

# **NEW FEATURES IN THE CARRIER HOURLY ANALYSIS PROGRAM v4.51**



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## Introduction

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This document describes enhancements in the Carrier Hourly Analysis Program (HAP) v4.50 and v4.51. It is intended for new users of HAP and for those upgrading from one of the HAP v4.4 versions to v4.51. Major enhancements in v4.5 relate to two themes, described in this introduction. Following this Introduction, section 1 provides a concise summary list of all v4.50 and v4.51 enhancements. Subsequent sections then describe these enhancements in more detail.

**1. Theme 1 - Making HAP Easier to use for LEED Analysis.** : Building upon features first introduced in v4.40, HAP v4.5 includes further modifications designed to make you more productive in LEED projects. This applies both to existing projects registered under LEED NC-2.2 and new projects registering under LEED 2009. Specific modifications include:

- **Project Preferences** - Expanded of the Project Preferences feature to allow you to specify the Energy Standard (ASHRAE 90.1-2004 or 90.1-2007) and the LEED Rating System (NC-2.2 or 2009) which applies to the current project. HAP automatically adapts its calculations and report formats to your specified preferences. Specifically, the 90.1 preference affects Appendix G baseline fan power allowance calculations and the defaulting of ASHRAE 90.1 minimum equipment efficiencies. The LEED preference affects the formatting of the LEED Summary Report.
- **Equipment Efficiencies** - Added a feature to default ASHRAE 90.1 minimum equipment efficiencies based on your ASHRAE 90.1 project preference (2004 or 2007). Currently this feature applies to DX cooling, heat pump heating and furnace heater equipment.
- **Baseline Fan Power** - Added features for automatically calculating the baseline fan power allowance per ASHRAE Standard 90.1-2007.
- **LEED Summary Report** - Revised this report to adjust its format and content based on your stated project preference for the LEED Rating System - either LEED NC-2.2 or LEED 2009.
- **LEED Style Unmet Loads** - Revised calculations to comply with the new definition of "unmet loads" in ASHRAE Standard 90.1-2007.
- **SEER and HSPF** - Added features to allow equipment performance to be defined in terms of SEER and HSPF.

**2. Theme 2 - Expanding Features for Preliminary or Schematic Design.** : Also building upon features introduced in v4.40, HAP v4.50 and v4.51 expand features for quickly and efficiently performing schematic design analyses. Specific enhancements include:

- **Full Wizard Session** - Expanded the Full Wizard Session feature to include Wizards for quickly defining weather data and utility rates. With the expanded Full Wizard feature, you can quickly configure 100% of the data needed for a schematic analysis in a matter of minutes.

- **Wizards Menu** - Expanded the Wizards Menu to include options for running the new Weather and Utility Rate wizards individually as a means of quickly adding data to an existing HAP project.
- **Weather Wizard** - This new wizard allows weather data to be quickly selected by one of two approaches - graphically by clicking on countries, states/provinces and cities in map images, or by selecting from drop-down lists.
- **Utility Rate Wizard** - This new wizard makes entry of electric and fuel pricing data vastly easier. Simple pricing data for electricity and fuels can be defined all on one screen. For detailed electric rates, the wizard guides you through the rate definition, eliminating much of the uncertainty that can occur when using the traditional HAP input screens.

## **1. Summary List of Enhancements in v4.50 and v4.51**

A complete summary list of enhancements in HAP v4.50 and v4.51 is provided below. More detailed explanations are found in subsequent sections.

### **1. Main Window**

- Expanded Project Preferences to include Energy Standard (90.1-2004 or 2007), LEED (NC-2.2 or 2009) and currency.
- Upgraded "gbXML Import" feature to more efficiently work with files from AutoDesk Revit MEP 2010 and eliminate import failures seen in prior versions when importing gbXML from this source.
- Expanded Help Menu to include User's Manual and links to web-based support and training information.
- Converted program to use HTML-help format for better compatibility with Windows 7 and Windows Vista.
- Added "What's New" pop-up window which appears at program start-up.
- Revised reporting features to generate batches of reports as a single document.
- Revised report "save as RTF" feature to remember the destination folder you specify.
- Added a template project which contains ASHRAE 90.1 default schedules and current EIA commercial sector average electric and gas prices for all 50 US states and the District of Columbia.

*See Section 3 for further details.*

### **2. Wizards**

- Expanded Full Wizard Session to include Weather and Utility Rate Wizards.
- Expanded Wizards Menu to include Weather and Utility Rate Wizards.
- Added new Weather Wizard for rapid specification of weather data.
- Added new Utility Rate Wizard to simplify specification of energy and fuel price data.

*See Section 2 for further details.*

### **3. Weather**

- HAP v4.50 automatically installs the full simulation weather library, eliminating the need to manually copy files.

### **4. Air Systems**

- Added feature to automatically ASHRAE 90.1 minimum efficiencies for DX and combustion heating equipment.
- Added ability to specify and calculate baseline fan power allowance per ASHRAE 90.1-2007.
- Added feature for defining equipment performance in terms of SEER and HSPF.
- Revised air system defaults to better match commonly used DX equipment settings and heating SATs.

- Revised terminology for coil capacity control options to make them easier to understand.

*See Section 4 for further details.*

#### 5. **Plants**

- Revised input screen validation procedures to make it easier to define chilled water plants.
- Revised the algorithm for DX free cooling in air-cooled chillers.

*See Section 5 for further details.*

#### 6. **Buildings**

- Revised LEED Summary Report to display in LEED NC-2.2 or LEED 2009 format based on your project preference.
- Revised calculation of LEED unmet cooling and heating loads to comply with definitions in ASHRAE 90.1-2007.

*See Section 6 for further details.*

#### 7. **Cooling Towers**

- Changed "River, Sea or Well Water" option to "Geo, Well or Surface Water" to make its use clearer.

#### 8. **Utility Rates**

- Made currency a project-level preference so it only has to be defined once per project.
- Revised emission analysis feature to consider only CO<sub>2</sub>e (CO<sub>2</sub> equivalent).

*See Section 7 for further details.*

#### 9. **Documentation**

- Updated help system and Quick Reference Guide to document new features.

## 2. **New Wizard Features**

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1. **Full Wizard Session** - Expanded the Full Wizard Session feature to include Wizards for quickly defining weather data and utility rates. With the expanded set of wizards, you can configure 100% of the data needed for a schematic analysis in a matter of minutes.
2. **Wizards Menu** - Expanded the Wizards Menu. The updated menu includes options for running Weather, Building, Equipment or Utility Rate wizards individually as a means of quickly adding data to an existing project. The menu also includes an option for launching a Full Wizard Session which integrates all four wizards together and allows a complete analysis to be configured in minutes.
3. **Weather Wizard** - This new wizard allows weather data to be quickly selected by one of two approaches - graphically by clicking on countries, states/provinces and cities in map images, or by selecting from drop-down lists.
4. **Utility Rate Wizard** - This new wizard makes entry of electric and fuel pricing data vastly easier. Simple pricing data for electricity and all applicable fuels can be defined on one input screen. For defining more detailed electric rates the wizard guides you through the process, eliminating much of the uncertainty that can exist when using the traditional HAP input screens for utility rates.

### 3. New Main Program Window Features

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1. **Project Preferences** - Expanded of the Project Preferences feature to allow you to specify the Energy Standard (ASHRAE 90.1-2004 or 90.1-2007) and the LEED Rating System (NC-2.2 or 2009) which applies to the current project. HAP automatically adapts its calculations and report formats to your specified preferences. Specifically, the 90.1 preference affects Appendix G baseline fan power allowance calculations and the assignment of ASHRAE 90.1 minimum equipment efficiencies. The LEED preference affects the formatting of the LEED Summary report.
2. **gbXML Import.** Upgraded the "gbXML Import" feature to more efficiently work with gbXML formatting conventions in files generated by AutoDesk Revit MEP 2010. This should eliminate failures seen in prior versions when importing gbXML from this source.
3. **Help Menu.** Expanded Help Menu to include a link to the User's Manual, support contact information, and web links to E20 support, E20 software, E20 training and Carrier commercial equipment web sites.
4. **On-Line Help.** Updated use HTML-help format to ensure compatibility with Windows 7 and Windows Vista, thereby eliminating the need for the special Microsoft patch file to make the WinHelp4-format online help system work.
5. **What's New.** Added a "What's New" pop-up window which appears at program start-up and explains the new features of this version. This feature can be turned off once it is no longer needed by checking a "do not show again" box.
6. **Streamlined Report Generation.** The report generating software in HAP has been revised to bundle reports as a single document file. This change was made in v4.51.

In prior versions of HAP, for example, if you selected three air system and requested 5 different system design reports, HAP would generate 15 report documents (3 systems x 5 reports), one for each individual report requested. This did not pose any problems if you were only viewing reports. But if the reports were printed, they would print as 15 separate print jobs. If saving to disk, the reports had to be saved individually as 15 Word RTF documents. If printing using a PDF converter, 15 separate PDFs would be generated. For many applications this was inconvenient for users.

For the same scenario in HAP v4.51, the program will generate one report document containing all 15 reports. If you print the report, it prints as one print job. If you save to disk, it saves as one large Word RTF document. If you print using a PDF converter, it generates a single PDF document. Note that this changes how you work with reports in the Report Viewer. Previously you used the Next and Previous buttons to advance forward or backward through the individual report documents. Now, since there is a single large document, you use the scroll bar and [PgDn], [PgUp] to scroll through all the pages in the bundled report.

7. **Save as RTF.** Revised reporting features so the "Save as RTF" feature remembers any changes you make to the destination path for saving report. Any change you make to the path during a HAP session will remain in effect throughout that session. You can save reports to the same custom folder over and over without having to respecify the destination path for each report.
8. **Template Project.** When you install HAP, an archive file named HAP45\_Schedules\_and\_Utility\_Rates.E3A is installed in the \E20-II\Archives folder. This archive is a template project which contains ASHRAE 90.1 default schedules and the current Energy Information Agency (EIA) commercial sector average electric and natural gas prices for all 50 US states and the District of Columbia. To use this data, retrieve this archive into a new project and save. Then use the "Import Data from Project" option to import schedules and utility rates from the template project into other projects you create.

## 4. New Air System Features

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1. **Equipment Efficiencies** - Added a feature to automatically determine ASHRAE 90.1 minimum equipment efficiencies based on your ASHRAE 90.1 project preference (2004 or 2007). This feature applies to DX cooling equipment, heat pumps and furnace heaters.
2. **Baseline Fan Power** - Added features for automatically calculating the baseline fan power allowance for the procedures mandated in ASHRAE Standard 90.1-2007. This involves additions to the air system inputs to allow specification of fan power allowance adjustment data, and changes to the calculation algorithms.
3. **SEER and HSPF** - Added features to allow air-cooled DX equipment performance to be defined in terms of SEER for cooling and HSPF for heating. For certain types of small tonnage equipment, ASHRAE 90.1 minimum efficiency requirements and manufacturers ratings are in these units. As with the existing features for inputting AHRI standard ratings of EER and COP, the program will automatically convert SEER and HSPF ratings to equivalent compressor and outdoor fan kW during calculations.
4. **Capacity Control**. Revised coil capacity control option names to make them more understandable. "Cycled or Staged Compressor, Fan On" was changed to "Cycled or Staged Capacity, Fan On".
5. **Defaults**. Revised the air system defaults to set low ambient control on and to adjust default minimum OADB settings for air-cooled DX cooling equipment, and to change default heating supply temperatures from 110 F (43.3 C) to 95 F (35 C).

## 5. New Plant Features

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1. **Chiller Plant Validation**. Revised validation procedures that occur when saving inputs for chiller plants. Previously chiller condenser and cooling tower water flow rates had to match within 0.05 gpm (0.003 L/s). That tolerance has been revised to 20 gpm (1.25 L/s).
2. **DX Free Cooling Algorithm**. Revised the simulation algorithm for DX free cooling in air-cooled chillers to cycle the refrigerant pump and condenser fans when DX free cooling capacity exceeds the chiller load.

## 6. New Building Features

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1. **LEED Summary Report** - Revised this report to adjust its format and content based on your stated project preference for the LEED Rating System. When your preference is LEED NC-2.2, the report formats to match the NC-2.2 EA Credit 1 submittal template. When your preference is LEED 2009, the report formats to match the LEED 2009 EA Prerequisite 2 submittal template, where results from the performance rating method are now tabulated.
2. **LEED Style Unmet Loads** - Revised calculations to comply with the new definition of "unmet loads" in ASHRAE Standard 90.1-2007. This definition mandates that a single hour can only result in one unmet load for cooling or heating. So, if 50 zones simultaneously have temperatures above the cooling range, this counts as 1 unmet cooling load hour, not 50 unmet cooling load hours.

## 7. New Utility Rate Features

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1. **Currency.** Made currency a project-level preference so it only has to be defined once per project rather than requiring it be defined in each utility rate that is created.
2. **Emission Factors.** Revised the emission analysis feature to consider only CO<sub>2</sub>e (CO<sub>2</sub> equivalent). Separate calculations for NO<sub>x</sub> and SO<sub>2</sub> have been eliminated.



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