



**US Army Corps
of Engineers®**

Engineer Research and
Development Center

Building Loads Analysis and System Thermodynamics (BLAST)

Technology

The Building Loads Analysis and System Thermodynamics (BLAST) energy analysis software program estimates the energy performance of new or retrofit building design options of almost any type and size. BLAST performs peak load (design day) calculations necessary for mechanical equipment design, and also estimates a facility's annual energy performance, which is essential for the design of solar and total energy (cogeneration) systems and for determining compliance with design energy budgets. BLAST encompasses three major subprograms, which compute hourly requirements of the space loads, calculate demands (hot water, steam, gas, electrical, chilled water) of the building and air-handling systems, and compute the hourly annual fuel and electrical power consumptions.

The heart of space loads prediction is the room heat balance. For each hour simulated, BLAST performs a complete radiant, convective, and conductive heat balance for each surface of each zone described and a heat balance on the room air. This heat balance includes transmission loads, solar loads, internal heat gains, infiltration loads, and the temperature control strategy used to maintain the space temperature. A companion program, the Life-Cycle Cost in Design (LCCID), provides life-cycle calculations. User inputs include building construction and operating costs (excluding energy), fan system construction and maintenance costs, and user-supplied and default capital and maintenance costs for plant components. In addition, users may select appropriate fuel cost adjustment factors as well as discount and inflation rates.

Problem

Many decisions made during the design phase of a building affect the energy consumption and cost over the life-cycle of the facility. Changes made early in the facility design can result in a more cost-effective, energy-conserving building. The complexity of building interactions requires some computerized method for predicting energy consumption and system performance. For such a program to be comprehensive and account for complex technologies (such as ice storage), an hour-by-hour analysis is required.

Expected Cost To Implement

An initial purchase of BLAST (software package for IBM 486/ Pentium/ Pentium II with a numeric co-processor) costs \$1500.00; an upgrade from BLAST 295 or greater costs \$495.00.

Benefits/Savings

Since repeated use of BLAST is inexpensive, it can be used to evaluate, modify, and re-evaluate alternate designs on the basis of annual energy consumption and cost. This separates efficient designs from inefficient ones, and can help to determine proper equipment type, size, and control. This approach can help develop near optimal designs for any new or retrofit project.

Status

The BLAST family of programs is maintained and enhanced through direction from the BLAST users. New windows interfaces for BLAST and LCCID are currently under release. Currently, BLAST technology is being incorporated into the DOE (Department of Energy) funded EnergyPlus software tool, available through URL:

<http://www.eere.energy.gov/buildings/energyplus/>

ERDC POC

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**Distribution
Source**

BLAST Support Office (BSL), 140 Mechanical Engineering Building, MC-244, 1206 West Green Street, Urbana, IL 61801, Phone: (217) 333-3977. An order form is available through the BLAST Support Office at URL: <http://www.bso.uiuc.edu/orderform.html>



**Available
Documentation**

User manuals may be purchased from the listed distribution source. Related information can be found through the BLAST Support Office Documentation Index (David Jacobson, *A Bibliography of BLAST Related Articles* [October 1986]), available online at URL: <http://www.bso.uiuc.edu/BLAST/bibliography.html>

**Available
Training**

The BSL offers individualized and group training courses that can be tailored to specific interests of the participants. Information about scheduling a training course and the current fees is available by contacting the BSL at: <http://www.bso.uiuc.edu/contact.html>

**Available
Support**

Support is available for current versions of programs only. Support will be provided through email, voice mail, and fax. Questions will be forwarded directly to a BLAST Consultant who will respond within one business day after receipt of the question.