



TRACE 700

HVAC load design & analysis software

Trane Air Conditioning Economics, or TRACE™, is a design-and-analysis tool that helps HVAC professionals optimize the design of a building's heating, ventilating, and air-conditioning system based on energy utilization and life-cycle cost. Introduced in 1973, the program was the first of its kind and quickly became a de facto industry standard.

A TRACE model can help establish the peak cooling and heating loads during the planning stage of a building project. At the design development stage, it aids evaluation of energy-saving concepts, such as the effects of daylighting, HVAC optimization strategies, and high-performance glazing. And near the end of the construction, when the design is finalized, the TRACE model can help document compliance with ASHRAE Standard 90.1 or validate the building's eligibility for LEED* certification.

Compliant calculation methodologies

TRACE 700 calculations apply techniques recommended by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE). The program was tested in accordance with ASHRAE Standard 140-2004, "Standard Method of Test for the Evaluation of Building Energy Analysis Computer Programs," and it meets the requirements for simulation software set by ASHRAE Standard 90.1 and the LEED Green Building Rating System. (continues on back)



Contact us

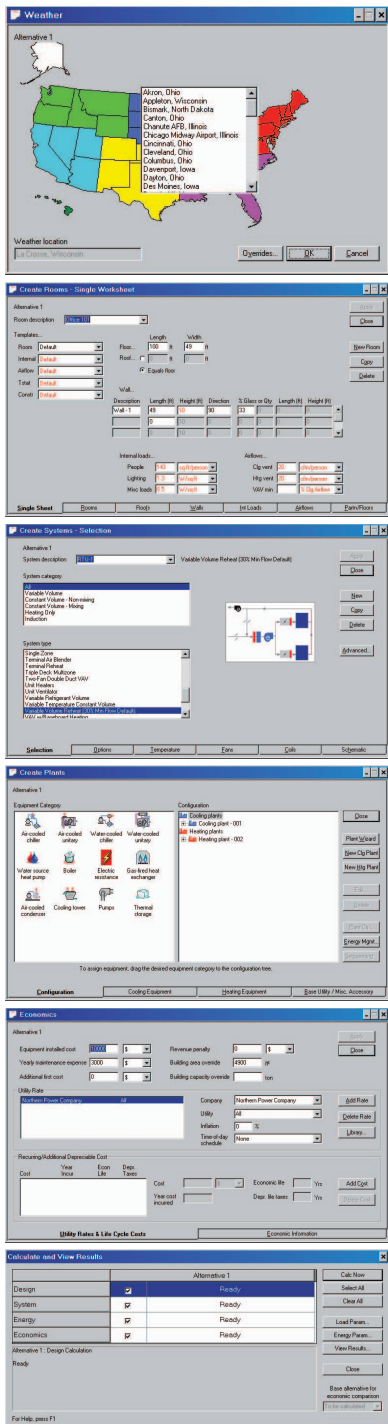
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Support hours

Mon - Thu. 8 a.m. - 5:30 p.m. CST
Fri 8 a.m. - 5 p.m. CST

How to order

Use the online order form or download a free demonstration version from www.tranecds.com



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www.trane.com

For more information, contact your local Trane office or e-mail us at CDSHelp@trane.com

Powerful modeling capabilities

- * Choose from eight load-simulation methodologies, including Heat Balance-based RTS, using algorithms provided in the latest ASHRAE Loads Toolkit. Specify either hour-by-hour (8760) or reduced-year energy/economic analysis
- * Predefined weather profiles represent the climates, elevations, and time zones of over 500 cities around the globe
- * Describe building envelope and site orientation, as well as room construction, airflows, thermostat settings, heat sources, and utilization schedules
- * Model chillers, unitary equipment, water-source and geothermal heat pumps, boilers, electric resistance heating, gas-fired heat exchangers, and air terminals
- * Include thermal storage, energy recovery, free cooling, cogeneration and district heating or cooling
- * Simulate control strategies, such as optimum start/stop, temperature or static pressure setpoint reset, humidification, night purge, fan cycling, demand-limiting, equipment sequencing, and ventilation reset
- * Model ventilation airflow based on the requirements of ASHRAE Standard 62-1989
- * Predict hourly room relative humidity with advanced humidity control modeling and reporting options
- * Account for daylighting, domestic hot water, process loads, parking lot lights, and other elements that consume energy or affect the building's heating/cooling load
- * Predict operating costs based on energy types and utility rates
- * Compare the economic impact of alternate HVAC system designs based on first and maintenance expense

Time-saving templates and libraries

TRACE libraries contain common design parameters for construction materials, equipment, base utilities, weather, and scheduling. Library members include more than 35 air distribution systems, and a host of HVAC equipment and accessories. It's common for several rooms in a building to share similar thermostat setpoints, construction, internal loads, and other design criteria. Templates let you enter this information once and then apply it to

an unlimited number of rooms. If a design criterion changes, you can either edit the information of an individual room or edit the template to automatically update all related room information.

Ease of use

- * "Drag-and-drop" functionality makes it easy to create thermal zones and to assign airside coils to the appropriate heating and cooling equipment
- * "Alternatives" simplify comparisons of the effects of system variations, different utility rates (stepped, time-of-day, time-of-use, or floating cutoff), and construction or equipment options
- * Display values in either English I-P or metric SI units
- * An optional wizard guides entries for quick load design and energy/economic simulations
- * Predefined reports include summaries and details of analysis results, entered data, and reports formatted to demonstrate compliance with ASHRAE Standard 90.1's Energy Cost Budget (ECB) Method and LEED Energy and Atmosphere Credit 1
- * Customize energy and load profile reports using the built-in graphing tool

Flexible file-handling options

- * Import weather data from TMY, TMY2, TRY, WY2, CEC, CTZ, CWC, and IWEK files
- * Import fenestration data from LBNL Window software
- * Import/export gbXML data for CAD interoperability
- * Import/export files for compatibility with Trane's System Analyzer™ software
- * Export analysis results as PDF, RTF, TXT, Word, or Excel files
- * Merge project files to accommodate large studies

Multifaceted support

In addition to online Help, TRACE 700's extensive documentation includes users, getting started, and design output interpretation manuals. Free newsletters and webinars provide additional tips and tricks. Your purchase of a TRACE 700 license also entitles you to unlimited technical support from our team of engineers and software support specialists, as well as access to our online knowledgebase.

Trane has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice.

TRACE 700... a complete, Windows™-based analysis tool for building loads, energy, and economics

- Custom libraries increase accuracy
- Output available in summary and detailed forms
- Model virtually any building
- Provides 8760 analysis
- Less complicated with drag-and-drop modeling
- Enhance presentations with graphical reports
- Templates and predefined libraries reduce modeling time
- Efficiently create multiple alternatives

A Closer Look at Modeling with *TRACE*700



Select weather information

- Provides both design and typical weather data by location
- Choose from 400 climate locations
- Import standard weather files for a full-year (8760) analysis



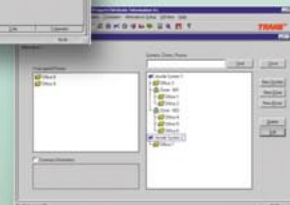
Create rooms

- Describe the construction, airflows, thermostat settings, heat sources, and schedules by room
- Use templates to streamline entries for similar rooms



Create airside systems

- Choose from more than 30 methods of air distribution
- Add energy recovery, economizers, and dedicated ventilation/makeup air



Assign rooms to systems

- Create thermal zones and assign them to systems using the drag-and-drop feature
- Determine airflows, coil loads, and fan sizes for each airside system

Create plants

- Use drag-and-drop editing to create cooling and heating plants
- Add demand limiting, free cooling, sequencing, reset, and other options
- Include base utilities and miscellaneous accessories that consume energy



Assign systems to plants

- Quickly assign (or reassign) coil loads to equipment using the drag-and-drop feature



Define economics

- Describe initial and maintenance costs to compare the economic impact of up to 4 alternative HVAC designs
- Define unique utility rates for each type of energy represented in the project
- Create alternatives based on different utility rates to determine the effect of deregulation



Trace 700 Software Overview

In 1973 the first version of Trane Air Conditioning Economics, TRACE, became the first computer program of its type. It is a complete load, system, energy and economic analysis program that compares the energy and economic impact of such building alternatives as architectural features, HVAC systems, HVAC equipment, building utilization or scheduling, and economic options.

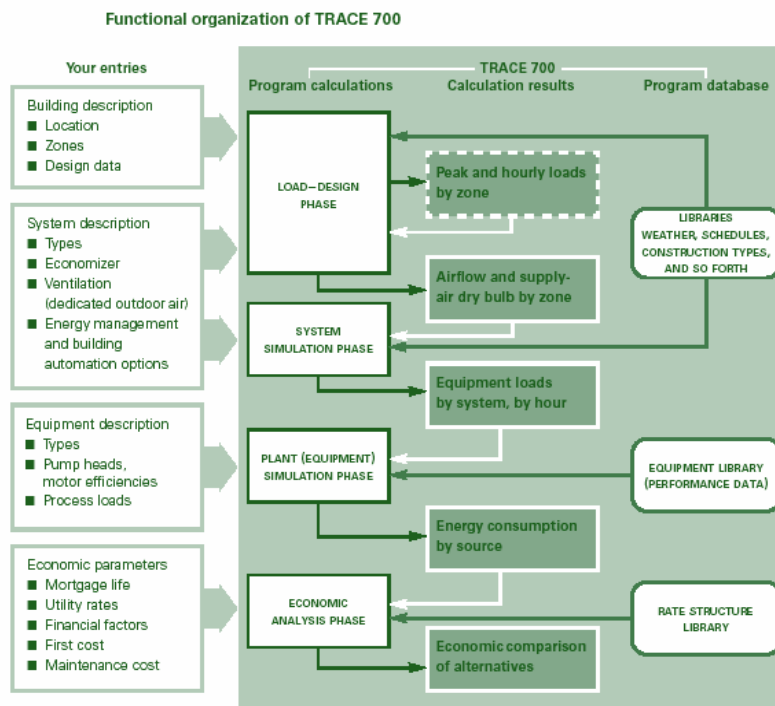
The TRACE program is, in essence, an analytic tool for building system designers. It enables them to optimize the building, system and equipment designs on the basis of energy utilization and life-cycle costs.

Using the TRACE program in the early stages of building planning, allows the building owner and building design team to receive the maximum benefit of a detailed analysis.

TRACE can also be invaluable for assessing the energy and economic impact of building renovation or system retrofit projects.

Explanation of the Program

To fully appreciate the capabilities of the Trane Air Conditioning Economics program and to obtain maximum value from its use, the following is a thorough explanation of the program.



Program Organization

The TRACE program incorporates five major phases, each with specific tasks or functions that must be performed to provide a complete energy and economic analysis. The names of these phases are load, design, system simulation, equipment simulation and economic analysis.

The building heating/cooling load calculations, used in the load phase of the program for annual energy consumption analysis, are of sufficient detail to permit the evaluation of the effect of building data such as orientation, size, shape and mass, heat transfer characteristics of air and moisture, as well as hourly climatic data.

Beyond this, the calculations used to simulate the operation of the building and its service systems through a full-year operating period, are of sufficient detail to permit the evaluation of the effect of system design, climatic factors, operational characteristics and mechanical equipment operating characteristics on annual energy usage. Manufacturers' data is used in the program for the simulation of all systems and equipment.

The calculation procedures used in TRACE are based upon 8,760 hours of operation of the building and its service system. These procedures use techniques recommended in the appropriate ASHRAE publications or produce results which are consistent with such recommended techniques.

The calculations explicitly cover the following items:

- Climatic data, including coincident hourly data for temperature, solar radiation, wind and humidity of typical days of the year, representing seasonal variations. In total, the TRACE program calculates building heat gains and losses, by zone, for 1152 hours of the year, representing seasonal variations. TRACE has the ability to import hourly climatic data and calculate building heat gains and losses for all 8760 hours in a year.
- Building and orientation, size, shape, mass and heat transfer characteristics of air and moisture.
- **Building operational characteristics**, accounting for temperature, humidity, ventilation, illumination and control modes for occupied and unoccupied hours.
- **Mechanical operational characteristics**, which take into account design capacity, part load performance and ambient dry bulb and wet bulb depression effects on equipment performance and energy consumption.
- Internal heat generation from illumination, equipment and the number of people in occupied spaces during both the occupied and unoccupied hours.

Load Phase

In the Load phase of the program, conventional load data describing the building construction, orientation and location are required entries. In addition, the utilization profile of the building, including lighting schedules, occupancy schedules and miscellaneous load schedules, are required.

The program obtains weather data from its library for the city designated by the program user. Building loads are then actually calculated by zone and by hour, from information provided from the weather library (in the case of weather-dependent loads). It takes into account the coincident loading scheduled by the program user for items such as lights, people and miscellaneous loads.

Beyond this, the program accounts for energy consumed by systems that do not contribute loads to the air conditioning system. These energy consumptions have an effect upon the overall energy demand of the building and the associated energy costs.

Design Phase

The second major phase of the program is the Design phase. The purpose of this phase is to establish the building load model at design conditions. Entries required by the Design phase include the type of mechanical system, as well as the percentage of wall, lighting and miscellaneous loads assigned to the return air. In addition, the designs outside air quantities are required.

The program then determines design cooling load, heating load, outside air quantity, total air quantity and the supply air dry bulb temperature. The air quantities and supply air dry bulb in the cooling mode are determined psychrometrically using standard procedures outlined in the ASHRAE Handbook of Fundamentals. Design loads determined in this phase are based on 100% of design entered values, even though the coincident design values of weather-affected loads may not actually occur during the weather year. The aforementioned design values are determined for both the perimeter and interior system from entries by the user.

Airside System Simulation

The next major phase of the program is the Airside System Simulation phase. Its key function in the program is to translate building heat gains and losses into equipment loads by system and by hour, utilizing all of the building variables that affect the system operation. In this phase, the program tracks an air particle around the complete airside system loop, picking up loads and canceling simultaneous gains and losses along the airflow path of each system.

The final output from the system simulation phase is the equipment loads by system and by hour. This consists of air-moving loads, heating loads, cooling loads, and humidification loads where applicable. This is perhaps the most complicated phase of the program. Complication arises from the fact that each major system or system combinations and hybrids thereof, must utilize separate individual system programming subroutines to reflect the actual operation and control of that system.

The program contains system simulation programming subroutines for 32 different system types. These can be combined to form innumerable variations for the building under study.

Equipment Simulation

The equipment loads, by system and by hour, are then provided to the equipment simulation phase, along with a description of the equipment to be used in the system.

The previously described weather information is also input into this phase. Regardless of whether the equipment has air-cooled or water-cooled condensing, the weather affects the overall part load efficiencies.

The essential function of the equipment and simulation phase is to translate equipment loads, by system and hour, into energy consumption by source. The loads are translated into kilowatt-hours of electricity, therms of gas, oil, district hot water or chilled water, even to the extent of calculating the total gallons of make-up water required by a cooling tower or the energy consumed by the crankcase heaters of a reciprocating compressor. The entry requirements of this phase consist only of the equipment types for heating, cooling and air-moving as well as pumping heads and pump motor efficiency for each system where hydronic pumping is involved.

This data is utilized within the program to call for the equipment library, which is the performance information for the various pieces of equipment. This information is used to convert system loads into energy consumption for subsequent processing to the economic analysis phase.

It is important to note it is not necessary for the user to enter the part load performance of equipment accessories into the program. They are already contained in the equipment library and are accessed when called for by the user. The capability to enter custom equipment and the associated part-load performance of the equipment, are available options to the user.

Economic Phase

The next and final major phase of the program is the economic analysis phase. This phase utilizes user entries, such as the utility rates and system installed cost data, along with other economic information such as mortgage life, cost of capital, etc., to compute annual owning and operating costs. It also calculates the various financial measurements of an investment such as cash flow effect, profit and loss effect, payout period and return on additional investment between alternatives.











In very simple terms, the program determines how much it costs to operate one system compared with another. It then computes the present worth of the savings and the incremental return on the additional investment. It is keyed to provide information the owner needs to make his or her final economic decision, including monthly and yearly utility costs over the life of the HVAC system.

Trace 700 User Interface

Project Navigator

This view acts as a road map to guide you through the modeling process. Each button along the left side of the screen opens a multi-tabbed worksheet that prompts you for the information needed to describe a room, system, or plant. Work from top to bottom to keep your analysis on course.

The high-level summary shown here makes it easy to track your progress by alternative.

Project Navigator					
		Alternative 1	Alternative 2	Alternative 3	Alternative 4
	Enter Project Information	Variable Primary Flow	VFDs on AHUs with IGVs	Optimized CT with VFDs	Flat Plate Heat Exchanger Free Cooling
	Select Weather Information	Dallas, Texas	Dallas, Texas	Dallas, Texas	Dallas, Texas
	Create Templates	35 Templates	Use Alternative 1	Use Alternative 1	Use Alternative 1
	Create Rooms	5 Rooms	Use Alternative 1	Use Alternative 1	Use Alternative 1
	Create Systems	1 Systems	1 Systems Based on Alternative 1	Use Alternative 2	1 Systems Based on Alternative 2
	Assign Rooms to Systems	5 Assigned Rooms	5 Assigned Rooms	5 Assigned Rooms	5 Assigned Rooms
	Create Plants	2 Plants	2 Plants Based on Alternative 1	2 Plants Based on Alternative 1	2 Plants Based on Alternative 3
	Assign Systems to Plants	System Assignments	System Assignments	System Assignments	System Assignments
	Define Economics	TX Retail Elect Provider Misc. 0(\$)	TX Retail Elect Provider Misc. 0(\$)	TX Retail Elect Provider Misc. 0(\$)	TX Retail Elect Provider Misc. 0(\$)
	Calculate and View Results	06/26/2006 - 07:53 AM	06/26/2006 - 07:53 AM	06/26/2006 - 07:53 AM	06/26/2006 - 07:53 AM

Project Tree

This view organizes your project by system, zone, and room. Select any one of these items to display all of the information about it on the same screen. Use the Project Tree view (along with or instead of Project Navigator) to create the building model, add alternatives, and fill in the necessary information. Take advantage of the familiar cut, copy, and paste features to make short work of data entry.

Project Tree View





























End

- Project Information
 - Economics
 - RLT Alternative 1
 - Utility Rates & Life Cycle Costs
 - Energy Mgmt.
 - Systems, zones and rooms
 - VAV AHUs
 - Coils
 - Fans
 - Options
 - Dedicated OA
 - Advanced Options
 - Fan Overrides
 - Temperature / Humidity
 - w1-R1 N**
 - w1-R2 E
 - w1-R3 S
 - w1-R4 W
 - w1-R5 Int
 - Plants and equipment
 - Cooling plants
 - Cooling plant - 001
 - Heating plants
 - Heating plant - 002
 - Base utilities
 - Miscellaneous accessories

Room Description	W1-R1 N
Assigned To System	W1-R1 N
Assigned To Zone	VAV AHUs
Room Template	Wing 1
Thermostat Template	Wing 1
Construction Template	Wing 1
Floor Length (ft)	135
Floor Width (ft)	9.25926
Fir to Fir Height (ft)	9
Plenum Height (ft)	4
Height Above Ground (ft)	
Acoustic Ceiling Resistance (hr-ft ² -F/Btu)	1.786
Cooling Dry Bulb (°F)	72
Heating Dry Bulb (°F)	72
Relative Humidity %	50
Cooling Driftpoint (°F)	78
Heating Driftpoint (°F)	60
Thermostat Cooling Schedule	None
Thermostat Heating Schedule	None
Thermostat Location	Room
Humidity Moisture Capacitance	None
Humidistat Location	Room
Duplicate Floor Multiplier	11
Duplicate Rooms per Zone	1
Room Mass / # of Hours	None
Floor Construction Type	4" LW Concrete
Carpeted Floor	Yes

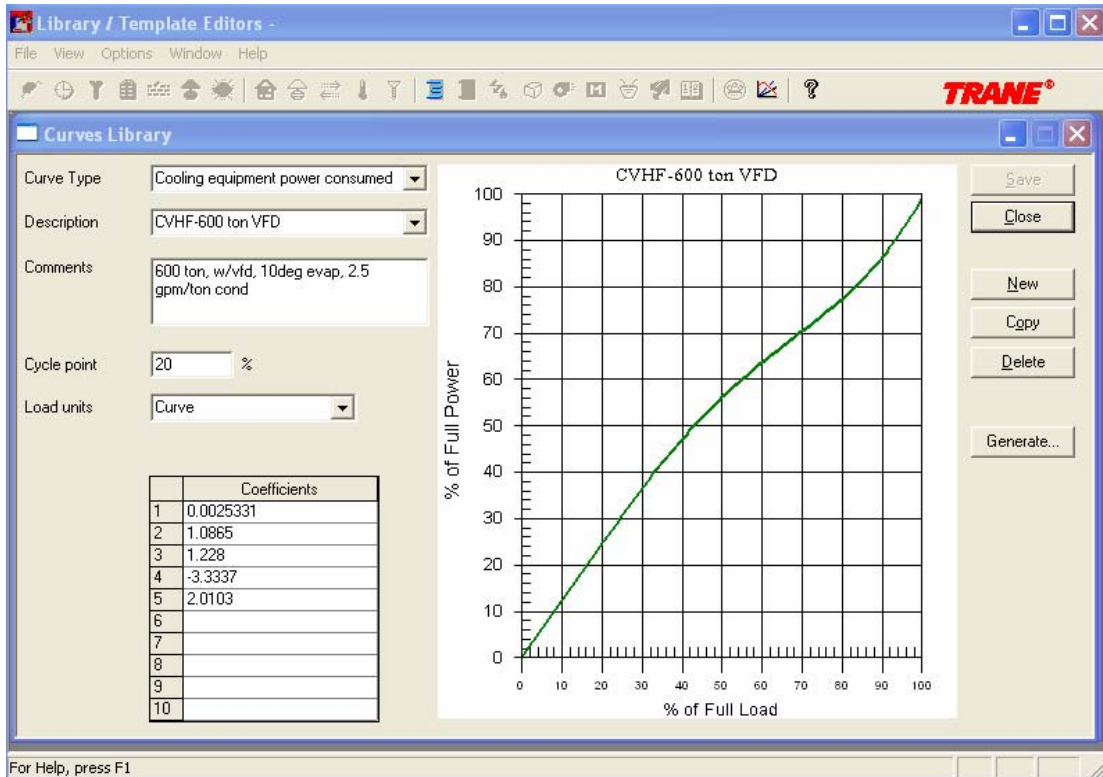
Component Tree

After describing the building and HVAC design in the Project Navigator or Project Tree view, use this view to review your entries. Cut, copy, and paste functions make it easy to change an airflow or temperature (for example) across multiple rooms, systems, or plants.

Component Tree View - Alternative 1		
 Project Information  Economics ALT Alternative 1  Utility Rates & Life Cycle Costs  Recurring/Additional Depreciable Costs  Utility Rates  Energy Mgmt.  Cooling plants  Plants  Cooling equipment  Controls  Heating plants  Plants  Heating equipment  Base utilities  Miscellaneous accessories  Systems  Options  Dedicated OA  Temperature / Humidity  Fans  Coils  Fan Overrides  Advanced Options  Zones  Rooms  Airflows  People & Lighting  Floors	System Description	Fans
	System Type	VAV AHUs
	Primary Fan Type	Parallel Fan-Powered VAV, Htg Coil on Plenum Inlet
	Primary Fan Static Pressure (in. wg)	FC Centrifugal vav/inlet vn
	Primary Fan Schedule	Available (100%)
	Secondary Fan Type	Fan coil supply fan
	Secondary Fan Static Pressure (in. wg)	0.5
	Secondary Fan Schedule	Available (100%)
	Return Fan Type	None
	Return Fan Static Pressure (in. wg)	0
	Return Fan Schedule	Available (100%)
	System Exhaust Fan Type	None
	System Exhaust Fan Static Pressure (in. wg)	0
	System Exhaust Fan Schedule	Available (100%)
	Room Exhaust Fan Type	None
	Room Exhaust Supply Fan Static Pressure (in. wg)	0
	Room Exhaust Fan Schedule	Available (100%)
	Optional Ventilation Fan Type	None
	Opt Ventilation Fan Static Pressure (in. wg)	0
	Optional Ventilation Fan Schedule	Available (100%)
	Auxiliary Fan Type	None
	Auxiliary Supply Fan Static Pressure (in. wg)	0
	Auxiliary Fan Schedule	Available (100%)
	Fan Cycling Schedule	Cycle with occupancy

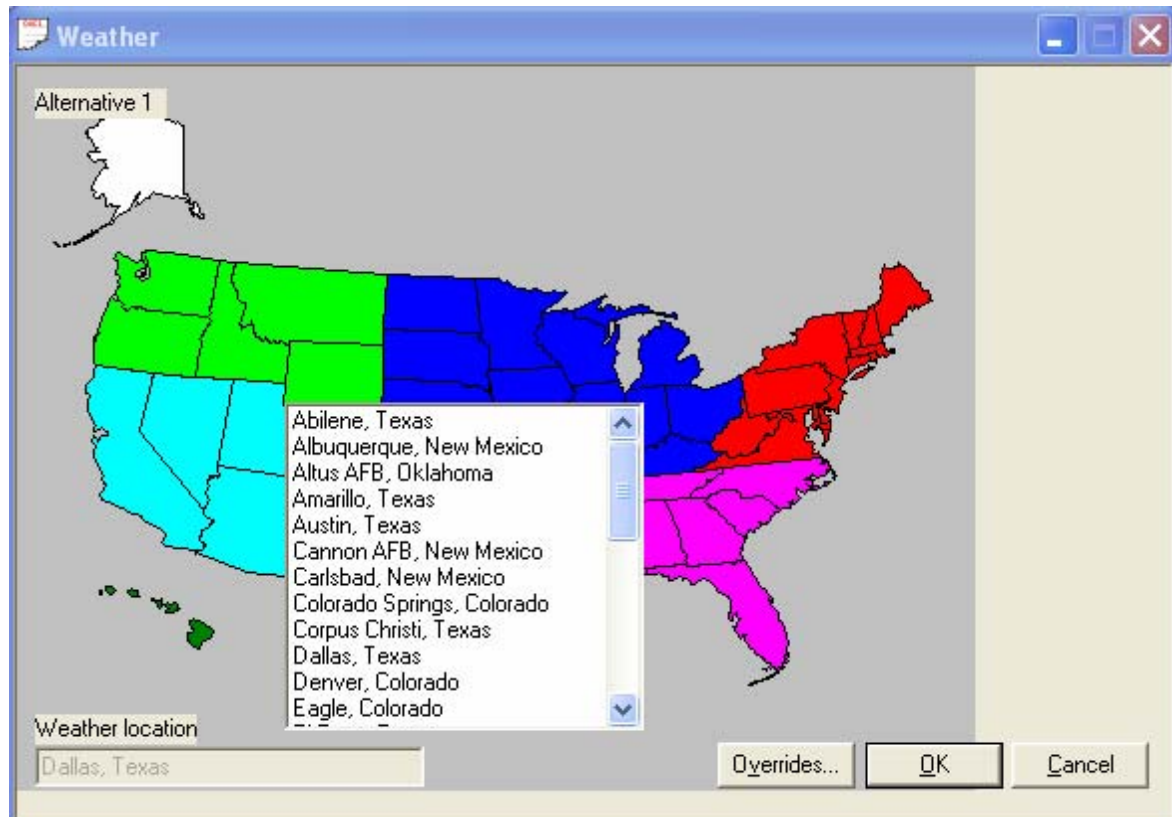
Libraries

Use Library/Template Editors to view detailed information about a particular construction type, schedule, or manufacturers' data for specific equipment. If none of the library members is quite right and accuracy is critical, customize one that's close. You can run the program by itself or start it from within TRACE 700.



Weather

TRACE 700's library of weather data represents the climates of more than 400 locations. Just pick the city that best matches the building location; its profile contains typical and design weather details for wet-bulb and dry-bulb temperatures, barometric pressure, wind velocity, ground reflectance, saturation curves, and cloud cover.



Create rooms

TRACE 700 lets you model as many rooms and as many surfaces in a room as you wish. Take advantage of templates to quickly define data that is common to all spaces in your building.

For simple designs or when a close estimate of design loads is sufficient, just complete the entries on the "single sheet" tab shown here. Use the entries on the remaining tabs to provide the additional details needed for complex designs or when accuracy is critical.

Alternative 1

Room description: W1-R1 N

Templates...

Room: Wing 1, Internal: Wing 1, Airflow: Wing 1, Tstat: Wing 1, Constr: Wing 1

Dimensions: Length 135 ft, Width 9.2592 ft, Height 0 ft (Equals floor)

Wall...

Description	Length (ft)	Height (ft)	Direction	% Glass or Qty	Length (ft)	Height (ft)
N Wall	135	12	0	50	0	0
	0	12	0	0	0	0
	0	12	0	0	0	0

Internal loads...

People: 143 sq ft/person, Lighting: 0.7 W/sq ft, Misc loads: 0.8 W/sq ft

Airflows...

Clg vent: 20 % Clg Airflow, Htg vent: 15 % Htg Airflow, VAV min: 30 % Clg Airflow

Single Sheet | Rooms | Roofs | Walls | Int Loads | Airflows | Partn/Floors

Alternative 1

Room description: W1-R1 N

Templates...

Room: Wing 1, Internal: Wing 1, Airflow: Wing 1, Tstat: Wing 1, Constr: Wing 1

Size...

Length: 135 ft, Width: 9.2592 ft, Height: 9 ft (Floor to floor), Plenum: 4 ft, Above ground: 0 ft

Duplicate...

Floor multiplier: 11, Rooms per zone: 1

Room mass/avg time lag: None, Slab construction type: 4" LW Concrete, Carpeted: ☒, Acoustic ceiling resistance: 1.786 hr-ft²-°F/Btu

Design...

Cooling dry bulb: 72 °F, Heating dry bulb: 72 °F, Relative humidity: 50 %, Thermostat...

Cooling driptpoint: 78 °F, Heating driptpoint: 60 °F, Cooling schedule: None, Heating schedule: None, Location: Room

Humidity...

Moisture capacitance: None, Humidistat location: Room

Single Sheet | Rooms | Roofs | Walls | Int Loads | Airflows | Partn/Floors

Create Rooms - Roofs

Alternative 1

Room description: W1-R1 N

Templates...

Room: Wing 1

Internal: Wing 1

Airflow: Wing 1

Tstat: Wing 1

Constr: Wing 1

Roof...

Roof - 1

Tag: Roof - 1

Construct: 4" LW Conc

Equals floor

Length: 135 ft

Width: 9.2592 ft

U-factor: 0.213 Btu/h ft² °F

Pitch: 90 deg

Direction: 0 deg

Skylight...

Roof area: 0 %

Length: 0 ft

Width: 0 ft

Quantity: 1

Type: Single Clear 1/4"

U-factor: 0.95 Btu/h ft² °F

Sh. Coef: 0.95

Ld to RA: 0 %

Shading...

Internal: None

Single Sheet Rooms **Roofs** Walls Int Loads Airflows Partn/Floors

Create Rooms - Walls

Alternative 1

Room description: W1-R1 N

Templates...

Room: Wing 1

Internal: Wing 1

Airflow: Wing 1

Tstat: Wing 1

Constr: Wing 1

Wall...

N Wall

Tag: N Wall

Construct: Face Brick, 12" HW Concrete, 1" Ins

Length: 135 ft

Height: 12 ft

Grnd reflect multiplier: 1

U-factor: 0.167 Btu/h ft² °F

Tilt: 0 deg

Direction: 0 deg

Glass...

Wall area: 50 %

Length: 0 ft

Height: 0 ft

Quantity: 0

Type: Double Coated 1/4"

U-factor: 0.5 Btu/h ft² °F

Sh. Coef: 0.55

Ld to RA: 0 %

Shading...

Internal: None

External: Overhang - None

Single Sheet Rooms Roofs **Walls** Int Loads Airflows Partn/Floors

Create Rooms - Internal Loads

Alternative 1

Room description: W1-R1 N

Templates...

Room: Wing 1 People... Activity: General Office Space Schedule: People 740 E Campbell

Internal: Wing 1 Density: 143 sq ft/person Sensible: 250 Btu/h

Airflow: Wing 1 Latent: 200 Btu/h

Tstat: Wing 1

Constr: Wing 1

Lights... Type: Recessed fluorescent, not vented, 80% load to space

Heat gain: 0.7 W/sq ft Schedule: Lights 740 E Campbell

Miscellaneous loads...

Misc Load 1

Tag: Misc Load 1 Type: Std Office Equipment

Energy: 0.8 W/sq ft Schedule: Misc - Highrise Bldg

Energy meter: Electricity

Single Sheet Rooms Roofs Walls **Int Loads** Airflows Partn/Floors

Create Rooms - Airflows

Alternative 1

Room description: W1-R1 N

Templates...

Room: Wing 1

Internal: Wing 1

Airflow: Wing 1

Tstat: Wing 1

Constr: Wing 1

Ventilation...

Type: General Office Space

Cooling: 20 % Clg Airflow

Heating: 15 % Htg Airflow

Schedule: Vent - High Rise Office

Infiltration...

Type: None

Cooling: 0 air changes/hr

Heating: 0 air changes/hr

Schedule: Available (100%)

Main supply...

Cooling: To be calculated

Heating: To be calculated

Auxiliary supply...

Cooling: To be calculated

Heating: To be calculated

VAV minimum...

Rate: 30 % Clg Airflow

Schedule: Available (100%)

Room exhaust...

Rate: 0 air changes/hr

Schedule: Available (100%)

Single Sheet Rooms Roofs Walls Int Loads **Airflows** Partn/Floors

Create Rooms - Partitions and Floors

Alternative 1

Room description

W1-R1 N

Templates...

Room

Wing 1

Internal

Wing 1

Airflow

Wing 1

Tstat

Wing 1

Constr

Wing 1

Partition...

Tag

Length

0

Height

0

Constr

U-factor

0

Adjacent space temperature...

Method

Cooling

Heating

New Partition

Copy Part

Delete Part

Floor...

Tag

Exposed

Slab on grade

Constr

Area

0

Perim

0

U-factor

0

Loss coeff

0

External temperature...

Method

Cooling

Heating

New Floor

Copy Floor

Delete Floor

Single Sheet

Rooms

Roofs

Walls

Int Loads

Airflows

Partn/Floors

Create airside systems

Add as many airside systems to the project as necessary — there's no limit — and let the program determine the design loads and hourly load profiles for each coil. TRACE 700 models more than 30 different methods of air distribution.

Create Systems - Selection

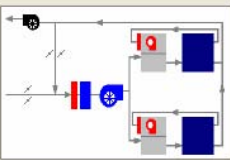
Alternative 1
System description: VAV AHUs Parallel Fan-Powered VAV, Htg Coil on Plenum Inlet

System category

- All
- Variable Volume
- Constant Volume - Non-mixing
- Constant Volume - Mixing
- Heating Only
- Induction

System type

- Bypass VAV
- Bypass VAV with Reheat (30% Min Flow Default)
- Changeover-Bypass VAV
- Changeover-Bypass VAV with Local Heat
- Changeover-Bypass VAV with Reheat
- Double Duct VAV
- Parallel Fan-Powered VAV
- Parallel Fan-Powered VAV, Htg Coil on Plenum Inlet
- Series Fan-Powered VAV
- Two-Fan Double Duct VAV
- Variable Refrigerant Volume



Buttons: Apply, Close, New, Copy, Delete, Advanced...

Selection Options Dedicated OA Temp/Humidity Fans Coils Schematic

Create Systems - Options

Alternative 1
System description: VAV AHUs Parallel Fan-Powered VAV, Htg Coil on Plenum Inlet

Evaporative Cooling

Type: None

Direct efficiency: 0 %

Direct coil schedule: Available (100%)

Indirect efficiency: 0 %

Indirect coil schedule: Available (100%)

Economizer

Type: None

"On" point: °F

Max outdoor air: 100 %

Schedule: Available (100%)

Stage 1 Air-to-Air Energy Recovery/Transfer

Type: None (default)

Sup-side deck: Ventilation upstream

Exh-side deck: Outdoor & room exhaust mix

Schedule: Available (100%)

Effectiveness Options

Stage 2 Air-to-Air Energy Recovery/Transfer

Type: None (default)

Sup-side deck: Ventilation upstream

Exh-side deck: Outdoor & room exhaust mix

Schedule: Available (100%)

Effectiveness Options

Buttons: Apply, Close, Advanced Options

Selection Options Dedicated OA Temp/Humidity Fans Coils Schematic

Create Systems - Dedicated Ventilation

Alternative 1
System description: **VAV AHUs** Parallel Fan-Powered VAV, Htg Coil on Plenum Inlet
Configuration: **None** Control method: **Fixed Setpoints**

Buttons: **Apply** **Close**

Cooling/Heating Design Setpoints

Cooling supply air dry bulb °F

Heating supply air dry bulb °F

Cooling supply air dew point °F

Cooling/Heating Setpoint Limits

Supply air dry bulb high limit °F

Supply air dry bulb low limit °F

Cooling SA dew point high limit °F

Cooling SA dew point low limit °F

Dedicated Ventilation Schedules

Cooling coil: **Available (100%)**

Heating coil: **Available (100%)**

Optional ventilation fan: **Available (100%)**

Dedicated Ventilation Locations

Deck: **Return/Outdoor Deck**

Level: **System**

Selection Options **Dedicated OA** Temp/Humidity Fans Coils Schematic

Create Systems - Design Temperatures

Alternative 1
System description: **VAV AHUs** Parallel Fan-Powered VAV, Htg Coil on Plenum Inlet

Buttons: **Apply** **Close**

Design Air Temperature

Cooling supply Max °F
Min °F

Leaving cooling coil Max **48** °F
Min **48** °F

Heating supply Max °F
Min °F

Supply duct temperature difference **0** °F

Reheat temperature difference **0** °F

Direct/Indirect Dehumidification Methods (System Simulation only)

Type: **None**

Maximum room relative humidity %

Main cooling coil minimum allowable leaving (when throttling a chilled water coil downward during dehumidification or "wild coil" mode) °F

Variable Fan Speed for capacity control (System Simulation only)

Number of fan speeds: **None**

Percent airflow at low speed %

Percent airflow at medium speed %

Humidification

Design humidity ratio difference grains

Minimum room relative humidity %

Selection Options **Dedicated OA** **Temp/Humidity** Fans Coils Schematic

Create Systems - Fan Overrides

Alternative 1

System description

VAV AHUs

Parallel Fan-Powered VAV, Htg Coil on Plenum Inlet

Fan cycling schedule

Cycle with occupancy

Apply

Close

Overrides...

	Type	Static Pressure (in. wg)	Full Load Energy Rate	Full Load Energy Rate Units	Schedule
Primary	FC Centrifugal vav/inlet vn	3.5	0.00032	kW/Cfm-in wg	Available (100%)
Secondary	Fan coil supply fan	0.5	0.00024	kW/Cfm	Available (100%)
Return	None	0	0	kW/Cfm	Available (100%)
System exhaust	None	0	0	kW/Cfm	Available (100%)
Room exhaust	None	0	0	kW/Cfm	Available (100%)
Optional ventilation	None	0	0	kW/Cfm	Available (100%)
Auxiliary	None	0	0	kW/Cfm	Available (100%)

Selection

Options

Dedicated OA

Temp/Humidity

Fans

Coils

Schematic

Create Systems - Heating and Cooling Coil Overrides

Alternative 1

System description

VAV AHUs

Parallel Fan-Powered VAV, Htg Coil on Plenum Inlet

Apply

Close

Capacity Overrides

	Capacity	Capacity Units	Schedule
Main cooling	100	% of Design Cooling Capacity	Available (100%)
Auxiliary cooling		% of Design Cooling Capacity	Available (100%)
Main heating	100	% of Design Capacity	Available (100%)
Auxiliary heating		% of Design Capacity	Available (100%)
Preheat	100	% of Design Capacity	Available (100%)
Reheat	100	% of Design Capacity	Available (100%)
Humidification	100	% of Design Capacity	Available (100%)

Diversity

People

100

%

Lights

100

%

Misc loads

100

%

Warning: The fields marked in red require other entries for a correct simulation. Contact C.D.S. Support at 608-787-3926 for a detailed explanation.

Selection

Options

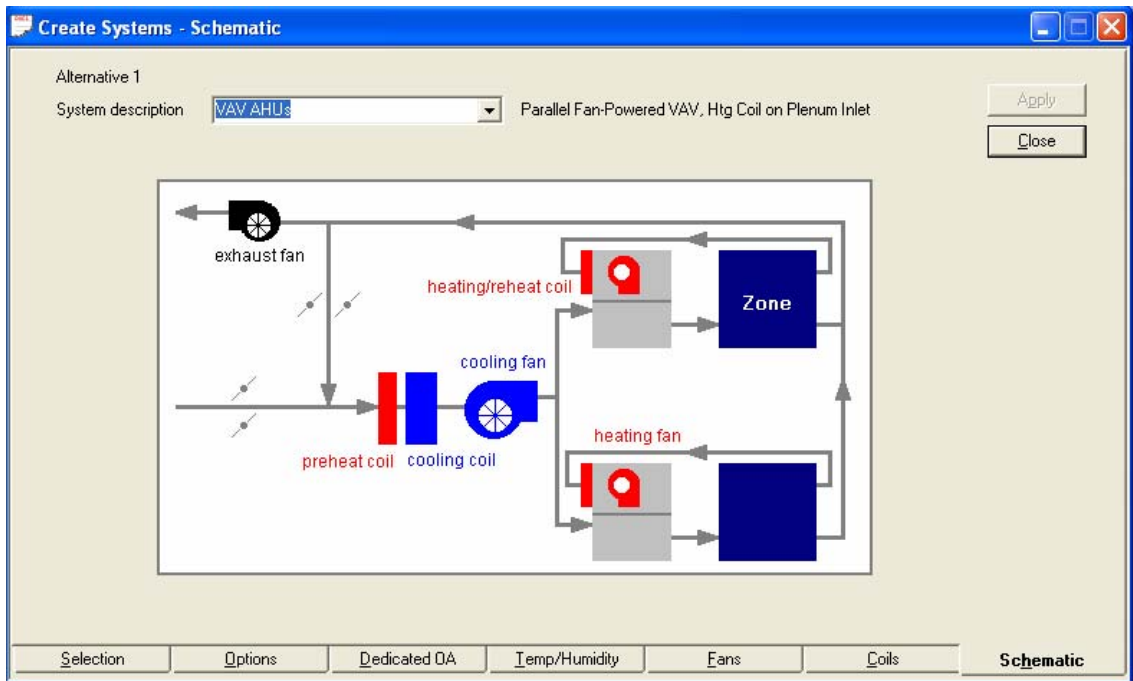
Dedicated OA

Temp/Humidity

Fans

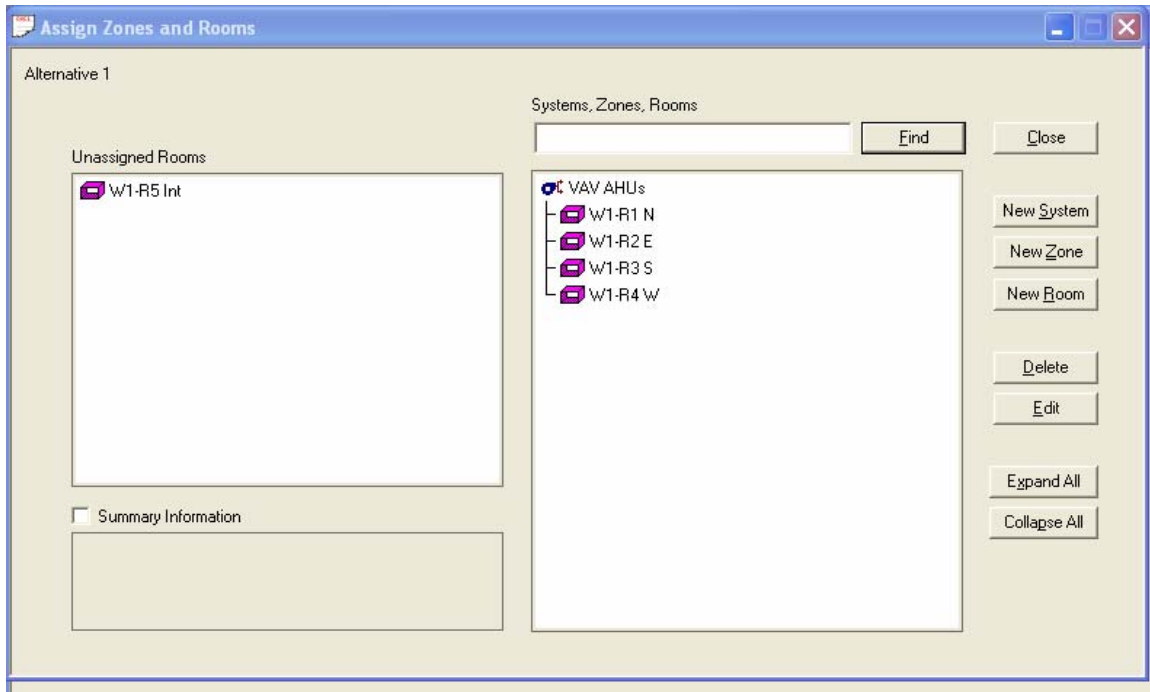
Coils

Schematic



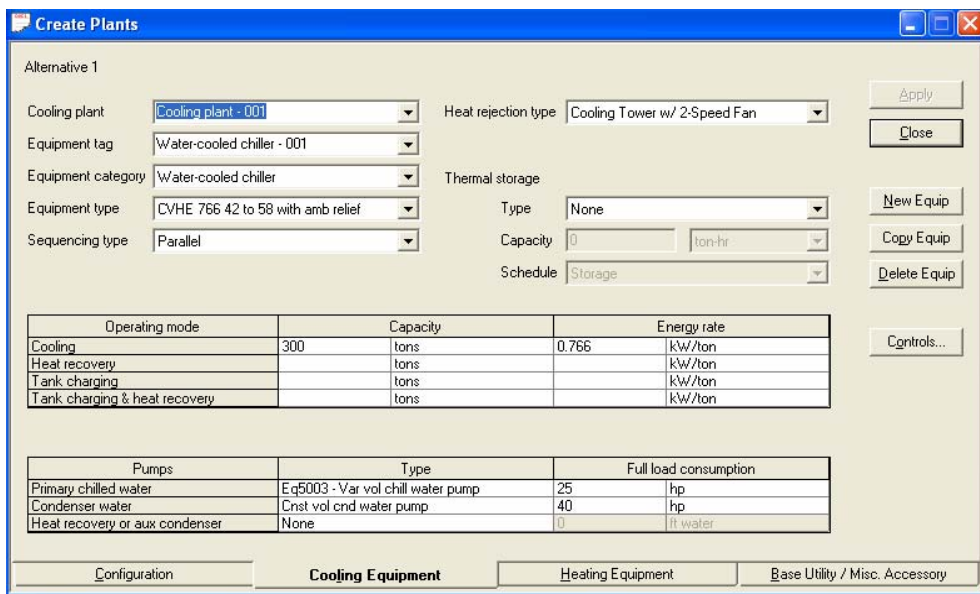
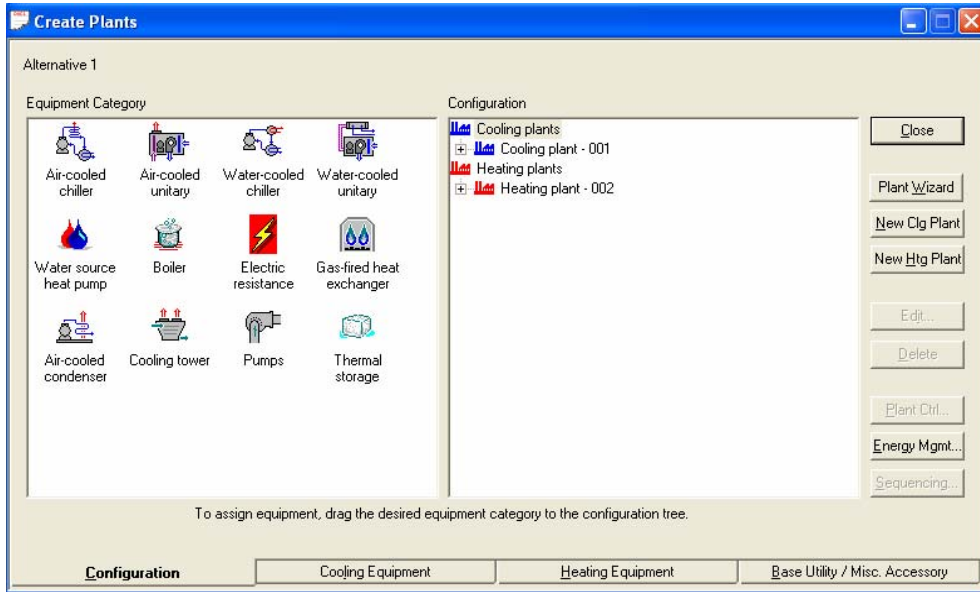
Assign rooms to systems

Use drag-and-drop editing to group rooms within thermal zones; then assign each zone to the appropriate airside system. Take advantage of the convenient "summary information" feature to estimate airflow and load for selected rooms, zones, and systems.



Create plants

The drag-and-drop feature makes it easy to model cooling and heating equipment. To "create" a cooling or heating plant, simply drag the desired equipment to the appropriate plant icon. TRACE fills in most of the information needed to calculate energy consumption based on your selection ... just add full-load consumption at design conditions.



Create Plants

Alternative 1

Heating plant:

Equipment tag:

Equipment category:

Equipment type:

Capacity:

Energy rate:

Thermal storage

Type:

Capacity:

Schedule:

Hot water pump

Type:

Full load consumption:

Equipment schedule:

Demand limiting priority:

Create Plants

Alternative 1

Miscellaneous accessories

Plant	Equipment tag	Type	Energy	Schedule
Cooling plant - ...	All	None	0 kW	Off (0%)

Type:

Description:

Plant:

Equipment tag:

Energy:

Schedule:

Base utility

Plant	Type	Hourly demand	Schedule
Stand-alone	Parking lot lights	57 kW	Available (100%)
Stand-alone	Misc Elect Loa...	130 kW	Available (100%)

Type:

Description:

Plant:

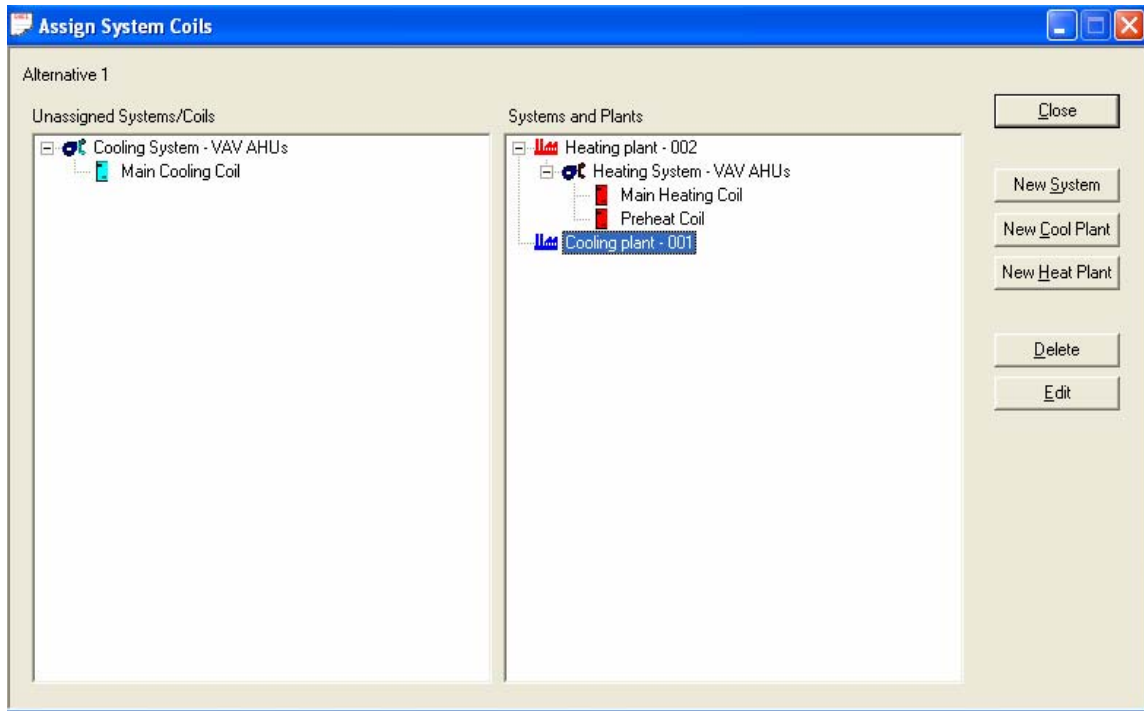
Hourly demand:

Schedule:

Demand limiting priority:

Assign systems to plants

Relating coil loads to equipment energy consumption is another modeling task made easy by drag-and-drop editing. Simply drag each unassigned system/coil to the appropriate cooling or heating plant.



Define economics

TRACE 700 calculates financial measures such as net present value of annual cash flow, internal rate of return, simple payback period, and savings-to-investment ratio. Enter initial and maintenance costs, utility rates, study life, and inflation rates to compare alternative HVAC designs or to model the effect of deregulation.

The screenshot shows the 'Economics' dialog box with the 'Utility Rates & Life Cycle Costs' tab selected. The 'Alternative 1' section contains input fields for 'Equipment installed cost' (0), 'Yearly maintenance expense' (0), 'Additional first cost' (0), 'Revenue penalty' (0), 'Building area override' (200475 ft²), and 'Building capacity override' (ton). The 'Utility Rate' section features a table with one entry: 'TX Retail Elect Provider Misc.' with a rate of 'All'. To the right are dropdowns for 'Company' (TX Retail Elect Provider Misc.), 'Utility' (All), 'Inflation' (0 %), and 'Time-of-day schedule' (None), along with 'Add Rate', 'Delete Rate', and 'Library...' buttons. The 'Recurring/Additional Depreciable Cost' section includes a table with columns for 'Cost', 'Year Incur', 'Econ Life', and 'Depr. Taxes'. To the right are input fields for 'Cost', 'Year cost incurred', 'Economic life' (Yrs), and 'Depr. life taxes' (Yrs), with 'Add Cost' and 'Delete Cost' buttons. The bottom of the dialog has two tabs: 'Utility Rates & Life Cycle Costs' (active) and 'Economic Information'.

Cost	Year Incur	Econ Life	Depr. Taxes
------	------------	-----------	-------------

The screenshot shows the 'Economics' dialog box with the 'Economic Information' tab selected. The 'Alternative 1' section contains input fields for 'Study life' (20 Yrs), 'Mortgage life' (20 Yrs), 'Depreciation life' (20 Yrs), 'Mortgage interest rate' (10 %), 'Percent financed' (0 %), 'Depreciation taxes' (None), and 'Declining balance taxes' (100 %). The 'Inflation' section includes a table with columns for 'Expense' and 'Rate'. To the right are input fields for 'Income tax rate' (0 %), 'Cost of capital' (10 %), 'Property tax' (0 %), and 'Insurance expense' (0 %). The bottom of the dialog has two tabs: 'Utility Rates & Life Cycle Costs' and 'Economic Information' (active).

Expense	Rate
Maintenance expense	0 %
Replacement expense	0 %
Property taxes	0 %
Insurance expense	0 %

View Reports

TRACE 700 provides numerous design and economic related reports. Depicted below are the available reports.

The 'View Results' dialog box is shown with the 'Design Reports' tab selected. It features a dropdown menu for 'Alternative' set to 'Alternative 1'. On the right, there are buttons for 'Close', 'Print', 'Preview', 'Clear All', 'Print Setup...', and 'Options...'. The main area contains four groups of checkboxes:

- Summary:**
 - ☐ Title page
 - ☐ System checksums
 - ☐ Zone checksums
 - ☐ Room checksums
 - ☐ Design cooling load
 - ☐ System component selection
- System:**
 - ☐ Design airflow
 - ☐ Design cooling capacity
 - ☐ Design heating capacity
 - ☐ Engineering checks
- Psychrometric State Points:**
 - ☐ System
 - ☐ Zone
 - ☐ Room
 - ☐ Auxiliary system
- Peak Load Summary:**
 - Main: ☐ Cooling, ☐ Heating
 - Aux: ☐ Load / Airflow

At the bottom, there are three tabs: 'Design Reports' (selected), 'Analysis Reports', and 'Detailed Reports'.

The 'View Results' dialog box is shown with the 'Analysis Reports' tab selected. It features a dropdown menu for 'Alternative' set to 'Alternative 1'. On the right, there are buttons for 'Close', 'Print', 'Preview', 'Clear All', and 'Print Setup...'. The main area contains three groups of checkboxes:

- Profiles:**
 - ☐ System load
 - ☐ Building cooling / heating demand
 - ☐ Building temperature
 - ☐ Building humidity
- Economic:**
 - ☐ Parameters
 - ☐ Monthly utility costs
 - ☐ Yearly cash flow
 - ☐ Alternative comparison
 - ☐ Summary
- Energy Consumption:**
 - ☐ Monthly
 - ☐ Equipment
 - ☐ Utility peak
 - ☐ Thermal storage
 - ☐ Cogeneration
 - ☐ Summary
 - ☐ Energy Cost Budget-Appendix G

At the bottom, there are three tabs: 'Design Reports', 'Analysis Reports' (selected), and 'Detailed Reports'. In the 'Graph' section, there are two buttons: 'Profiles and Energy Consumption' and 'Economics'.

View Results

Alternative: Alternative 1

Close

Print

Preview

Clear All

Print Setup...

Building Envelope Loads

Cooling

Heating

☐

☐ At time of coil peak

☐

☐ At time of aux coil peak

☐

☐ At time of space peak

Internal Loads

Cooling

Heating

☐

☐ At time of coil peak

☐

☐ At time of aux coil peak

☐

☐ At time of space peak

Airflow Loads

Cooling

Heating

☐

☐ At time of coil peak

☐

☐ At time of aux coil peak

Building Envelope Composition

☐ Building U-factors

☐ Building areas

☐ ASHRAE 90 analysis

Heat Gain / Loss

Cooling

Heating

☐

☐ At time of coil peak

☐

☐ At time of aux coil peak

Design Reports

Analysis Reports

Detailed Reports