HOURLY ANALYSIS PROGRAM v6.4
NEW FEATURES GUIDE

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Overview

This New Features Guide summarizes enhancements in HAP v6.4 which include:

1. **Building Modeling**
   Added and enhanced drawing features to make construction of building geometry models more efficient
2. **ASHRAE Standards**
   Add data and calculation procedures for ASHRAE Standard 62.1-2022 and ASHRAE Standard 90.1-2022.
3. **Design Load Reports**
   Added ability to export design load calculation results in spreadsheet format.
4. **Air System Modeling**
   Added ability to model air source heat pump DOAS units.
5. **Chilled Water Plant Modeling**
   Added further options for modeling free cooling features.
6. **Other Enhancements and Problem Fixes**
   Other enhancements were made involving calculation speed, space models, air systems, plants, schedules, and utility rates.

   Corrected problems identified in HAP v6.3 and v6.3.1

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Building Modeling Features (1 of 3)

Added and enhanced features in the Building section of the program to make creating building models more efficient:

1. **Copy Spaces Level-to-Level**

   Added ability to copy space boundaries from another level on the Walls & Spaces, Roofs tab. Previously only the perimeter boundary of a level could be copied from another level. The new feature allows you to select a level and one or more individual spaces on that level to copy to the current level. This is useful for spaces having the same location and boundary as other levels. Common examples include stairwells, elevator shafts, and service shafts. This eliminates the need to draw boundaries of such spaces over and over on each level. It also results in perfect vertical alignment between such spaces and can reduce calculation time by eliminating extra surfaces created due to misalignment.

2. **Shell Guidelines for Spaces**

   Added ability to apply Shell Guidelines for individual spaces on the Walls & Spaces, Roofs tab. Previously only Shell Guidelines for the perimeter boundary of another level could be displayed for the current level. Now guidelines for the perimeter of a level and individual spaces on the level can be applied. One application is when applying skylights in a roof level. Skylights cannot cross interior walls on the level below. By displaying guidelines for all spaces on the level below, skylights can now be placed with confidence in locations where they avoid overlapping interior walls.

3. **On-the-Fly Switching Between Drawing Tools**

   Added ability to switch between Perpendicular and Diagonal drawing tools on-the-fly without visiting the tool bar. For example, while using the Perpendicular tool to draw boundaries that are vertical or horizontal on the floor plan, you can press and hold SHIFT to switch to the Diagonal tool. As long as you hold SHIFT down, the program remains in Diagonal drawing mode. When you release the SHIFT key, the program automatically returns to Perpendicular mode. A similar switch can be performed when starting in Diagonal mode and switching temporarily to Perpendicular mode. This feature is useful for sketching over floor plans that contain a mix of spaces with perpendicular and angled walls.

Building Modeling Features (2 of 3)

4. **Auto-Snapping to an Angle when Drawing**

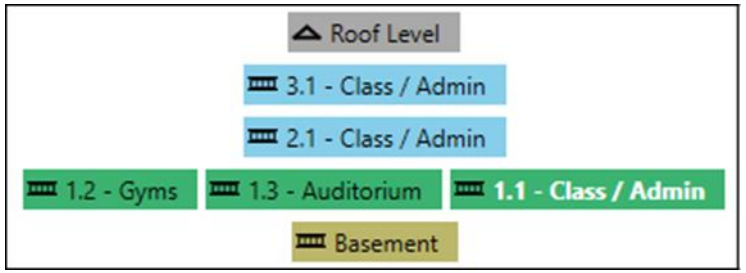
   Added ability to snap a line to the closest round angle increment. This is done by pressing the CTRL key while drawing. The program will snap the line to the closest multiple of 15 deg. This is useful when drawing boundaries that are not vertical or horizontal. It can also be useful when using the Diagonal tool to draw vertical or horizontal boundaries. With the Diagonal tool it is difficult to get boundaries exactly vertical or horizontal. Getting the boundary close and snapping with CTRL ensures the boundary is perfectly vertical or horizontal. This feature imitates functionality offered in other widely used AEC drawing tools.

5. **Panning while Drawing**

   Added ability to pan the floor plan view in the midst of drawing space boundaries on the Walls & Spaces, Roofs tab. This is done by depressing the mouse wheel (or middle mouse button on other types of mice). While the wheel is depressed you can pan the floor plan view by moving the mouse. When you release the wheel you immediately return to drawing. This can be useful when sketching long sections of a perimeter wall or large spaces. The feature imitates functionality offered in other widely used AEC drawing tools.

6. **Level Selector**

   Replaced the level selection drop-down list with a color-coded selector feature that shows the relative vertical positions of levels with respect to each other. The feature makes it easier to understand the composition of the building model and locate a level for editing particularly in larger buildings, those using side-by-side levels, and projects imported via gbXML. The example shown at the right is for a 3-story high school with a basement. At grade there are three side-by side levels with different heights: classroom / administration spaces, a gymnasium, and an auditorium. To move to a different level, click on the rectangle for the desired level.



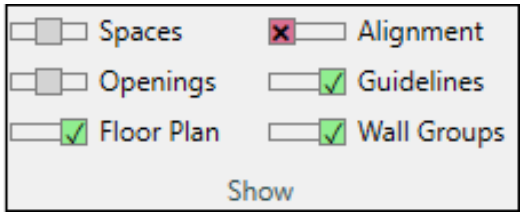
7. **Space Locator**

   Revised the Locate Space feature on the Walls & Spaces, Roofs tab. The updated feature provides a searchable space list and options to filter for multi-level and unmodeled spaces. This allows more efficient use of the feature, especially for projects with levels containing large quantities of spaces.

Building Modeling Features (3 of 3)

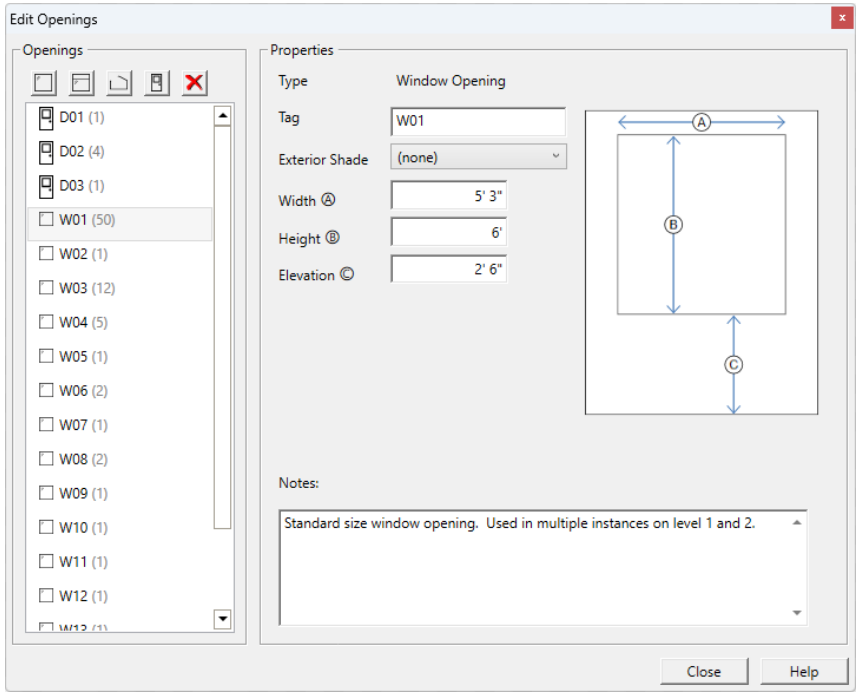
8. **Show Settings**

Updated the Show panel in the toolbar to become more visually intuitive. The Show panel specifies which building model features are visible on a tab. Model features include space boundaries, openings, floor plan, alignment markers, guidelines, and wall groups. Previously a three-state check box was used to indicate visible, default, and hidden states. This has been replaced with a three-state selector bar that indicates visible (green box with check mark), default (neutral box), hidden (red box with "x"). In the example shown to the right Spaces and Openings have default visibility. Visibility has been locked on for Floor Plan, Guidelines, and Wall Groups. Visibility has been turned off and locked for Alignment markers.



9. **Displaying Opening Tag Usage**

On the Edit Openings window the number of times each opening tag has been used in the model is now displayed. In the image to the right, the window tag W01 is currently used 50 times in the model. In addition, when an opening is deleted, the number of of openings is displayed in the deletion confirmation window. This helps communicate the consequences of deleting an opening type. For example, if window W01 is deleted, that action will remove 50 openings from the building model.



10. **Persisting Settings**

Additional Building Properties window settings are now persisted from one editing session to the next. For example, the level being displayed when you exit the Building window is the default level displayed in the next editing session. The zoom setting, pan position, and angle rotation of that level also persist. The Show settings including space boundaries, floor plan, openings, alignment markers, guidelines, and wall groups are persisted. And the 3D view zoom, rotation, and pan location now persist. This enhancement eliminates the need to re-establish preferred defaults and settings in each new editing session.

ASHRAE Standards 62.1-2022 and 90.1-2022

Added default data and calculation procedures supporting ASHRAE Standards 62.1-2022 and 90.1-2022:

1. **Preferences Window**

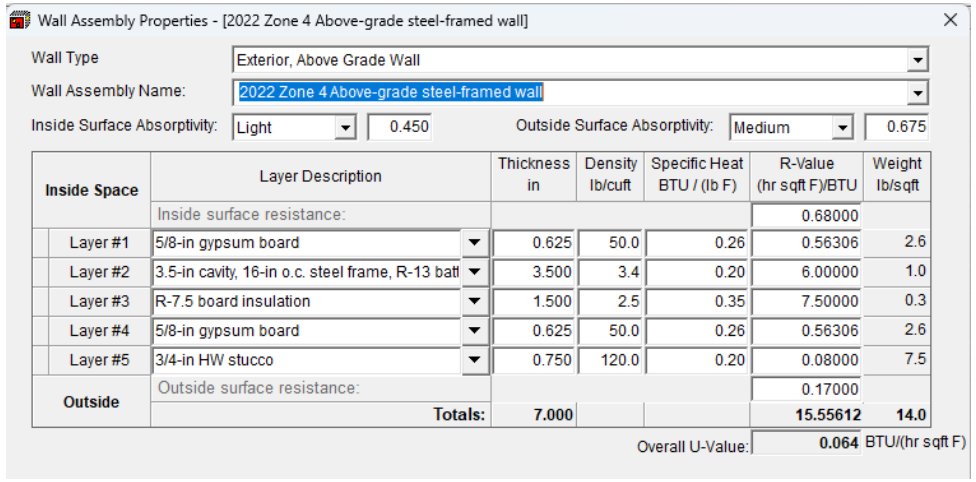
   Added options to select 62.1-2022 as the project ventilation standard and 90.1-2022 as the project energy standard.

2. **Default Data for Space Models**

   The spaces grid in the Space Model window offers ventilation space usage options to default ventilation requirements per 62.1-2022. It also offers overhead lighting power density default requirements per 90.1-2022.

3. **Default Prescriptive Envelope Assemblies**

   Default envelope assemblies can be selected which comply with 90.1-2022 prescriptive requirements for wall, roof, floor, window, and door assemblies based on the climate zone for the project.



4. **Ventilation Rate Procedure for Air System Design Calculations**

   Outdoor ventilation airflow rate for air systems can be calculated per the 62.1-2022 Ventilation Rate Procedure.

5. **Air System Fan Power Allowance Calculations**

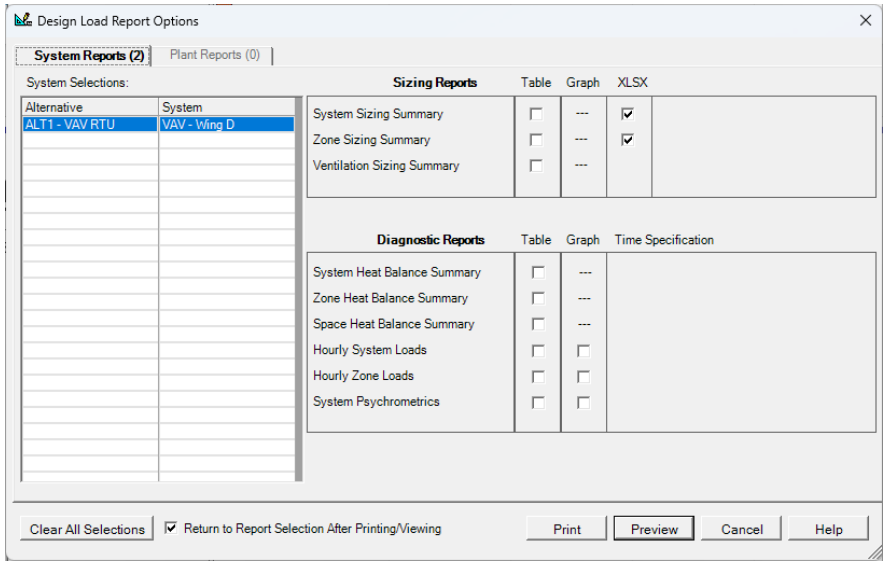
   System fan power allowance can be calculated per 90.1-2022.

6. **Auto-Calculation of ASHRAE Minimum Equipment Efficiencies**

   For energy modeling, equipment efficiencies can be defaulted to the minimum values allowed by 90.1-2022. This applies to unitary air conditioners, unitary heat pumps, VRF outdoor units, PTACs and PTHPs, WSHPs, GSHPs, and GWSHPs, and combustion heating sections and furnaces.

Exporting Design Load Results to Spreadsheet Format

Added features for exporting design load results to XLSX spreadsheet format files.



1. **New Report Selection Options**

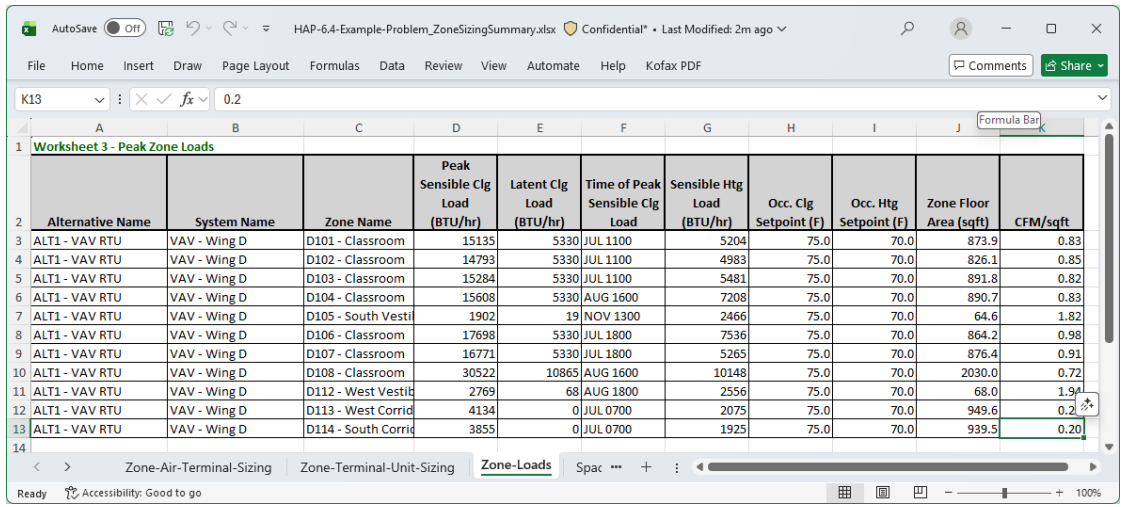
   Add two options to the Design Load Reports selection window for exporting system-level and zone or space level data to XLSX format files.

2. **Air System Sizing Summary XLSX Export**

   This export file contains two worksheets. One contains load and sizing information for components such as cooling coils, heating coils, and fans in central HVAC systems. The other contains similar sizing data for components in DOAS AHU equipment.

3. **Zone Sizing Summary XLSX Export**

   This export file contains four worksheets. The first contains sizing data for zone air terminals in central systems. VAV terminals are an example. The second contains sizing data for terminal units such as fan coils, VRF indoor units, and WSHP units. The third worksheet contains peak cooling and heating loads for HVAC zones. A sample Is shown to the right. The final worksheet contains peak cooling and heating loads for spaces.



Worksheet 3 - Peak Zone Loads

Alternative Name	System Name	Zone Name	Peak Sensible Clg Load (BTU/hr)	Latent Clg Load (BTU/hr)	Time of Peak Sensible Clg Load	Sensible Htg Load (BTU/hr)	Occ. Clg Setpoint (F)	Occ. Htg Setpoint (F)	Zone Floor Area (sqft)	CFM/sqft
ALT1 - VAV RTU	VAV - Wing D	D101 - Classroom	15135	5330	JUL 1100	5204	75.0	70.0	873.9	0.83
ALT1 - VAV RTU	VAV - Wing D	D102 - Classroom	14793	5330	JUL 1100	4983	75.0	70.0	826.1	0.85
ALT1 - VAV RTU	VAV - Wing D	D103 - Classroom	15284	5330	JUL 1100	5481	75.0	70.0	891.8	0.82
ALT1 - VAV RTU	VAV - Wing D	D104 - Classroom	15608	5330	AUG 1600	7208	75.0	70.0	890.7	0.83
ALT1 - VAV RTU	VAV - Wing D	D105 - South Vesti	1902	19	NOV 1300	2466	75.0	70.0	64.6	1.82
ALT1 - VAV RTU	VAV - Wing D	D106 - Classroom	17698	5330	JUL 1800	7536	75.0	70.0	864.2	0.98
ALT1 - VAV RTU	VAV - Wing D	D107 - Classroom	16771	5330	JUL 1800	5265	75.0	70.0	876.4	0.91
ALT1 - VAV RTU	VAV - Wing D	D108 - Classroom	30522	10865	AUG 1600	10148	75.0	70.0	2030.0	0.72
ALT1 - VAV RTU	VAV - Wing D	D112 - West Vestib	2769	68	AUG 1800	2556	75.0	70.0	68.0	1.94
ALT1 - VAV RTU	VAV - Wing D	D113 - West Corrid	4134	0	JUL 0700	2075	75.0	70.0	949.6	0.2
ALT1 - VAV RTU	VAV - Wing D	D114 - South Corrid	3855	0	JUL 0700	1925	75.0	70.0	939.5	0.20

4. **Further Information**

   Further information about the specific contents of each XLSX export file and worksheet is found in sections 15.2.4 and 15.2.5 of the program help system

Other Enhancements (1 of 5)

(A) Design Load Calculations

1. **Calculation Speed Increase**

   Refactored how safety factors are processed in design load calculations to increase calculation speed. The EnergyPlus calculation engine does not explicitly model safety factors. A custom approach is used to represent safety factor as a purely convective heat gain in the EnregyPlus model instead. In HAP 6.3.1 and prior versions this custom approach was found to require excessive processing time. The approach has been refactored to reduce overall time for design load calculations.

   The size of the time savings varies widely as a function of many factors, but number of spaces in the building is one key factor. As an example, in the Medical Office Building project used in HAP training classes, calculation time from v6.3.1 is reduced by 35% in v6.4. The Medical Office Building is a small to medium sized building containing 200 spaces. Savings does not change linearly according to space quantity. The savings can be substantially less for very small buildings, but can be considerably more for large buildings. For example, in a sample 850-space building using safety factors, the calculation time was reduced by 70%.

(B) Space Model Features

1. **Space Name Input**

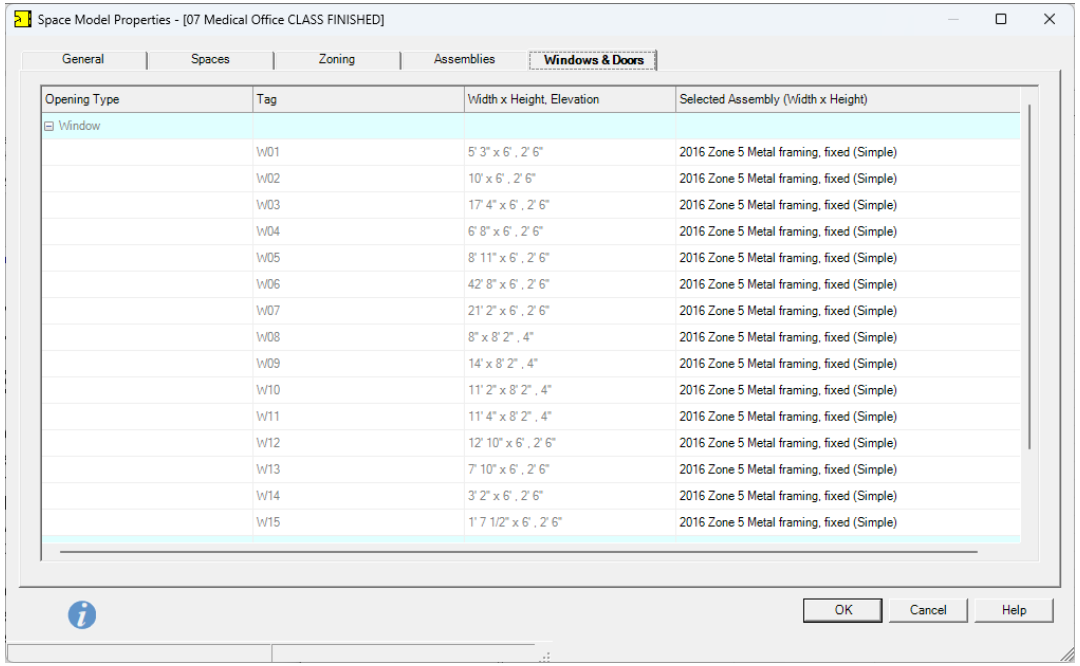
   Added ability to edit space names in the grid on the Spaces tab. Normally space names are specified while creating the Building Model. Space names can now be defined or modified in the Space Model. When a Space Model containing modified space names is saved, the program automatically updates the Building Model and any other Space Model linked to the same building.

Other Enhancements (2 of 5)

(B) Space Model Features (continued)

2. **Copy / Paste Window and Door Assemblies**

   Added ability to copy and paste window and door assemblies on the Windows & Doors tab. This speeds up input in situations where a model has many different opening tags but where the same window assembly performance is used for multiple opening tags. An example is use of ASHRAE Standard 90.1 prescriptive window performance. For the example shown at the right, there are 15 different window opening Tags. With the new copy/paste feature, you could select a window assembly for the first tag W01 and then copy and paste that to the remaining 14 window tags. Formerly, assembly selection had to be made one by one for all opening tags.



3. **Copy / Paste Opaque Assemblies**

   Added ability to copy and paste opaque assemblies such as walls, roofs, and floors on the Assemblies tab. This can be useful when two or more surface groups in a particular assembly type like exterior above grade walls use the same assembly.

Other Enhancements (3 of 5)

(C) Air Systems

1. **Air Source Heat Pump DOAS**

   Added features for modeling air source heat pump heating in DOAS AHUs

2. **Small VRF Performance Units**

   Added HSPF2 as performance units for small capacity VRF outdoor units.

(D) Plants

1. **Modular Water Source Economizer for A/C Chillers**

   Added this free cooling option for air-cooled chillers. It models a dry-cooler section positioned in upstream and in series with the chiller. When outdoor air is colder than to return water, the economizer section precools water returning to the chiller to reduce the mechanical cooling load. When the outdoor air is sufficiently cold, the economizer handles the full load and the chiller turns off.

2. **Refrigerant Migration Free Cooling for W/C Centrifugal Chillers**

   Added this free cooling option for water-cooled centrifugal chillers. When entering condenser water is sufficiently colder than leaving chilled water temperature, the chiller's compressors turn off. Refrigerant flows between condenser and evaporator due to pressure differences to deliver a cooling effect.

3. **Performance Units for Air-to-Water and Water-to-Water Heat Pumps**

   Added COP as a performance units option for defining full load performance and the part-load performance map for A2W and W2W heat pumps and reversibles.

Other Enhancements (4 of 5)

(D) Plants (continued)

4. **Performance Map Size**

   Expanded the number of rows permitted in the performance map from 8 to 14 to permit modeling of chillers and heat pumps operating over a wider range of entering temperatures, and for finer granularity in modeling.

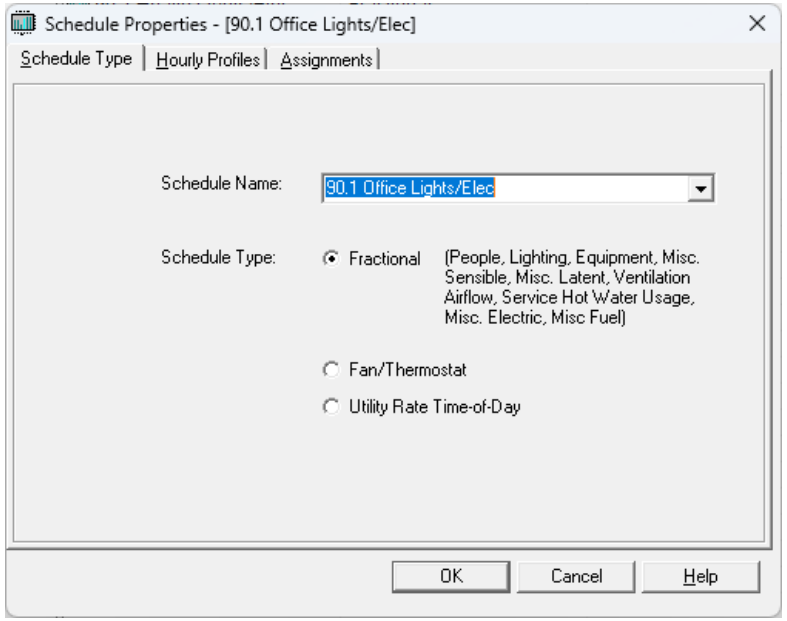
5. **Plant Size**

   Expanded the maximum size for a plant from 12 to 30 machines. This applies to chillers in chilled water plants, boilers and heat pumps in hot water plants, reversibles in changeover plants, and cooling and heating machines in heat recovery plants.

(E) Schedules

1. **ASHRAE Default Data**

   Added a feature for selecting ASHRAE Standard 90.1 default schedules. The Schedule Name input now provides a drop-down list containing the ASHRAE 90.1 default schedules for various building types and heat gain types. The Schedule Name input can still be used as a text box to directly enter a name when manually entering your own schedule data.



Other Enhancements (5 of 5)

(F) Utility Rates

1. **EIA Price Data**

   Updated default electric and natural gas price data for US states using the most recent data published by the US Energy Information Administration (EIA). That data is for calendar year 2024. The option to default EIA price data appears in the Utility Rate Wizard.

2. **CO2e Emission Rate Data**

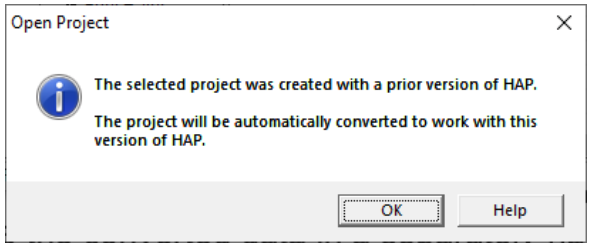
   Added default carbon dioxide equivalent (CO2e) emission rate data for US states based on the latest data published by the US Environmental Protection Agency (EPA) in the eGRID2023 report. When using the Utility Rate Wizard, selection of EIA price data now defaults both the energy price and the corresponding state CO2e emission rate.

(G) Problems Fixes

1. Corrected problems identified in HAP v6.3.1. A detailed list of problem fixes can be found in section 1.2 of the HAP help system in the “What’s New in HAP” topic. To display program help, press F1 or press the Help button on the main window tool bar.

About Data Conversion & Calculation Results

1. **Project Conversion.** When you open a project created by v6.3 or an earlier v6 version it will be converted to 6.4 format automatically. An informational message appears to make you aware this is happening (image at right). All input data is converted. Calculations must be rerun so they incorporate any changes to calculations made in 6.4.



2. **Saving Converted Projects** - The word "(converted)" is inserted into the project name when it is converted. This is done so you don't inadvertently overwrite the original project file. When you save the converted project for the first time you can choose to save it as a separate file with a different name, or you can choose to overwrite the original project with the original file name.

   Note that once you convert a project to 6.4 format, it cannot be opened thereafter in 6.3. Therefore, if you will need to inspect the original project data in 6.3 later, don't overwrite the original file when you save. Save it as a separately-named file.

3. **Will calculation results in 6.4 be different than 6.3.1 for a converted project?** Typically no. Calculation results in 6.4 will match 6.3.1. The exception to this is the following situation:

   a. If your 6.3 project was affected by one of the problems corrected in 6.4, that correction could cause changes in results. In the help system, the "What's New in HAP" topic in section 1.2 provides a detailed list of problem fixes. See item 10 in section B of this topic. While running HAP the help system can be displayed by pressing F1 or pressing the Help button on the main window tool bar.

      Most of the problem fixes for calculations in HAP 6.4 involve very narrow, specific situations. One that could have wider significance is a change to supply fan sizing for VAV systems using Dual Maximum VAV air terminals in climates where peak zone heating load dictates the supply airflow rate for one or more zones. This only affects such VAV systems in colder climates and particularly where large numbers of zones have supply airflow dictated by the peak zone heating load rather than peak zone cooling sensible load.

QUESTIONS?

Please contact Carrier Software Systems at

software.systems@carrier.com

Thank you!