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CARRIER® eDESIGN SUITE NEWS
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Make Equipment Selection Easier: Interoperability Between HAP and E-CAT

Carrier® Hourly Analysis Program (HAP) is a multi-function tool for peak load estimating, system design and energy modeling. Among HAP's features is interoperability, the ability to exchange data with other building design tools. One type of interoperability HAP supports is the ability to export equipment sizing requirements to Carrier® Electronic Catalog (E-CAT) software to drive equipment selections. Interoperability can make selecting heating, ventilation and air-conditioning (HVAC) equipment faster and easier.

The conventional approach for selecting equipment involves running a system design tool like HAP, creating a virtual model of the building and its HVAC systems, running peak load calculations and generating system sizing requirements on printed reports. Next, an equipment selection tool like Carrier E-CAT is run. Sizing requirements are manually entered by transcribing data from the printed reports in order to select equipment, which can meet the specified performance requirements. Since this process involves a significant amount of manual data entry, it is time consuming and prone to error.

With HAP-to-E-CAT interoperability, the process begins the same way: running HAP, creating a building model and running load and system sizing calculations. However, at this point, the process changes in important ways:

» Instead of generating printed reports, the "Publish Equipment Sizing Requirements" button in the toolbar allows users to electronically export sizing requirements to Carrier E-CAT.

» Next, using E-CAT the project containing the building model can be opened. Equipment "tags" (individual equipment units) will appear automatically in this project. By simply clicking on the tags, equipment selection will be launched. Equipment performance requirements such as supply airflow, coil entering temperatures and capacities that were calculated by HAP are defaulted and do not need to be manually entered.

When the user pushes the "Publish" button, HAP automatically identifies all the individual equipment elements, creates an E-CAT "tag" for each and writes the performance requirements into a format E-CAT can read. For example, "publishing" an air system of a VAV rooftop air system in HAP serving 30 perimeter zones with parallel fan powered mixing boxes, and five interior zones with VAV cooling only boxes will automatically generate 36 "tags" for E-CAT: one rooftop unit, 30 parallel fan powered mixing box air terminals, and five VAV cooling-only air terminals.

When collaborating with a Carrier sales engineer, users can take this interoperability one step further to make their work even easier. After running load and sizing calculations in HAP:

» Press the "Publish Equipment Sizing Requirements" button on the HAP toolbar.

» Then press the "E-mail your Sales Engineer" button the toolbar. This automatically archives the project data, launches an e-mail software, creates an e-mail addressed to a Carrier sales engineer, and attaches the project archive file. Users simply input a message such as "Attached is my project, Please propose equipment selections." And then press Send.

Through this collaboration, the sales engineer can propose equipment selections, saving users the work of selecting equipment themselves.

The features described above are not only available in HAP, but are also offered in the System Design Load and Block Load software programs.

Currently, E-CAT can perform selection with data exported by HAP, System Design Load or Block Load for the following types of equipment:

» Packaged Rooftops (2 to 27.5 ton constant volume or staged air volume rooftops)
» Applied Rooftops (20 to100 ton constant volume, staged air volume or VAV rooftops)
» Split Systems (2 to 130 ton split air conditioning and heat pump systems)
» Self contained units
» Water source heat pumps
» Fan coil units (hydronic and DX)
» Unit ventilators
» Air terminals (VAV boxes, series fan powered mixing boxes, parallel fan powered mixing boxes)

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eDesign Suite

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Software in the Works - HAP v4.70 and BSO v1.20

Carrier continually works to update and improve its eDesign software tools. Currently, work is proceeding on the next versions of the Hourly Analysis Program (HAP) and Building System Optimizer (BSO).

In **HAP v4.70**, program modifications center around three themes:

- **Standards** - The addition of features for defaulting ventilation airflow requirements and calculating system ventilation airflow per ASHRAE Standard 62.1-2010, supplementing the existing features to calculate per the 2007 standard. Addition of features for automatically calculating minimum equipment efficiencies for DX equipment using ASHRAE Standard 90.1-2010.

- **Plant Equipment Simulation** - The addition of new plant and plant equipment types. The first is air-to-water and water-to-water reversible heat pump chiller plants with changeover. The second is heat machine plants. These are dedicated hot water plants using air-to-water or water-to-water heat pumps. The third is hybrid plants, which can combine hot water boilers with air-to-water or water-to-water heat pumps.

- **Service Hot Water (SHW) Systems** - The addition of performance models for SHW systems. Previously SHW systems were modeled by defining an hour-by-hour energy consumption profile with the Miscellaneous Energy feature at the Building level. With the new features in HAP v4.70, hot water consumption profiles, equipment performance and system controls are directly specified as a "plant" feature. HAP will simulate the performance of the equipment to determine hour-by-hour energy performance. SHW can be a standalone system or can be linked to plants serving SHW and space heating needs simultaneously.

HAP v4.70 will be released in January 2013.

Building System Optimizer v1.20 will add the equipment modeling features included in HAP v4.70: reversible heat pump chiller plants, heat machine hot water plants and service hot water. In addition, v1.20 includes several productivity enhancements:

- Increasing the project maximum size from 10 to 30 alternatives.

- Ability to select and arrange which equipment alternatives to include in reports. Currently all alternatives in a project are automatically included in calculation reports. With v1.20, the user can select the specific alternatives to include and control the order in which the alternatives are arranged on reports.

- **Smart calculation**. Previously any change to a project required recalculation of all alternatives when generating calculation reports. With Smart Calculation, the software tracks individual changes to the project and only recalculates when necessary. This minimizes the user's wait time for energy performance comparison reports.

Building System Optimizer v1.20 will be released one to two months following the release of HAP v4.70.

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Frequently Asked Questions

Q. What is a HAP template project used for and how do I create one?

A. A "template" project is a storage place for previously created HAP project data to be re-used. HAP allows any data to be imported from other projects to help save time when entering new project information. HAP's import feature can quickly populate a new project with project data originally entered in other projects. This feature also allows the user to establish one or more helpful template projects representing standard work.

The "Import HAP Project Data" function is the key feature can be used to create and maintain a template project.

Importing HAP project data is an easy process as described here:

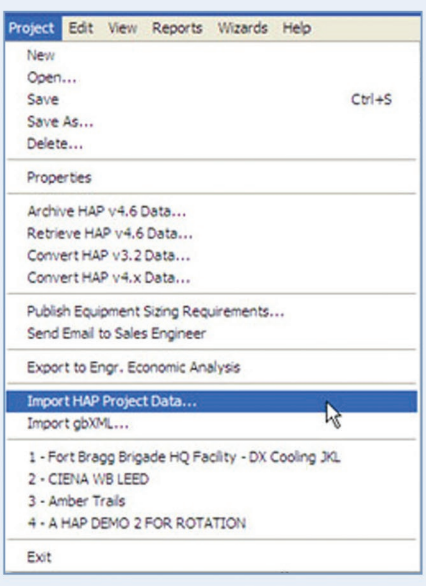

Figure 1- Import HAP Project Data

1. Open the HAP project that requires "borrowed" data from some other project.
2. From the Project menu, select "Import HAP Project Data..." as shown in Figure 1.
3. This opens a "Select Project" window that allows the user to highlight the name of the project that contains the data to import from.
4. Click on OK to open the selected project.
5. Select the desired Data Category.
6. Choose the specific items to import.

The recent version of HAP (4.61) allows all levels of data in any stored HAP project to be imported including:

Weather
Spaces
Systems
Plants
Buildings
Schedules
Wall, Roof, Window Constructions
Doors
External Shades
Chillers
Cooling Towers
Boilers
Electric Rates
Fuel Rates

HAP e-Help 012 "How To Import Data From Template Projects" contains additional information and can be found at the Carrier website.

Import HAP Project Data For Large Collaborative Projects

The "Import HAP Project Data" option on the Project Menu was recently expanded to handle space, air system, plant and building data as shown in the list above. Previously the option only allowed the lower level project elements - weather, schedules, walls, roofs, windows, doors, external shade geometries, chillers, cooling towers, boilers, electric rates and fuel rates - to be imported from one project into another. By including all sixteen categories of HAP project data in the feature, users can effectively merge complete projects together. This is often useful in large projects where individual team members initially model portions of the building separately and then combine the data for final energy modeling calculations.

Build Your First Template Project Using Default Schedules Archive

A reference project, which contains ASHRAE 90.1 default schedules, was updated in HAP v4.61.The archive file for this project is automatically installed with the program. To utilize data from this archive first select the Project/Retrieve option. From the \E20-II\Archives folder select the archive file named *"HAP46_Default_Schedules_and_Utility_Rates.E3A"*. After this data is retrieved, save the project. This will serve as a good first template project from which data can be imported into other projects.

The Import HAP Project Data is a powerful feature that "power" users of HAP sometimes are not utilizing to its full potential. This feature is now expanded and should be used to create a template project, which can increase productivity on all project work.

Q. I have a HAP project where I'm modeling energy performance of packaged rooftop equipment. The program only asks me to define gross cooling capacity at design and the rated EER. But the rooftop will only operate at this capacity and EER for a few hours a year at most. The rest of the year it will be running at off-design and part-load conditions where the equipment efficiency will be different. How to I account for performance all these other conditions?

A. We receive this type of question frequently and it suggests there may be a misunderstanding about how HAP calculates energy performance of DX equipment like rooftop units.

For all types of DX equipment HAP uses a performance model built into the program to calculate how the efficiency of the equipment changes with the operating conditions for each operating hour. If a rooftop in your model has 3000 hours of cooling duty during the year, HAP will calculate 3000 different equipment efficiencies - one for the operating conditions unique to each operating hour.

Example. Consider a rooftop unit. As input data you specify gross cooling capacity at design (or instruct the program to autosize capacity), rated EER and information about the indoor fan.

HAP will first derive compressor and outdoor fan kW at the design condition using the EER, design capacity and indoor fan power. Hour by hour energy use by the indoor fan will be analyzed separately during the simulation because fan operation is governed by factors often independent of those driving operation of the compressor and outdoor fan. For example, the indoor fan may run continuously during occupied hours regardless of whether there is a cooling demand or not. The hour by hour energy use of the compressors and outdoor fans are determined by:

Calculating the operating cooling capacity of the rooftop as a function of the current hour's outdoor air dry-bulb temperature, entering coil wet bulb temperature and airflow using performance curves built into HAP.

Calculating the part-load ratio by dividing the current hour's cooling load by the operating cooling capacity.

Calculating the compressor and outdoor fan input power as a function of the current hour's outdoor air dry-bulb temperature, entering coil wet-bulb temperature, part-load ratio and airflow using performance curves built into HAP.

With this approach, the efficiency of the rooftop will change each hour as outdoor dry-bulb, entering wet-bulb, part-load ratio and airflow change hour by hour.

The performance curves mentioned above were derived by curve fitting published equipment performance data across many models and sizes. This creates a generic, normalized model that can be scaled to your rooftop based on the capacity and EER you specify, and can be used to accurately predict equipment performance while only requiring you to specify a few simple, widely available input parameters.

Similar approaches are used for other types of DX equipment such a split systems, variable refrigerant flow systems, water-source heat pumps, ground source heat pumps, vertical packaged units, DX fan coils and PTACs. The specific factors used in the calculation for each equipment type may vary. For example, a water source heat pump's performance is driven by entering water temperature rather than outdoor air temperature. However, the basic concepts of separating indoor fan from compressor performance, and calculating compressor performance as a function of hour by hour operating conditions, remains the same across these equipment types.

Q. How will I know when my renewal is coming due?

A. Two months prior to expiration of your license you will receive a Renewal Invoice indicating what programs you have licensed and the cost for renewing. This invoice is sent to the customer contact we have on file or "bill to" person we have on file.