

## **eQUEST version 3.6 and DOE-2.2 version 44 Released**

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These new versions of eQUEST and DOE-2.2 were posted to <http://DOE2.com> on August 12, 2006. eQUEST 3.6 contains a complete version of DOE-2.2 version 44d3 as its simulation engine. This version of eQUEST was also submitted, along with D2Comply version 3.6, to the California Energy Commission for certification as an Alternative Calculation Method for the non-residential 2005 Title 24 Standards. Additionally, eQUEST 3.6 has been updated to perform analysis of energy savings and calculate incentive payments for the California State-wide Saving By Design new construction energy efficiency program.

Below is a partial list of new features you will find in eQUEST 3.6 and DOE-2.2-44d3.

### **New simulation features in DOE-2.2 version 44**

(Excerpts from Volume 6 of DOE-2.2 Manuals – all have new eQUEST interface controls as well)

#### **Water-Loop and Ground Source Heat Pump Enhancements**

The ability to model water loop heat pumps, in both ground coupled and conventional configurations, has been greatly enhanced in two major ways:

1. Water-source heat pump – the PVVT, PVAVS and PSZ systems can now be specified to be water-loop heat pump systems thus allowing all the options of these SYSTEM TYPEs to be available for use in modeling water-loop heat pump configurations (including variable flow, staged heating and cooling, heat recovery, ERV's, as well as sub-zone conditioning and return air plenum pathways).
2. Vertical well ground source heat exchangers – a new modeling approach has been added to more accurately model vertical wells. This new model allows the specification of grout properties, the fluid type plus a library of 42 well configurations is included..

These enhancements to the water-source and ground-source heat pump modeling capability of DOE-2.2 were supported, in part, by ClimateMaster, Inc. The new vertical well ground heat exchanger model is based upon work by Claesson, Eskilson, Hellstrom, et.al, at the University of Lund, Sweden and Spitler, et.al, at Oklahoma State University; changes for the new heat exchanger models were implemented in collaboration with ClimateMaster.

#### **Small "Frictionless" Centrifugal Chillers**

Centrifugal chillers most commonly have been available in sizes 300 tons (1000 kW) and larger. Recent developments in compressor technology now allow hermetic centrifugal chillers to be available in sizes as small as 70 tons (250 kW). These compressors utilize frictionless bearings and do not circulate oil with the refrigerant. Capacity modulation is via a variable-speed drive and inlet vanes. Multiple compressors can share a common evaporator and condenser (not circuited separately), further improving part load performance.

The implementation into DOE-2.2 is for chillers with water-cooled condensers. As with any variable-speed centrifugal, part-load performance is maximized by allowing the cooling tower temperature to float, or by utilizing a wetbulb-reset strategy. Models for the use of small frictionless compressors in air-cooled chillers and built-up DX equipment are planned for later during 2006 and early 2007.

### **Glass Manufacturer Window Library**

A new set of window entries have been added to the window library. These entries reflect actual products sold on the market today. Depending on whether the glazing system is single glazed, double glazed or triple glazed, the user can select a window with a glazing system from a specific glass manufacturer. The user needs to be familiar with the glass types offered by a manufacturer in order to select the corresponding window system from the library.

The new windows were created within WINDOW 5.2 using glass from release 14.4 of the International Glazing Database (IGDB 14.4). The International Glazing Database includes spectral data for glass manufactured by all glass manufacturers who have chosen to submit their data for peer review to Lawrence Berkeley National Laboratory. Use of these windows improves the accuracy of the calculations because the windows represent actual products and the simulations employ the angular properties of the glazing systems from WINDOW 5.2.

### **Return Duct Losses**

The program has simulated supply duct thermal heat gains/losses and leakage for several years. This capability has been extended to return ducts. The keyword RETURN-UA is specified to define the UA value of the return duct. This value should include losses through the duct insulation as well as any bypass effects due to the duct hangars, crushed insulation, etc. This keyword applies only for air handlers having return ducts; if the return is via plenums, then this keyword is ignored.

### **Boiler and Chiller Cycling Losses**

When a boiler or chiller is online, but there is no load on the equipment, the equipment may still use energy simply to remain at the required supply temperature. Previously, this effect was approximated using a portion of the START-UP-TIME. Now, a keyword, STANDBY-TIME, is used to explicitly account for this standby energy. Additionally, the default ELEC-INPUT-RATIO for forced draft boilers (i.e.,) has been lowered from 0.022 to 0.0024.

### **New 'Triggers' Methods for the Deployment of Window Shades**

Window management options in DOE-2 have long permitted users to specify a schedule of solar radiation, i.e., MAX-SOLAR-SCH, to help 'trigger' the deployment of window shades. DOE-2 version 2.1E used transmitted direct (beam) solar radiation. Previous versions of DOE-2.2 used exterior incident total (beam + diffuse) solar radiation as the trigger. The new MAX-SOLAR-CTRL keyword allows selection among four alternative trigger quantities: Incident Direct, Incident Total, Transmitted Direct and Transmitted Total.

## **New analysis features in eQUEST 3.6**

### **2005 Title 24 Non-Residential Compliance Analysis**

The Alternative Calculation Method (ACM) for the non-residential Title 24 Standards capability has been updated for use in showing compliance with the 2005 version of the Standard. This includes changes to the Title 24 "ruleset" as well as changes to the wizard input and BDL generations and many changes to the detail edit mode screens.

**2006 Savings By Design Analysis**

The Savings By Design (SBD) analysis capability has been updated to agree with the 2006 California statewide program as offered by electric and gas utilities. This capability includes the ability to calculate incentive payments for program participation.

**New Detail Edit Mode On-line Help**

The eQUEST on-line help systems for the detail edit mode has been completely replaced with a system that fully incorporates the entire set of current DOE-2.2 manuals reformatted as a single searchable help system. In the detail edit mode, using the quick menu (accessed using a right mouse click on a interface data entry control) will present item and topic help selections which take you directly to the relevant item of the help system; this will normally include any DOE-2.2 manual pages for the BDL element that corresponds to the interface control selected.

**Wizard HVAC selection of Ground Source Heat Pump**

The building creation wizards now include the capability to select and define the details of a ground loop heat pump circulation loop and ground heat exchanger system.

**New Hourly Results Export Option**

A new more convenient capability has been added for use with hourly reports that allows the easy export of the contents of any hourly report to a CSV file, ready for use with spreadsheet programs. To access this new feature, from within the eQUEST detailed edit mode, select 'File', then 'Export Hourly Results'.

**Wizard HVAC "System per area" Selection**

The Design Development Wizard has a new input control on the System screen that allows control of the number of air handlers for each system type to be used when the DOE-2.2 input file is created, i.e., one per zone, one per floor, one per shell, one per project.