimensions.

As any user of DOE-2 can attest, the input procedure for building surfaces using overlaying Cartesian coordinate systems is flexible but error-prone and a blindman's buff to decipher. As soon as the building geometry is more complex than the square box beloved of energy analysts, debugging becomes tedious because it requires retracing each step in the original input procedure. Moreover, since people develop different BDL "styles", debugging other people's files is even more difficult and well-nigh impossible. After years of DOE-2 modeling, and littering my office with crude sketches, I decided to develop programs for reading input files and sketching them on a computer. These efforts have evolved into **DrawBDL** which uses the built-in graphics capabilities and print drivers in Windows 3.1 to produce a standalone tool for the DOE-2 user.

DrawBDL has a built-in parser to interpret BDL input, and a drawing routine to transform the parsed output to plan, elevation, or axonometric drawings. Since **DrawBDL** runs under Windows 3.1, its user interface should be familiar to Windows users (see Fig. 1).

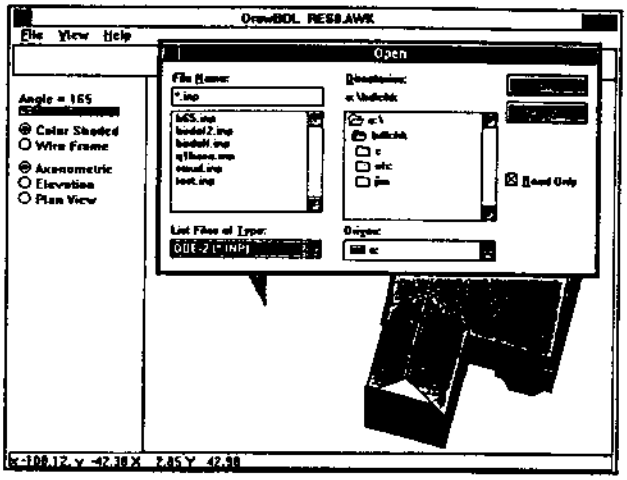


Figure 1

The file window has been opened in order to select the file type to be processed (*.inp are standard DOE-2 input files, *.prc are parsed output files, and *.txt their text equivalents).

The parser in **DrawBDL** reads DOE-2 input files, strips off comments and inputs unrelated to building geometry, substitutes LIKE, PARAMETER, or SET–DEFAULT values, and multiplies for the TIMES command. It creates a parsed binary output file (*.prc) with the geometry of the building surfaces and the total areas of walls, roofs, windows, and doors. Since the parser does not do BDL error checking, it is preferable (but not mandatory) to feed the input first through BDL to eliminate syntax mistakes and point out

Joe Huang is an expert DOE-2 user with over 10 years experience in building energy analysis. To place an order for DrawBDL or to obtain more information, please contact him at Joe Huang & Associates, 6720 Potrero Avenue, El Cerrito CA 94530, phone: 510-559-9067.

missing values. Although users in most cases will jump directly from the parser to the drawing routine, the parsed output can be saved as a text file for the numerically-inclined (or graphically challenged).

The drawing routine generates a selected drawing from the parsed output. The user options are these:

(1) *Projection*: plan, elevation, or axonometric (Figs. 2, 3, and 4, respectively).

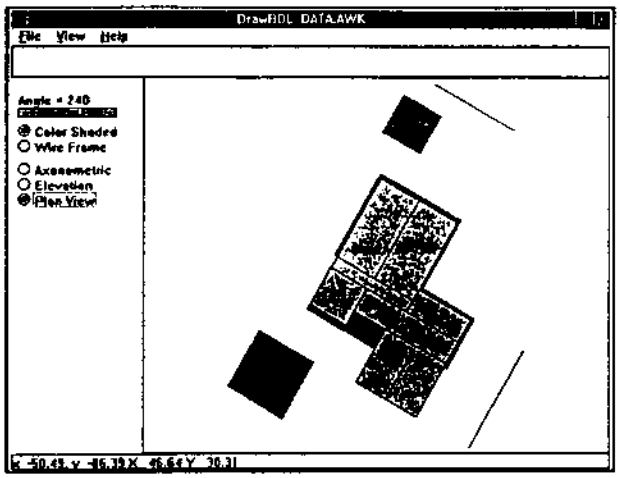


Figure 2

Plan View (Color Shaded) of the house.

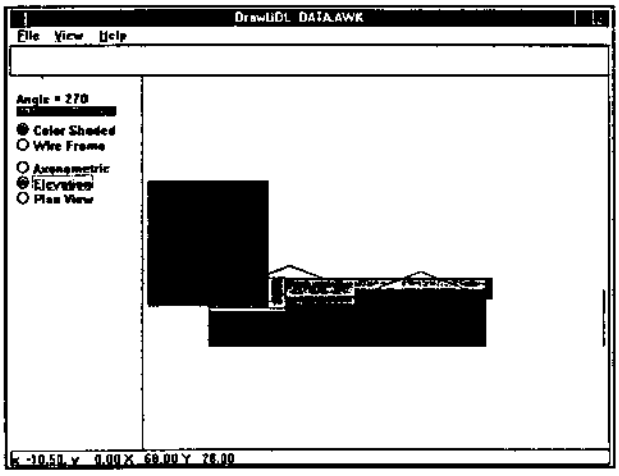


Figure 3

Elevation (Color Shaded) view of the house and building shade (idealized tree).

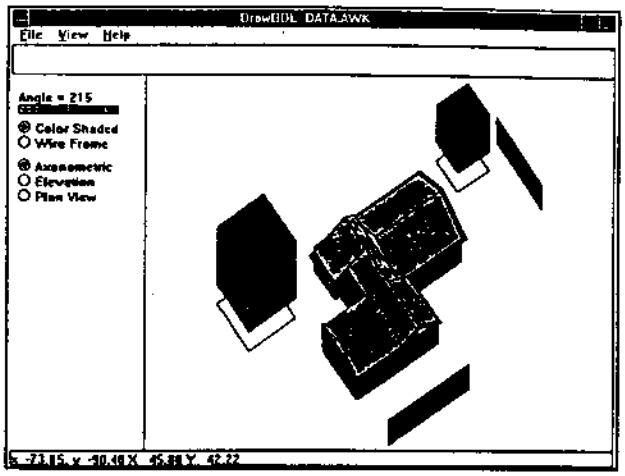


Figure 4

Axonometric (Color Shaded) view of the house and building shades (trees).

(2) *Drawing Type:* wire-frame or shaded (Fig. 5).

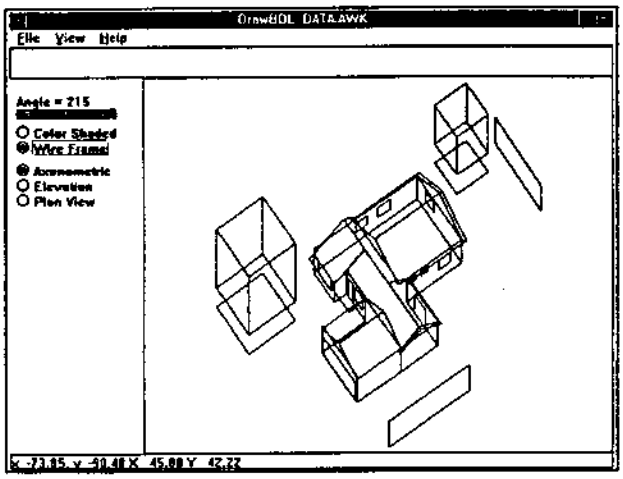


Figure 5

Axonometric (Wire Frame) view of the house.

(3) *View Angle:* selected using a "boom box" switch of 5° increments from 0° to 360°.

(4) *Selective Drawing:* by space, walls only, roofs only, no building shades, etc.

Figs. 2, 3, 4 and 5 show views of a house from several viewing angles. The two square boxes near the house are

DOE-2 approximations of shade trees. Note that a "ground projection" shadow has been added to indicate surfaces floating above ground level.

A useful feature of the drawing routine is a search routine allowing users to identify building surfaces using the mouse. Once the mouse is clicked, the building surface is outlined in red, and its name, coordinates, and dimensions appear across the bottom of the screen. In Fig. 6, the cursor has been clicked over a roof, which has been identified as "NROOF1" along with its input values. If used on wire-frame drawings, the search routine can be used to selectively identify overlaying surfaces.

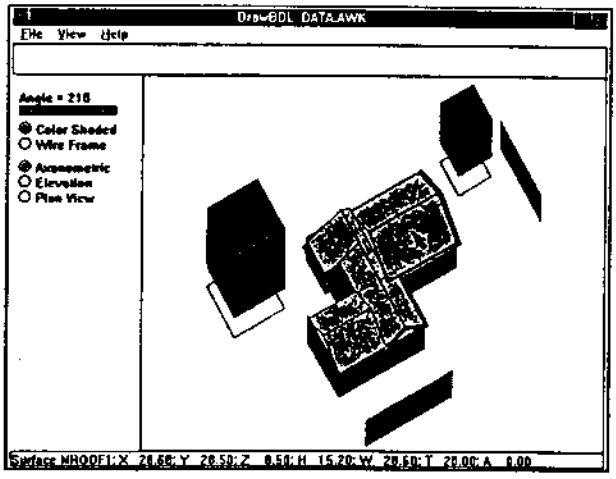


Figure 6

Axonometric (Color Shaded) view of the house with cursor clicked over the roof.

Because **DrawBDL** operates in the Windows 3.1 environment, it can be used in tandem with an editor to facilitate debugging. For example, Fig. 7 shows a reduced **DrawBDL** screen superimposed on an editor opened to the actual DOE-2 input file. Once a correction is made to the DOE-2 input file, you can toggle immediately to **DrawBDL** and draw the result.

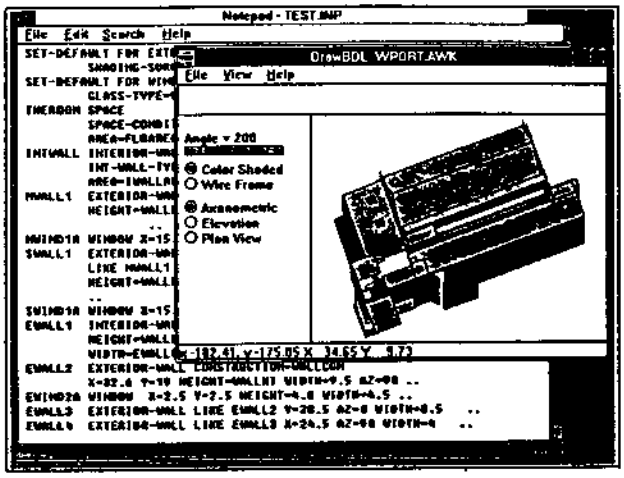
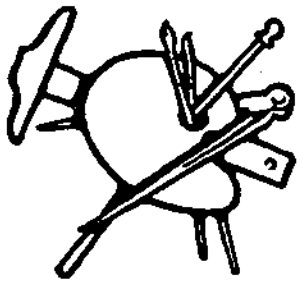


Figure 7

DrawBDL screen running on top of the DOE-2 input file.

The release date for **DrawBDL** is July, 1993, with a projected price of $99. Interested DOE-2 users can request a pre-release demo diskette by leaving a phone message at Huang and Associates (Ph: 510-559-9067).



28 Grams of Prevention is worth 0.45 Kilograms of Cure
or
Start Thinking Metric!!

The United States is the only industrialized country in the world not officially using the metric system. Because of its many advantages (e.g., easy conversion between units of the same quantity), the metric system has become the internationally accepted system of measurement units. Most federal agencies have agreed to convert to metric (SI) units for construction by January 1994. Bill Brenner, executive director of the National Institute of Building Sciences (NIBS), whose Construction Metrication Council is overseeing the metric conversion of the construction industry for the federal government, said metrication would be in full effect 10 to 15 years from now. Metrication will penetrate construction in two phases: "soft", which means re-labeling existing dimensions in SI, and "hard", which will require changes in modular components to rounded-off metric units. According to NIBS, 95 percent of all construction products will not change size because they are not modular or panelized. For example, a 2¾ by 4½ inch wall-switch face plate will be re-labeled 70 by 115mm, a 30-gallon tank will be re-labeled to 114L. Increased use of the metric system by industry is expected to promote more standardized and simpler product packaging. Reducing the large number of package sizes will simplify price comparisons and save on packaging and shipping costs; resulting savings will reach the consumer. It is expected that U.S. products will also sell better in foreign countries. Metric conversion is will make commerce and industry more efficient and the teaching and learning of measurement much easier.

Metric Conversion Factors (approximate)

Symbol	When You Know	Multiply by	To Find	Metric (SI) Symbol
		LENGTH		
in	inches	2.54 (exact)	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
		WEIGHT (mass)		
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 pounds)	0.9	metric tons	t

DOE-2 User News, Vol.14, No.1

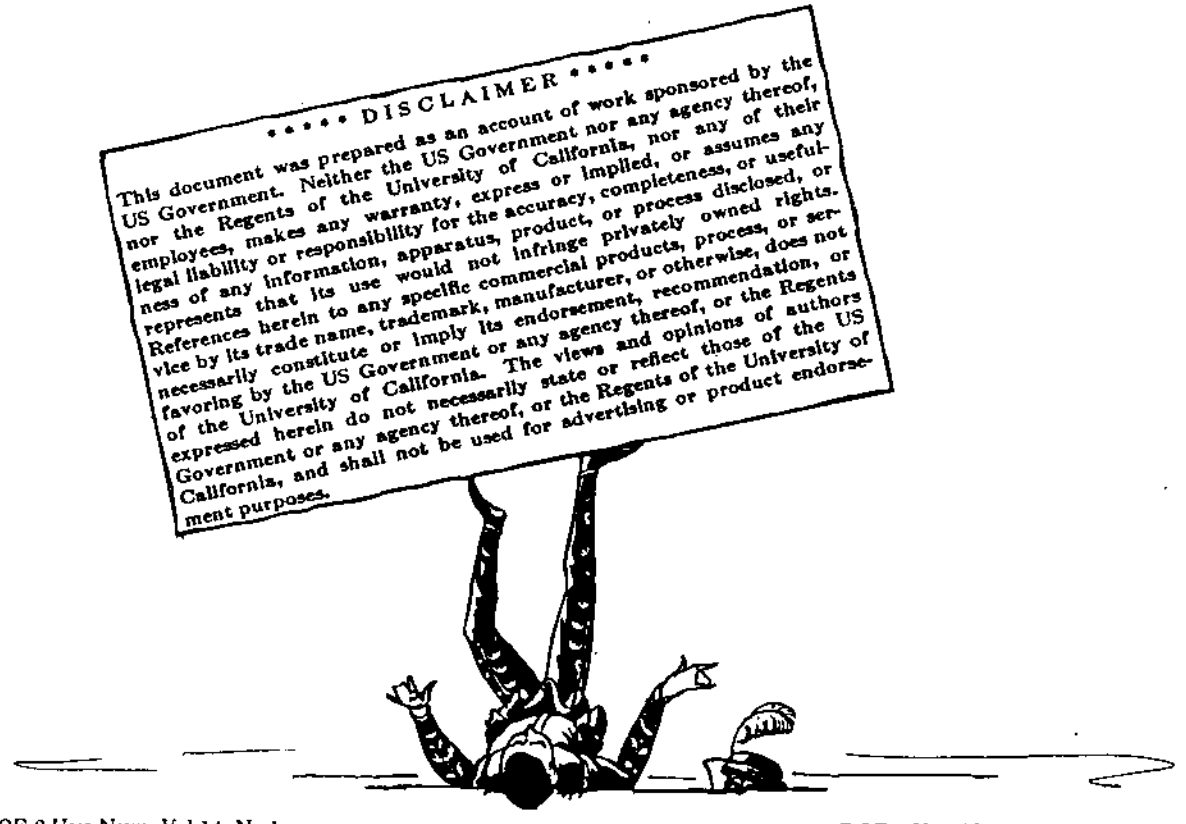
DOE-2 allows metric input and output; you can also have English input with metric output, and vice-versa. To get a feeling for metric units, you can compare two runs, one with INPUT–UNITS = ENGLISH (the default) and OUTPUT–UNITS = ENGLISH (the default), and another (using the same input) with OUTPUT–UNITS = METRIC. See the *Supplement (2.1D)*, p.1.27, "Metric Option".

For more metric information, contact:

Metric Program
National Institute of Standards
and Technology
Technology Administration
U.S. Department of Commerce
Gaithersburg, MD 20899
Phone: (301) 975-3690

Or, order these publications from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

Title (NIST code number)	GPO Stock Order Number	Price Each	Bulk Price
"Metric Ruler" (NIST-SP-376)	003-003-03089-9	$1.00	$28/100 copies
"Metric Conversion Card" (NIST-SP-365)	003-003-03090-2	$1.00	$28/100 copies
"Metric Chart" (NIST-SP-304)	003-003-03096-1	$2.00	
"The International System of Units (SI)" (NIST-SP-330)	003-003-03099-6	$3.50	
"Interpretation of SI for the U.S. and Metric Conversion Policy for Federal Agencies" (NIST-SP-814)	003-003-03117-8	$1.75	



□ □ □ □ DOE-2 DIRECTORY □ □ □ □

Program Related Software and Services

Mainframe Versions of DOE-2

DOE-2.1D (Source Code) For DEC-VAX mainframe or SUN-4 mini-computer; contact the Simulation Research Group for directions on obtaining the program.	Simulation Research Group Bldg. 90, Room 3147 Lawrence Berkeley Laboratory Berkeley, CA 94720 Contact: Kathy Ellington Phone: (510) 486-5711 FAX: 486-4089/5172
DOE-2.1D (Source Code) For DEC-VAX, Order #159-D6220-00 **DOE-2.1C** (Source Code) For IBM-3083, Order #158-I3083-00 For DEC-VAX11, Order #158-DVX11-00 For a complete listing of the software available from ESTSC order their "Software Listing" catalog ESTSC-2.	Energy Science and Technology Software Center P.O. Box 1020 Oak Ridge, TN 37831-1020 Contact: Phone: (615) 576-2606 FAX: (615) 576-2865
* **FTI-DOEv2.1D** (Source Code) This is a highly optimized and basically platform-independent version of the DOE-2.1D source code. Will compile for most computing systems. The original LBL 2.1D source code is also available in a variety of distribution formats. Site licenses and educational discounts are available. Also available is the full set of program documentation as distributed by NTIS and weather files (TMY and TRY) in a variety of distribution formats. [See *User News* Vol.12, No.4, p.16 for more information]	Finite Technologies, Inc 821 N Street, #102 Anchorage, AK 99501 Contact: Scott Henderson Phone: (907) 272-2714 FAX: (907) 274-5379

Microcomputer Versions of DOE-2

* **ADM-DOE2** ADM-DOE2 (DOE-2.1D) is for professional energy analysts who require a state-of-the-art simulation tool for building energy use. It performs a detailed, zone-by-zone hourly simulation and includes a wide array of modeling features that make it possible to simulate "real buildings". These capabilities offer much greater accuracy and detail than is possible with handbook methods or simplified analysis. [See *User News* Vol.7, No.2, p.6 for more information]	ADM Associates, Inc. 3239 Ramos Circle Sacramento, CA 95827 Contact: Marla Sullivan, Sales Kris Krishnamurti, Support Phone: (916) 363-8383 FAX: (916) 363-1788
* **CECDOEDC (Version 1.0A)** A microcomputer version of DOE-2.1D integrated with a pre- and post-processing system designed strictly for compliance use within the State of California. It generates some of the standard compliance forms as output. Order P40091009 for the CECDOEDC Program with Manuals. Order P40091010 for the DOE-2.1 California Compliance Manual. [See *User News* Vol.12, No.4, p.13 for more information]	Publication Office California Energy Commission P.O. Box 944295 Sacramento, CA 94244-2950

* We list third-party DOE-2-related products and services for the convenience of DOE-2 users, with the understanding that the Simulation Research Group does not have the resources to check the DOE-2 program adaptations and utilities for accuracy or reliability.

Microcomputer Versions of DOE-2 (continued)

* **"DOE-24/Comply-24"** DOE-24 is a special DOE-2 release which is both a California-approved compliance program for the state's 1992 non-residential energy standards, and a stand-alone version of DOE-2.1D which includes a powerful yet easy-to-use input preprocessor. A free demonstration program is available upon request. [See *User News* Vol.12, No.2, p.2 for more information]	Gabel Dodd Associates 1818 Harmon Street Berkeley, CA 94703 Contact: Rosemary Howley Phone: (510) 428-0803 FAX: (510) 428-0324
* **DOE-Plus™** DOE-Plus is used to interactively input a building description, run DOE-2, and plot graphs of simulation results. Features include interactive error checking, context-sensitive help for all DOE-2 keywords, a 3-D view of the building that can be rotated, and several useful utilities. DOE-Plus is a complete implementation of DOE-2. [See *User News* Vol.11, No.4, p.4 and Vol.13, No.2, p.54 for more information]	ITEM Systems P.O. Box 5218 Berkeley, CA 94705-0218 Contact: Steve Byrne Phone: (510) 549-1444 FAX: (510) 549-1778
* **FTI-DOEv2.1D** Highly optimized version of DOE-2.1D available for the following operating systems: DOS, VMS, ULTRIX, SCO UNIX, RS/6000 (AIX), NeXT and SUN Sparc. Call for more information. [See *User News* Vol.12, No.4, p.16 for more information]	Finite Technologies, Inc 821 N Street, #102 Anchorage, AK 99501 Contact: Scott Henderson Phone: (907) 272-2714 FAX: (907) 274-5379
* **MICRO-DOE2** MICRO-DOE2 (DOE-2.1D) has been in use since 1987; it is an enhanced PC version of the DOE-2 program (over 500 users world-wide). Two versions of MICRO-DOE2 are available: a regular DOS version for all IBM-PC compatibles and an extended DOS version for 386 or 486 computers only. [See *User News* Vol.7, No.4, p.2 and Vol.11, No.1, p.2 for more information]	Acrosoft International, Inc. Suite 230 9745 East Hampden Avenue Denver, CO 80231 Contact: Gene Tsai, P.E. Phone: (303) 368-9225 FAX: (303) 368-5929
* **PRC-DOE2** A fast, robust and up-to-date PC version of DOE-2.1D. Runs in extended memory, is compatible with any VCPI compliant memory manager and includes its own disk caching. 377 weather data files available (TMY, TRY, WYEC, CTZ) for the U.S. and Canada [See *User News* Vol.13, No.4, p.11 for information]	Partnership for Resource Conservation 140 South 34th Street Boulder, CO 80303 Contact: Paul Reeves Phone or FAX: (303) 499-8611

Pre- and Post-Processors for DOE-2

* **DrawBDL** Graphic debugging and drawing tool for DOE-2 building geometry [See *User News* Vol.14, No.1, p.5 for information]	Joe Huang & Associates 6720 Potrero Avenue El Cerrito CA 94530 Contact: Joe Huang Phone: (510) 559-9067.
* **Graphs from DOE-2** [See *User News* Vol.10, No.3, p.5 for information]	Ernie Jessup 4977 Canoga Avenue Woodland Hills, CA 91364 Phone: (818) 884-3997
* **PRC-TOOLS** A set of programs that aids in extracting, analyzing and formatting hourly DOE-2 output. Determines energy use, demand, and cost for any number of end-uses and periods. Automatically creates 36-day load shapes. Custom programs also available.	Partnership for Resource Conservation 140 South 34th Street Boulder, CO 80303 Contact: Paul Reeves Phone or FAX: (303) 499-8611
* **Pre-DOE** (A BDL math pre-processor)	Nick Luick 19030 State Street Corona, CA 91719 Phone: (714) 278-3131
* **Prep**™ Prep is a batch preprocessor that enables conditional text substitution, expression evaluation, and spawning of other programs. Prep is ideal for large parametric studies that require dozens or even thousands of DOE-2 runs.	ITEM Systems P.O. Box 5218 Berkeley, CA 94705-0218 Contact: Steve Byrne Phone: (510) 549-1444 FAX: (510) 549-1778
* **Graphs for DOE-2** 2-D, 3-D, hourly, daily, and psychrometric plots [See *User News* Vol.13, No.1, p.5 for information]	Energy Systems Laboratory Texas A&M University College Station, TX 77843-3123 Contact: Jeff Haberl Phone : (409) 845-6065 FAX: (409) 862-2762

RESOURCES

DOE-2 User News Sent without charge to DOE-2 users, the newsletter prints documentation updates and changes, bug fixes, inside tips on using the program more effectively, and articles of special interest to program users. Regular features include a directory of program-related software and services and an order form for documentation. In the summer issue an alphabetical listing is printed of all commands and keywords in DOE-2, and where they are found in the documentation. The winter issue features an index of articles printed in all the back issues.	Simulation Research Group Bldg. 90, Room 3147 Lawrence Berkeley Laboratory Berkeley, CA 94720 Contact: Kathy Ellington Phone: (510) 486-5711 FAX: (510) 486-4089 or -5172 e-mail: kathy%gundog@lbl.gov
Help Desk – Bruce Birdsall Call our help desk if you have a question about advanced modeling techniques. If you need to fax an example of your problem, please use the Simulation Research Group's fax number (510-486-4089) and we will forward it. This service is supported by the Simulation Research Group.	Bruce Birdsall Ph: (510) 829-8459. Hours: Monday through Friday 10:00 a.m. to 3:00 p.m. Pacific Time
DOE-2 Training DOE-2 courses for beginning and advanced users.	Energy Simulation Specialists 64 East Broadway, Suite 230 Tempe, AZ 85282 Contact: Marlin Addison Phone: (602) 967-5278
Instructional DOE-2 Video and Manual	JCEM/U. Colorado Campus Box 428 Boulder, CO 80309-0428 Contact: Prof. Jan Kreider Phone: (303) 492-3915
Weather Tapes TMY (Typical Meteorological Year) TRY (Test Reference Year)	National Climatic Data Center Federal Building Asheville, North Carolina 28801 (704) 259-0871 climate data (704) 259-0682 main number
CTZ (California Thermal Climate Zones)	California Energy Commission Bruce Maeda, MS-25 1516-9th Street Sacramento, CA 95814-5512 1-800-772-3300 Energy Hotline
WYEC (Weather Year for Energy Calculation)	ASHRAE 1791 Tullie Circle N.E. Atlanta, GA 30329 (404) 636-8400

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Consulting Engineers Charles Fountain Burns & McDonnell Engineers 8055 E. Tufts Avenue, Suite 330 Denver, CO 80237 (303) 721-9292	**Consultant** Greg Cunningham Cunningham + Associates 512 Second Street San Francisco, CA (415) 495-2220
Microcomputer DOE-2 for European Users Werner Gygli Informatik Energietechnik Weiherweg 19 CH-8604 Volketswil Switzerland	**Consultant** Jeff Hirsch 2138 Morongo Camarillo, CA 93010 (805) 482-5515
Large Facility Modeling George F. Marton, P.E. 1129 Keith Avenue Berkeley, CA 94708 (510) 841-8083	**Computer-Aided Mechanical Engineering** Mike Roberts Roberts Engineering Co. 11946 Pennsylvania Kansas City, MO 64145 (816) 942-8121
Mainframe DOE-2 for European Users Joerg Tscherry EMPA, Section 175 8600 Dubendorf Switzerland	**Consultant** Philip Wemhoff 1512 South McDuff Avenue Jacksonville, FL 32205 (904) 632-7393
Consultant Steven D. Gates, P.E. Building HVAC Design/Performance Modeling 9718-A Fair Oaks Boulevard Fair Oaks, CA 95628 (916) 638-7540	**Consultant** Donald E. Croy CAER Engineers, Inc. 814 Eleventh Street Golden, CO 80401 (303) 279-8136
Mechanical Engineers Chuck Sherman Energy Simulation Specialists 64 East Broadway, Suite 230 Tempe, AZ 85282 (602) 967-5278	**DSM and Energy Engineering** Michael W. Harrison, P.E. Energy Resource Management, Inc. 305 West Mercury Butte, MT 59701 (406) 723-4061
Consulting Engineers Jeff Ponsness, P.E. Criterion Engineers 5331 SW Macadam Ave., Suite 205 Portland, OR 97201 (503) 224-8606	**Hourly Calibrated DOE-2 Analysis** Jeff S. Haberl Energy Systems Laboratory Texas A&M University College Station, TX 77843-3123 (409) 845-6065
Consultant Martyn C. Dodd Gabel Dodd Associates 761 Sir Francis Drake Blvd. San Anselmo, CA 94960 (415) 456-7588	**Consulting Engineers** Prem N. Mehrotra General Energy Corporation 230 Madison Street Oak Park, IL (708) 386-6000
Energy Management Specialists Hank Jackson, P.E. R,C, & I Engineering Services P.O. Box 2059 Asheville, NC 28802 (704) 254-6080	**Consultant/Building Systems Analysis** Robert H. Henninger, P.E. ElectroCom GARD Ltd. 7449 N. Natchez Avenue Niles, IL 60714 (708) 647-3252

DOE-2 Program Documentation

Document	Order Number	Price
DOE-2 Basics Manual (2.1D)	DE-920-07955	43.00*
BDL Summary (2.1D)	DE-890-17726	26.00*
Sample Run Book (2.1D)	DE-890-17727	66.00*
Reference Manual (2.1A)	LBL-8706, Rev.2	115.00*
Supplement (2.1D)	DE-890-17728	59.00*
Engineers Manual (2.1A) [algorithm descriptions]	DE-830-04575	50.00*

* Prices shown are for shipment within the United States; for shipment to foreign countries, double the U.S. prices.

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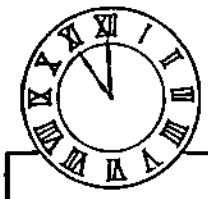
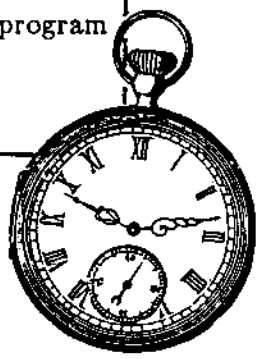


Negative Time Zone Bug

In some PC versions of DOE-2.1D (and in the pre-April 20, 1993 versions of the Hirsch & Associates PC test version of DOE-2.1E) you will get incorrect solar calculations if you input TIME–ZONE *less than 0* (i.e., time zones east of Greenwich).
For example, if you input TIME–ZONE = -3, the program will incorrectly set TIME–ZONE = 0, which will give sun positions that are 3 hours off. To see if you have this problem, check the time zone printed in Loads verification report LV–A.

The work-around is to *not* input TIME–ZONE, in which case the program will get it from the weather file and the reset to 0 will not occur.

This is not a problem on the mainframe versions of DOE-2.



A new LBL report (LBL-32931) describes a method of optimizing solar control and daylighting performance in commercial office buildings. We have reprinted the abstract; you may order the report by contacting Pat Ross by fax at (510) 486-4089.

A Method of Optimizing Solar Control and Daylighting Performance in Commercial Office Buildings

by
Robert Sullivan, Eleanor Lee, and Steven Selkowitz
Building Technologies Program
Energy and Environment Division
Lawrence Berkeley Laboratory
Berkeley, CA 94720

Abstract

We present a method for analyzing the annual cooling and lighting energy use and peak demand associated with varying fenestration and lighting strategies in commercial office buildings. A prototypical office building module consisting of four perimeter zones and a central core zone was defined and a series of DOE-2 building energy simulations were completed to create a data base for varying fenestration and lighting system parameters. Using regression analysis procedures, we characterize electric energy an peak performance patterns as a function of *solar aperture*, defined as the product of shading coefficient and window-to-wall ratio, and *effective daylight aperture*, defined as the product of visible transmittance and window-to-wall ratio. Optimum performance consists of defining the solar and effective daylighting aperture values that minimize annual energy consumption and peak demand, a process easily facilitated by the methods described herein.

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