BUILDING ENERGY SIMULATION

For Users of EnergyPlus, SPARK, DOE–2, BLAST, Genopt, Building Design Advisor, ENERGY–10 and their Derivatives

What's New ?

Release of EnergyPlus 1.0.1

EnergyPlus 1.0.1 may be downloaded free of charge from http://www.energyplus.gov. Turn to p. 2 for the new features.

EnergyPlus wins Awards!

The EnergyPlus program has won an award from the Federal Laboratory Consortium for Technology Transfer. EnergyPlus has also won the 2001 DOE Award for Information Technology.

Download VisualSPARK 1.0.1

Version 1.0.1 of VisualSPARK is available as a free download. Go to http://SimulationResearch.lbl.gov and click on VisualSPARK 1.0.1 in the left menu. User manuals are available as PDF files.

DOE-2 Bug/Change List

The entire, up-to-date bug fix and additions list for DOE-2.1E is available as a text file on our website. It's at http://SimulationResearch.lbl.gov under "DOE-2" in the left menu

New DOE-2 Consultant in Texas

Tarek Bou-Saada is the newest DOE-2 consultant; please turn to p. 10.

IBPSA-USA Free Membership

The IBPSA-USA Board of Directors has waived the annual membership fee for 2002; see p. 13.

What's Inside ?

EnergyPlus Version 1.0.1

To download a free copy of the program go to

www.energyplus.gov

Features of EnergyPlus 1.0.1

1. **Linux version**

2. **End-use meters**

3. **Auto sizing of system components and equipment.**

4. **Trombe wall**

5. **Photovoltaic calculations (through TRNSYS link)**

6. **New Window-Related Features**

   - **Window blind model (slat-type shading devices such as Venetian blinds).**
   - **Coupling of window blinds to daylighting calculation.**
   - **More control types for shading devices, including heating season controls.**
   - **Capability to import a window data file from WINDOW 5; allows EnergyPlus to do annual energy run on a window designed in WINDOW**
   - **Ability to assign a shading device to a window imported from WINDOW**
   - **Calculation of beam solar radiation passing through interior windows (needed for modeling double-envelope buildings).**
   - **Window blinds with movable slats and associated slat-angle control options.**
   - **Window gap fill as a mixture of gases rather than a single gas.**
   - **Triangular windows.**

7. **New input file example for each new feature.**

8. **New HVAC system templates:**

   - **Zone Thermostat**
   - **Purchased Air**
   - **Four Pipe Fan Coil**
   - **VAV Single Duct with Reheat**
   - **Packaged Furnace with DX Air Conditioner**
   - **Purchased Hot Water and Chilled Water Supply Loop**
   - **Single Boiler Supply Loop**
   - **Single Chiller Supply Loop.**

9. **Version 1.0.1 has ben tested against:**

   - **HVAC BESTEST (IEA SHC Task 22 Building Energy Analysis Tools)**
   - **ASHRAE RP-1052, Development of an Analytical Verification Test Suite for Whole Building Energy Simulation Programs - Building Fabric**
   - **ANSI/ASHRAE Standard 140-2001 [BESTEST] (updated results)**

10. **Weather utility updates—now automatically includes ASHRAE 2001 HOF design conditions, typical/extreme periods within weather file, new summary report, and processes new formats such as ASHRAE IWEC and ESP-r text. Weather data now available on EnergyPlus web site for more than 570 locations (80 countries).**

11. **Air-to-air heat pump**

12. **Water-to-water heat pump (Ground loop heat exchanger and Ground Source Heat Pump)**

13. **Air Cooled Condenser**

14. **Evaporatively cooled condenser (simplified)**

15. **Dehumidification Control (Cooling Coil) added for unitary systems. DX coil meets the dehumidification load; uses heating coil to offset excess sensible cooling that is provided.**

16. **DOE-2 Translator Improvements: (INTERIOR-WALL, FIXED-SHADE, LIKE, SET DEFAULT, purchased air solution, bug fixes)**

17. **IDFEditor (support for ',' as decimal point)**

18. **Major updates to gas heating coil--electric parasitics, part-load performance curve, and fan and coil cycling controls.**

19. **Node connection validation.**

20. **Branch and Node Details report (.bnd file)**

21. **Surface Details report**

22. **Many HVAC/plant changes, details on request. New or changed items include:**
    - **Gas Turbine Chiller**
    - **Heat Recovery in Gas Turbine Chiller**
    - **Electric Baseboard option**
    - **Boilers, Plant Supply and Condenser Supply**
    - **DX Coil**
    - **System night cycle control**

23. **Movable transparent insulating material for walls**

24. **Introduction of translation programs for converting previous version input files to latest release (Main folder, TransitionV1-0-0-to-V1-0-1.exe, Rules1-0-0to1-0-1.xls, Report Variables 1-0-0-023 to 1-0-1.csv**

25. **WinEPDraw utility program**

26. **Versioning on all input data files.**

EnergyPlus – What it is, What it is not

A statement from the EnergyPlus Development Team

EnergyPlus is a simulation program designed for modeling buildings with all their associated heating, cooling, lighting, ventilating and other energy flows. EnergyPlus is a stand-alone simulation engine without a 'user friendly' graphical interface . . . EnergyPlus reads input and writes output as text files. Private sector interfaces are under development--the first is anticipated to be available by June 2002. (More than five private sector companies have indicated that they intend to develop EnergyPlus interfaces.) Because public funds (U.S. Department of Energy, primarily) were used to develop EnergyPlus, we chose to develop the engine and not try to be all things to all users. Developing good user interfaces takes many resources, specific attention to problem domains, and backing from specific user communities. The team feels that those interests are better served through private considerations where domain-specific funding may help quantify the requirements.

New!!   EnergyPlus Weather Data

The EnergyPlus development team is pleased to announce that our web site now offers more than 570 weather locations available for download and ready to use with EnergyPlus. There are 275 locations in the United States, 16 California thermal zones, 55 Canadian locations, and 233 international locations in more than 80 countries.
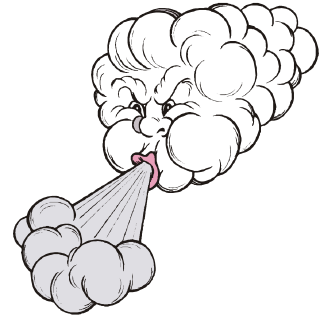
Go to www.energyplus.gov

**On the right side, under Weather Data, click on one of the following links:
USA, California, Canada or International.**

We recommend that you also download the weather utility RPT file for each location. The RPT file includes design data where available, statistics for the weather file, including typical and extreme periods (hottest summer week, coldest winter week, typical spring week, etc), Koppen climate classification, heating and cooling degree days, monthly average minimum and maximum dry bulb and dew point temperatures, undisturbed ground temperatures, direct and diffuse solar radiation, relative humidity, and wind speed and direction.

GenOpt 1.1.2

Generic Optimization Program

GenOpt is a multi-parameter optimization program; it automatically finds the values of user-selected design parameters that minimize a cost function, such as annual energy use, calculated by an external simulation program like EnergyPlus, SPARK, DOE-2, BLAST, TRACE, TRNSYS, etc.

GenOpt can be used with any simulation program that has text-based input and output. It also offers an interface for adding custom optimization algorithms to its library.

Release of GenOpt 1.1.2

GenOpt 1.1.2 fixes problems in reading simulation output files where the objective function value is followed by a comma. Such output strings can be found, for example, in some EnergyPlus outputs.

Also, a method called 'postProcessObjectiveFunction(int, double[] f)' has been added to the file named 'Optimizer.java'. You can modify this function to easily implement post-processing of the objective function value, such as adding two outputs to seek the minimum of the sum of the two outputs.

Example files have been added to the **GenOpt** web page (http://SimulationResearch.lbl.gov > GenOpt) to help users set up the program to optimize EnergyPlus simulations. **GenOpt** input files still have the same syntax as in version 1.1.1. Therefore, your **GenOpt** input files are compatible with the new version.

GenOpt 1.1.2 (with user manual) may be downloaded free of charge from

http://SimulationResearch.lbl.gov > GenOpt

DOE-2

DOE-2.1E (version 119) 1,000-Zone version for Windows from ESTSC; other vendors of DOE-2 based programs are listed on our website: http://SimulationResearch.lbl.gov > DOE-2

Cost is as follows:

- $ 300   U.S. Government, non-profit Educational
- $ 575   U.S., Mexico, Canada
- $ 1268   Japan only
- $ 1075   All Other Non-U.S.

DOE-2 Documentation on a CD from ESTSC - Cost US$100

What is included on the CD?

- DOE-2 Reference Manual (Part 1)
- DOE-2 Reference Manual (Part 2)
- DOE-2 Supplement to the Reference Manual (2.1E)
- DOE-2 BDL Summary (2.1E)
- DOE-2 Engineers Manual (2.1A)

Order Software and ESTSC Documentation

Ed Kidd
NCI Information Systems, Inc.
Energy Science and Technology Software Center (ESTSC)
P.O. Box 1020
Oak Ridge, TN 37831

Phone: 865/576-1037
Fax: 865/576-6436
Email: estsc@adonis.osti.gov

Free DOE-2 Documentation (http://SimulationResearch.lbl.gov > DOE-2 > Documentation)

- DOE-2 Basics (2.1E)

- Update Package #1:
  DOE-2.1E Basics, the Supplement and BDL Summary

- Update Package #2: (Version 107, DOE-2.1E)
  BDL Summary and Supplement.

- Update Package #3:
  Appendix A of the Supplement.

- Update Package #4: (1000-zone DOE-2.1E)
  BDL Summary.

- DOE-2 Modeling Tips (pdf)

DOE-2 Basics Manual and Update Packages 1, 2, 3 and 4, not included on the ESTSC CD, consist of scanned pdf files and may be downloaded from our web site. You may also request the same information on a CD by sending email to klellington@lbl.gov.

The files need to be printed and the update pages inserted into the existing DOE-2 manuals.

Note that Update Packages are **not** cumulative and each one contains different information. You have to download all four packages to update the DOE-2 documentation completely.

DOE-2 Modeling Tips a compilation of all the "how to" articles from the *Building Energy Simulation User News* (through 2001).

Purchase DOE-2 Documentation

DOE-2 Sample Run Book (2.1E) -- The Sample Run book is the only remaining DOE-2 manual not available electronically. It must be purchased separately from NTIS; information is at http://SimulationResearch.lbl.gov > DOE-2 > Documentation

DOE-2 Training	Private or group DOE-2 courses for beginning and advanced users:
	Contact Marlin Addison at (602) 968-2040, or send email to marlin.addison@doe2.com

DOE-2 Help Desk

Email, phone or fax the Simulation Research Group with your questions (klellington@lbl.gov).
Phone: (510) 486-5711, Fax: (510) 486-4089

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Changes to DOE-2.1E

Recent changes to DOE-2.1E are described. Shown at the left is the version number of DOE-2.1E, which is incremented for each change. Following is a short description of the changes, the initials of the author and date of change. Note that each version of DOE-2.1E includes all changes made up to and including that version number. Therefore, Version -119 includes all prior changes. You can determine which version of the program you are using by checking any of the output reports, where version *nnn* is indicated as DOE-2.1E-*nnn*.

-117 : dkey lds sys

Updated the Input Functions Global Variables Table after the changes   [EE 20011110]
for the big version of DOE-2.1E (IDENT -117, big1).

-118 : dkey

In Plant the tower keyword TWR-DESIGN-APPRO has the wrong units;   [FB 20011205]
it should be R (for delta T) not F (for T).
This means the metric conversion for this input will be incorrect.

-119 : bdl lds plt sim sys

Bug fix: PARAMETRIC-INPUT statement doesn't work and stops BDL.   [EE 20020315]

Fixed uninitialized variable in subroutine CPUTIM.   [EE 20020220]

Deleted unused subroutine SETFLS in bdl.f. Deleted unused subroutines DUMMY,
SETFLS, REQFLS in sim.f . Fixed bug in surface temperature calculations
(related to IDENT MODST). Uninitialized variable gives incorrect results.   [EE 20020318]

LBNL-47308

Development of a New Duct Leakage Test: Delta Q

by
I. S. Walker, M. H. Sherman, J. Wempeh, D. Wang,
J. A. McWilliams and D.J. Dickerhoff

Environmental Energy Technologies Department
Lawrence Berkeley National Laboratory

Abstract:

Duct leakage is a key factor in determining energy losses from forced air heating and cooling systems. Several studies have shown that duct system efficiency cannot be reliably determined without good estimates of duct leakage. Specifically, for energy calculations, it is the duct leakage air flow to outside at operating conditions that is required. Existing test methods either precisely measure the size of leaks (but not the flow through them at operating conditions), or measure these flows with insufficient accuracy. The Delta Q duct leakage test method was developed to provide improved estimates of duct leakage during system operation. In this study we developed the analytical calculation methods and the test procedures used in the Delta Q test. As part of the development process, we estimated uncertainties in the test method (both analytically and based on field data) and designed automated test procedures to increase accuracy and reduce the contributions of operator errors in performing field tests. In addition, the test has been evaluated in over 100 houses by several research teams to show that it can be used in a wide range of houses and to aid in finding limits or problems in field applications. The test procedure is currently being considered by ASTM as an update of an existing duct leakage standard.

This report is available electronically at
http://epb.lbl.gov/Publications/lbnl-47308.pdf
For duct research at LBNL, go to **http://ducts.lbl.gov.**
If you would like a complete list of publications about Indoor Environmental Research at LBNL, contact **Olivia Salazar** *at* **ocsalazar@lbl.gov***.*

Also download the California Energy Commission's most recent "blueprint" newsletter (Spring/Winter 2002), it's a special issue on duct sealing. The url is http://38.144.192.166/efficiency/blueprint/index.html.

LBNL-pending

A Zonal Model for Predicting Simultaneous Heat and Moisture Transfer in Buildings

by
K. C. Mendonça[1,2], C. Inard[1], E. Wurtz[1],
F. C. Winkelmann[3] and F. Allard[1]

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La Rochelle, France
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Curitiba, PR, Brazil
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90-3147 Building Technologies
Berkeley, CA, USA

Abstract:

To study the influence of adsorption/desorption by building materials on indoor air behavior, we have developed a zonal model to predict temperature and moisture fields in a room. This model is composed of two sub-models that represent indoor air conditions and room envelope. The heat and mass transfer across the building envelope are predicted by "evaporation and condensation" theory. The resulting set of non-linear coupled equations is solved simultaneously by the oriented-object platform, SPARK. In a study case with 27 zones the proposed model is compared to one without adsorption/desorption by building materials. The results indicate that adsorption/desorption influences the moisture field in confined spaces.

This report is available electronically at
http://SimulationResearch.lbl.gov/dirpubs/katia_02.pdf

♦ ♦ ♦ Version 1.5 was scheduled to be released May 2, 2002 – Go to www.sbicouncil.org for more news! ♦ ♦ ♦

ENERGY-10, Version 1.3 with WeatherMaker

Version 1.3 of ENERGY-10 is now available. It includes the much-anticipated *WeatherMaker* function. *WeatherMaker* allows users to create their own weather files based on information available from nearly 4,000 weather stations throughout the U.S. Revisions to the program itself include some minor fixes, an improved and expanded Help section, and greater clarity in titling and identification of various sections. Contact the Sustainable Buildings Industries Council for more information, or to order your upgrade disc (the cost is $15, which covers production and shipping).

ENERGY-10, written in C^{++}, is a design tool for smaller residential or commercial buildings that are less than 10,000 ft^2 floor area, or buildings that can be treated as one- or two-zone increments. It performs whole-building energy analysis for 8760 hours/year, including dynamic thermal and daylighting calculations. ENERGY-10 was specifically designed to facilitate the evaluation of energy-efficient building features in the very early stages of the design process.

Input: Only four inputs required to generate two initial generic building descriptions. Virtually everything is defaulted but modifiable. As the design evolves, the user adjusts descriptions using fill-in menus (utility-rate schedules, construction details, materials).

Output: Summary table and 20 graphical outputs available, generally comparing current design with base case. Detailed tabular results also available.

Platform: PC-compatible, Windows 3.1/95/98, Pentium processor with 16 MB of RAM is recommended.

Douglas K. Schroeder
1331 H Street N.W., #1000
Washington, DC 20004

Tel: 202.628.7400 ext 210
Fax: 202.383.5043
www.sbicouncil.org

Sustainable Buildings Industry Council (SBIC)

SBIC Workshops
   May 8, 2002   Designing Low-Energy Buildings with ENERGY-10 (Charlotte, NC)

ENERGY-10 User Group at http://www.sbicouncil.org/forum

SBIC Bookstore at http://www.sbicouncil.org/store/resources.php#pubs
  ✓ *High Performance School Buildings Resource & Strategy Guide*
  ✓ *Low-Energy Sustainable Building Design for Federal Managers*
  ✓ *Designing Low-Energy Buildings With ENERGY-10*
  ✓ *Guidelines for Home Building*
  ✓ *Mastering ENERGY-10*

Web Sites

For Building Energy Efficiency

http://arch.hku.hk/research/BEER	**Building Energy Efficiency Research**

BEER is the Building Energy Efficiency Research project of the Architecture Department at the University of Hong Kong. Sam Hui (cmhui@hku.hk) is their building simulation expert and head of the Hong Kong DOE-2 Resource Center. BEER is an important source of building simulation information for the Hong Kong area. The site has links to Climate Analysis, Energy Standards, Sustainable Architecture and much more.

http:// http://www.jintek.com/binary.html	**Binary Calculator – FREE!**

Binary Calculator is a simple RPN-style calculator designed for programmers. It lets you manipulate numbers in a variety of formats and do binary operations on them that few other calculators allow. With BinCalc you can directly turn bits on and off just by clicking them. BinCalc requires System 7.1 or later on the Macintosh, or Windows 95 or NT on the PC, or BeOS PR2 on a PowerPC.

http://www.esbconsult.com.au/esbcalc/esbunitconv.html	**Unit conversion utility – FREE!**

A unit conversion utility that offers much more than the average, run-of-the-mill "miles to kilometers" converter. This powerful program converts time, angles, temperature, torque, etc.

http://phibot.org	**Intelligent tool for scientist**

Phibot, a special search engine designed specifically for mathematicians and scientists, is part of the *Adaptive Read Project*, a web-based experiment for collaborative information retrieval.

URLs to these sites are compliments of the LockerGnome Newsletter (www.lockergnome.com)

The man who removes a mountain begins by carrying away small stones

DoeRayMe

You are invited to test **DoeRayMe**, a new DOE-2.1E screening tool application currently being developed by Jason Glazer, P. E., of GARD Analytics, Inc. **DoeRayMe** is a simple and flexible interface that uses a specially developed DOE-2 input file (template) that contains special codes describing the parameters available to be changed in the user interface. This allows new screening tools to be developed by any DOE-2 user. Please visit the **DoeRayMe** web site at http://www.gard.com/DoeRayMe.

Building Design Advisor 2.0

Decision making through the integrated use of multiple simulation tools and databases

The **Building Design Advisor (BDA)** is a Windows® program that addresses the needs of building decision-makers from the initial, schematic phases of building design through the detailed specification of building components and systems. The BDA is built around an object-oriented representation of the building and its context, which is mapped onto the corresponding representations of multiple tools and databases. It then acts as a *data manager* and *process controller*, automatically preparing input to simulation tools and integrating their output in ways that support multi-criterion decision-making. Version 3.0 of the BDA is now available for Beta testing and includes links to three main simulation tools for daylighting, electric lighting and energy analyses:

- **DCM**, a simplified daylighting simulation tool,
- **ECM**, a simplified electric lighting simulation tool, and
- the **DOE-2.1E** building energy simulation program.

ECM, the **new electric lighting simulation tool** in BDA 3.0 beta, is integrated through BDA with DOE-2. BDA's Schematic Graphic Editor allows placement of electric lighting luminaires and specification of reference points for daylight-based electric lighting controls. Moreover, BDA now has the capability of **running DOE-2 parametrically** to generate a plot that shows the relationship between effective aperture and energy requirements. BDA 3.0 beta provides the added functionality of working with either **English units or Metric units**.

Current research and development efforts are focused on the development of links to **Desktop Radiance**, a Windows 95/98/NT version of the **Radiance** lighting/daylighting simulation and rendering software.

The BDA source code is available for licensing; if interested, please contact Dr. Papamichael at K_Papamichael@lbl.gov. To learn more about the BDA software and to download a copy of the latest public version (BDA 2.0), go to http://gaia.lbl.gov/BDA

For Beta Testing of BDA 3.0, contact Vineeta Pal at VPal@lbl.gov.

New DOE-2 Consultant !!

Energy Management/Engineering Services

Tarek Bou-Saada
4410 Grand Cayman Drive
Sugar Land, TX 77479

Tel: (281) 265-9139 -- bousaada@flash.net

Specializing in DOE-2 Measurement and Verification

Join the EnergyPlus User Group

The developers of EnergyPlus have formed a support group in order to foster discussion and maintain an archive of information for program Users. We invite questions about program usage and suggestions for improvement to the code. To join, go to groups.yahoo.com/group/EnergyPlus_Support/

Southern California Gas Company
Educational Programs - May-June 2002

To register, either call 800.427.6584 and select Option 1 or send email to erc@socalgas.com

May 1	**Title 24 Update: the Non Residential Standards**
	Get practical information to comply with California's new, more stringent Title 24 standards for energy efficiency in new construction.
May 14	**Controlling HVAC Costs Through the Use of Energy Management Systems**
	How energy management systems can be used to reduce energy costs for HVAC systems; live demo.
June 4	**EnergyPro Training (Non Residential): Envelope · Lighting · WIndows**
	Explore advanced envelope design options, lighting analysis basics, etc. using EnergyPro 3.1, California state-certified energy modeling software for Title 24 compliance.

The Energy Resource Center is located at 9240 Firestone Boulevard in Downey, CA 90241.
The striking, award-winning building (shown above) was designed using DOE-2

Join the BLDG-SIM Mailing List

BLDG-SIM is a mailing list for users of building energy simulation programs like EnergyPlus, DOE-2, Trace-600, HAP, BLAST, ESP, SERIRES, TRNSYS, TASE, ENERGY-10 and others. Because building simulation professionals are located worldwide, the BLDG-SIM list is an attempt to foster the development of a community of those users. Users of all levels of expertise are welcome and are encouraged to share their questions and insights about these programs.

The web page for BLDG-SIM is http://www.gard.com/bldg-sim.htm

Jason Glazer, P.E., Of GARD Analytics, Inc. Is the list administrator (jglazer@gard.com).

The Lowdown on Downloads from Lawrence Berkeley National Laboratory

Free Downloads

BDA 2.0 (Building Design Advisor) *A beta version of 3.0 is available from vpal@lbl.gov*	**gaia.lbl.gov/BDA**
COMIS (multi-zone air flow and contaminant transport model)	**www-epb.lbl.gov/comis**
EnergyPlus 1.0 (new-generation whole-building energy analysis program, based on BLAST and DOE-2)	**www.energyplus.gov** --or-- **SimulationResearch.lbl.gov > EnergyPlus**
GenOpt®1.1 (generic optimization program)	**SimulationResearch.lbl.gov > GenOpt**

RADIANCE
(analysis and visualization of lighting in design)
   Desktop Radiance (integrates the Radiance Synthetic
   Imaging System with AutoCAD Release 14)
	radsite.lbl.gov/radiance/
	
	radsite.lbl.gov/deskrad/

RESEM (Retrofit Energy Savings Estimation Model) (calculates long-term energy savings directly from actual utility data)	**eetd.lbl.gov/btp/resem.htm**
SUPERLITE (calculates illuminance distribution for room geometries)	**eetd.lbl.gov/btp/superlite2.html**
THERM 2.1a (models two-dimensional heat-transfer effects in building components where thermal bridges are of concern)	**windows.lbl.gov/software/therm/therm.html**
VisualSPARK 1.0.1 (Simulation Problem Analysis and Research Kernel) (connect component models to simulate innovative building envelope and HVAC systems)	**SimulationResearch.lbl.gov > VisualSPARK**
WINDOW 5 (thermal analysis of window products)	**windows.lbl.gov/software/window/ window.html**

Free Software / Request by Fax from 510.486.4089

RESFEN 3.1 (choose energy-efficient, cost-effective windows for a given residential application)	**windows.lbl.gov/software/resfen/resfen.html**

Web Based

Home Energy Saver (quickly computes home energy use) and **Home Improvement Tool** (simplified Home Energy Saver)	**hes.lbl.gov** and **hit.lbl.gov**

Purchase

ADELINE 2.0 (daylighting performance in complex spaces)	**radsite.lbl.gov/adeline/**

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BLAST*news*

www.bso.uiuc.edu

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University of Illinois, 1206 West Green Street
Urbana, IL 61801
Tel: (217) 333-3977 - Fax: (217) 244-6534
support@blast.bso.uiuc.edu

The **Building Loads Analysis and System Thermodynamics (BLAST** program predicts energy consumption, energy system performance and cost for new or existing (pre-retrofit) buildings.

BLAST contains three major sub-programs:

- **Space Load Prediction** computes hourly space loads in a building based on weather data and user inputs detailing the building construction and operation.

- **Air Distribution System Simulation** uses the computed space loads, weather data, and user inputs.

- **Central Plant Simulation** computes monthly and annual fuel and electrical power consumption.

Heat Balance Loads Calculator (HBLC)
The BLAST graphical interface (HBLC) is a Windows-based interactive program for producing BLAST input files. You can download a demo version of HBLC (for MS Windows) from the BLAST web site (User manual included).

HBLC/BLAST Training Courses
Experience with the HBLC and the BLAST family of programs has shown that new users can benefit from a session of structured training with the software. The Building Systems Laboratory offers such training courses on an as needed basis typically at our offices in Urbana, Illinois.

WINLCCID 98
LCCID (Life Cycle Cost in Design) was developed to perform Life Cycle Cost Analyses (LCCA) for the Department of Defense and their contractors.

To order BLAST-related products, contact the Building Systems Laboratory at the address above.

Program Name	Order Number	Price
PC BLAST Includes: BLAST, HBLC, BTEXT, WIFE, CHILLER, Report Writer, Report Writer File Generator, Comfort Report program, Weather File Reporting Program, Control Profile Macros for Lotus or Symphony, and the Design Week Program. The package is on a single CD-ROM and includes soft copies of the BLAST Manual, 65 technical articles and theses related to BLAST, nearly 400 processed weather files with a browsing engine, and complete source code for BLAST, HBLC, etc. Requires an IBM PC 486/Pentium II or compatible running MS Windows 95/98/NT.	3B486E3-0898	$1500
PC BLAST Package Upgrade from level 295+	4B486E3-0898	$450
WINLCCID 98: executable version for 386/486/Pentium	3LCC3-0898	$295
WINLCCID 98: update from WINLCCID 97	4LCC3-0898	$195
The last four digits of the catalog number indicate the month and year the item was released or published. This will enable you to see if you have the most recent version. All software will be shipped on 3.5" high density floppy disks unless noted otherwise.		

FREE Membership in 2002!!!

Pacific Gas and Electric Company™
PG&E
WE DELIVER ENERGY.™

PG&E Spring 2002 Programs

To register call the Pacific Energy Center (at least one week in advance) 415.973.7268 or go to www.pge.com/pec

HVAC

May 7	**Designing Mechanical Systems for Indoor Air Quality** – Program covers Title 24 and ASHRAE 62-1999 requirements, methods of achieving minimum ventilation on VAV systems and techniques to achieve ventilation effectiveness.
May 8	**Labs for the 21st Century – High Performance, Low Energy Laboratory Design Course** This one-day course will provide a comprehensive understanding of the opportunities to optimize energy performance of new and existing laboratories. The course will be taught by seasoned laboratory designers, energy managers, and facilities professionals.

WHOLE-BUILDING PERFORMANCE

May 21 **May 22** **May 29**	**Building Energy Audits –** An overview of energy auditing techniques, tools, and software including building benchmarking, billing data analysis, identifying energy conservation opportunities, and cost and payback calculations, and the use of monitoring equipment through a series of hands-on exercises.

ARCHITECTURE

May 9 **May 17**	**The Glass Class** - Learn the performance characteristics of high performance glazing and how to specify it for your projects. Discover how shading devices affect glazing performance, energy efficiency, and quality of the indoor environment.
May 23 **June 11**	**Photovoltaic Systems (PVs) for Architects –** Studies of PV installations, discuss the pros and cons of different installation types, and provide answers to frequently asked questions about PV. Fundamentals.
June 18 **June 19 or** **June 20**	**Site Analysis for Architects** – Learn how to assess climate data, recognize the appropriateness of low-energy or passive design strategies and use measurement tools to analyze site variables.
June 24	**Residential Wall Sections –** Best practice in the design of residential exterior walls includes the interior finishes, the building frame, insulation, moisture barriers, and exterior finishes in the right combination for the local climate.

LIGHTING

July 9	**Lighting Design for Architects –** Lighting concepts for architects, including terminology, visual perception, surface properties, light and color theory, equipment, design criteria, and applied design.
July 10	**Task and Ambient Lighting Solutions –** Using the 2001 Advanced Lighting Guidelines, we will explore the techniques for optimizing occupant lighting comfort and energy efficiency.

EVENING LECTURES

May 16	**Charles Eley – The Future of Title 24 Energy Standards** The California energy-efficiency standards (Title 24) were recently revised under emergency statute. They are being revised again for adoption in July 2003 and enforcement in 2005. Charles Eley, a prime contractor to the CEC, provides a glimpse into what the future holds with regard to California's trend-setting standards.
May 30	**Athena and Bill Steen – Building with Earth and Straw** Athena and Bill Steen will present their work constructing inexpensive, energy-efficient buildings in Mexico and the United States using primarily local and natural materials. Their building techniques emphasize a high degree of craftsmanship and beauty.

Using WINDOW 4 Data in DOE-2.1E -- and "-*nan*" outputs

The

DOE-2

Puzzler

Question:

I have a question about the use of WINDOW 4 data within DOE-2. There's a discrepancy between the WINDOW 4 data and the window results listed in DOE-2 LOADS reports LV-D and LV-H. I have run tests with a file using only one window of the same size and details as per WINDOW 4 and found that the Center-of-Glass (CoG) U-value in LV-H differs from the CoG U-value in WINDOW 4. In addition, the U-value from LV-D differs from the whole window U-value in WINDOW 4. Do you have any idea why this is? And do the values in the DOE-2 reports include:

a) a fixed outside air film resistance as the documentation seems to indicate?

b) a weighted average of the actual outside air film resistance from the weather file

c) no outside air film resistance; and

d) is an inside air film resistance included?

Answer:

Both LV-D and LV-H include inside and outside air film resistances. Prior to Version 098, the values (in $[Btu/ft^{-2}\text{-}h\text{-}F]^{-1}$) were:

in LV-D, $R_{out} = 0.4$, $R_{in} = 0.68$
in LV-H, $R_{out} = 0.2987$, $R_{in} = 0.68$

Starting with version 098, R_{out} was made the same in LV-D and LV-H and set to 0.1957, which corresponds to a wind speed of 15 mph (winter conditions). This is close to the values used in the DOE-2 file from WINDOW 4 at this wind speed: 0.1980 for zero solar and 0.1971 for 783 W/m^2 beam solar at normal incidence.

So, beginning with Version –098 we have
in LV-D, $R_{out} = 0.1957$, $R_{in} = 0.68$
in LV-H, $R_{out} = 0.1957$, $R_{in} = 0.68$

In the DOE-2 file from WINDOW 4, R_{in} varies from 0.75 to 0.85 compared to 0.68 in LV-D and LV-H.

In the hourly calculation DOE-2 splits R_{out} into convective and radiative pieces and uses a convective piece that depends on wind speed and direction, and on surface tilt. R_{in} is constant and depends on surface tilt.

A note on frame U-values: DOE-2 does not use the frame characteristics on the WINDOW 4 data files – you have to input your own frame. In Versions –080 and earlier the frame U-value in LV-D had no outside film resistance. Starting with Version –081 an outside film resistance of 0.4 was added and in version –098 this was changed to 0.1957. These values of frame outside film resistance are not used in the hourly calculation but are replaced with the same values used for the glazing.

Question: I am getting "-*nan*" outputs in my SIM file. What does this mean?

Answer: It means "not a number" but somehow I don't think this fully answers your question. ☺
The "-*nan*"s might be the result of a divide by zero. Try changing your inputs, such as the system flow rate.

***Please email your "DOE-2 Puzzler" questions to* KLEllington@lbl.gov**

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