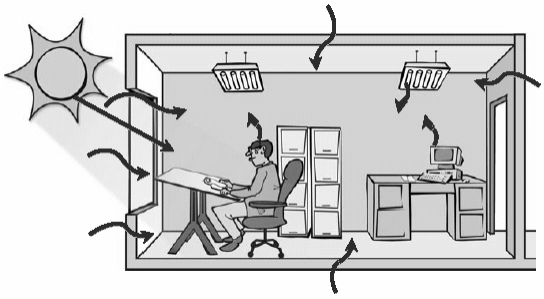
TRACE™ 700

HVAC load design & analysis software

TRACE™ 700

Tính Toán Tải Lạnh
Phần mềm tính toán TRACE 700

A Trane Air Conditioning Clinic



TRANE

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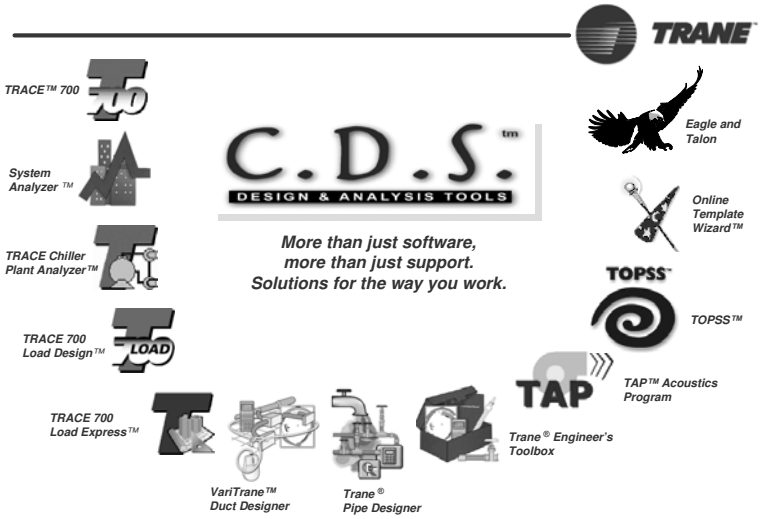
TRACE™ 700



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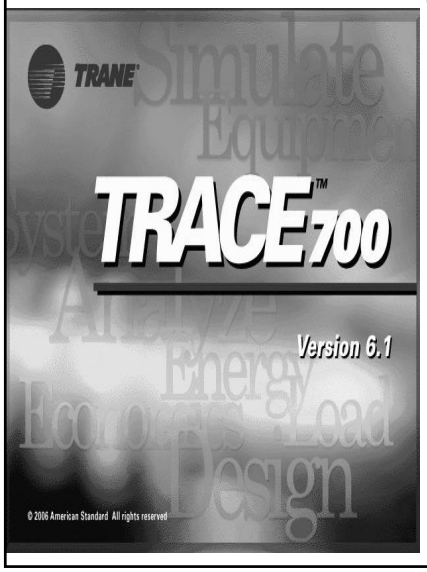

Chương trình tính toán tải lạnh, điện năng và phân tích kinh tế.

- Chạy trên nền Windows®
- Phân tích điện năng theo giờ hay năm
- Có các hệ thống linh hoạt và nhiều hệ máy
- Nhiều hệ thống thiết bị và hệ thống phân phối gió có sẵn.

TRACE™ 700

Tuổi đời của phần mềm

TRACE™ 700

TRACE 35 1972 — 2007

Join Trane in celebrating 35 years of TRACE™. Introduced into the HVAC industry in 1972, the HVAC design and analysis program was the first of its kind and quickly became a de facto industry standard. It continues to grow with the industry meeting requirements for ASHRAE Standard 140*, ASHRAE 90.1, and LEED® Green Building Rating System and recently approved by the IRS to certify energy savings for building owners. Find out more, visit **www.trane.com**

*ASHRAE Standard 140, Standard Method of Test for Evaluation of Building Energy Analysis Computer Programs.

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Độ tin cậy của phần mềm.

Hiện tại

- Tuân theo ANSI/ASHRAE Standard 140 - 2004 (based on IEA BESTEST)
- Các phép tính hồi qui Regression testing
- Các phép tính bằng tay

- Iowa State University & Arizona State University Nghiên cứu, so sánh kết quả với công trình với số liệu được theo dõi thực tế

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Giấy chứng nhận phần mềm Trace 700 được thiết kế theo tiêu chuẩn ANSI/ASHRAE 90-2004, và được kiểm chứng theo Std. 140-2004: "**Tiêu chuẩn của phương pháp kiểm tra, đánh giá chương trình máy tính phân tích năng lượng/kinh tế công trình".**

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30 October 2007

SUBJECT: TRACE™ 700 v6.1.2 Compliance with ANSI/ASHRAE Standard 140-2004

Dear TRACE User:

We are pleased to inform you that TRACE 700 v6.0 was tested in compliance with ANSI/ASHRAE Standard 140–2004, *Standard Method of Test for the Evaluation of Building Energy Analysis Computer Programs*. Test results, supplemented by graphs and explanatory notes, accompany this letter.

As you may know, ANSI/ASHRAE/IESNA Standard 90.1–2001, *Energy Standard for Buildings, Except Low-Rise Residential Buildings*, stipulates that any computer program that is used to demonstrate code compliance via the performance path's Energy Cost Budget Method must be tested in accordance with Standard 140. (Addendum P to Standard 90.1–2001, published in February 2004, defined this stipulation and also required that the test results be made available to the public.)

Standard 90.1 defines minimum requirements for the design of energy-efficient buildings and is used by many state and local code-writing bodies as the "standard of care" in their jurisdictions. Building-energy simulation programs, such as TRACE 700, are used to estimate the difference in energy costs between the design- and budget-building models specified in Section 11 of Standard 90.1.

If you have questions about the testing documentation that accompanies this letter, or about any of Trane's design and analysis tools, please contact our C.D.S. Support Center by phoning (608) 787-3926 or e-mailing cdshelp@trane.com.

Best regards,

Eric Sturm
ASHRAE Standard 140 Coordinator
C.D.S. Group

Attachments: Results and modeling notes from Standard 140 testing of TRACE 700

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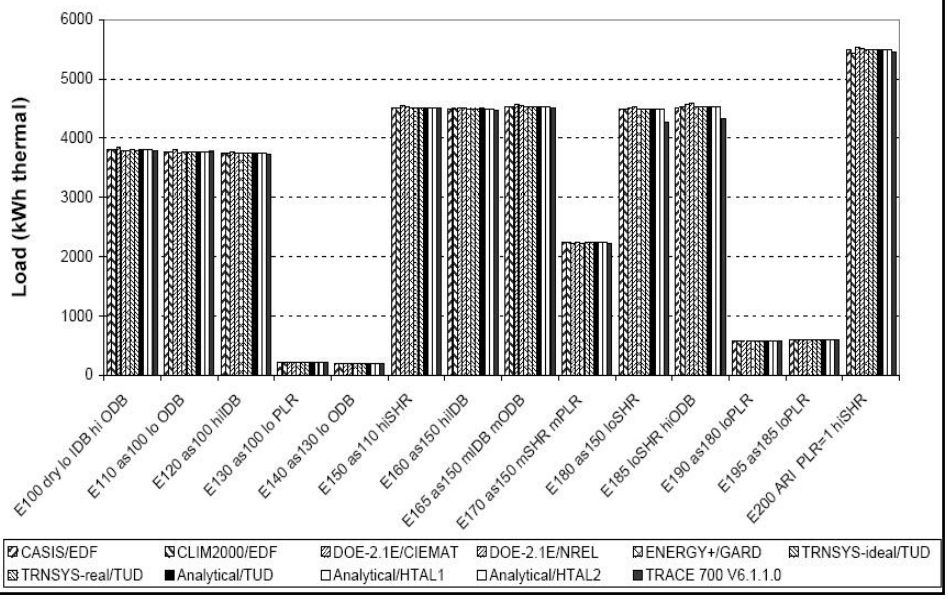
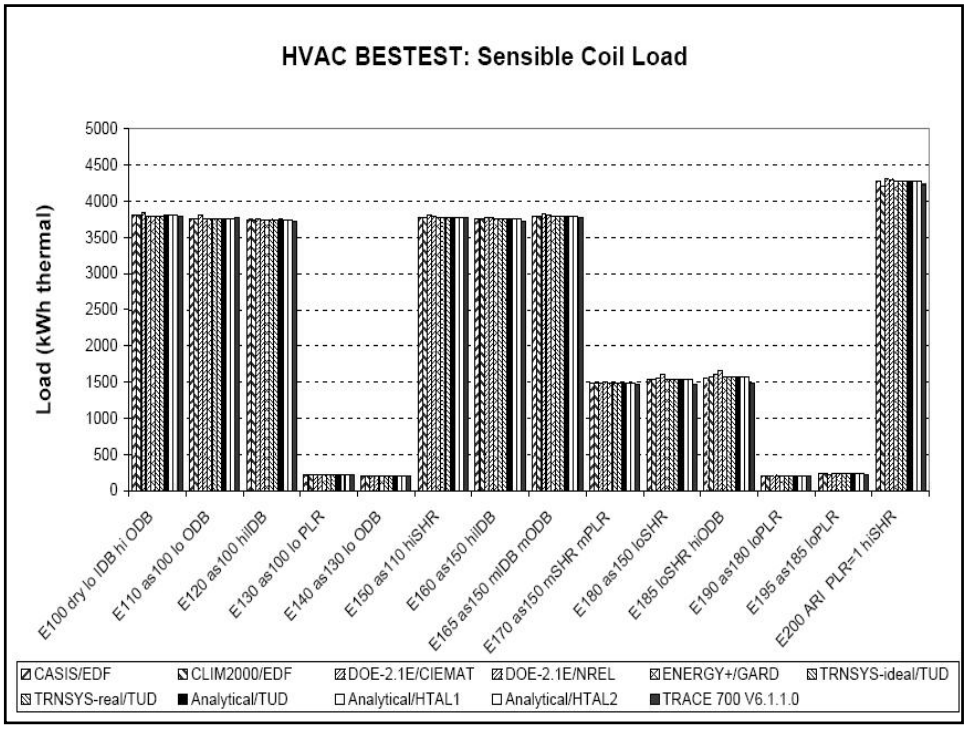
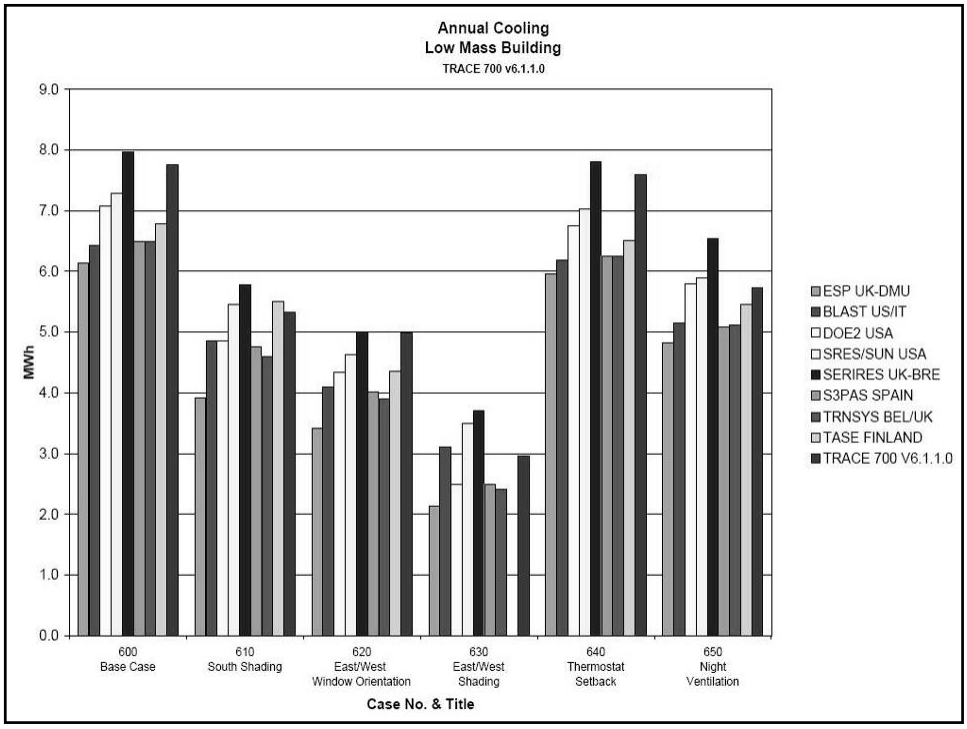
HVAC BESTEST: Total Coil Load

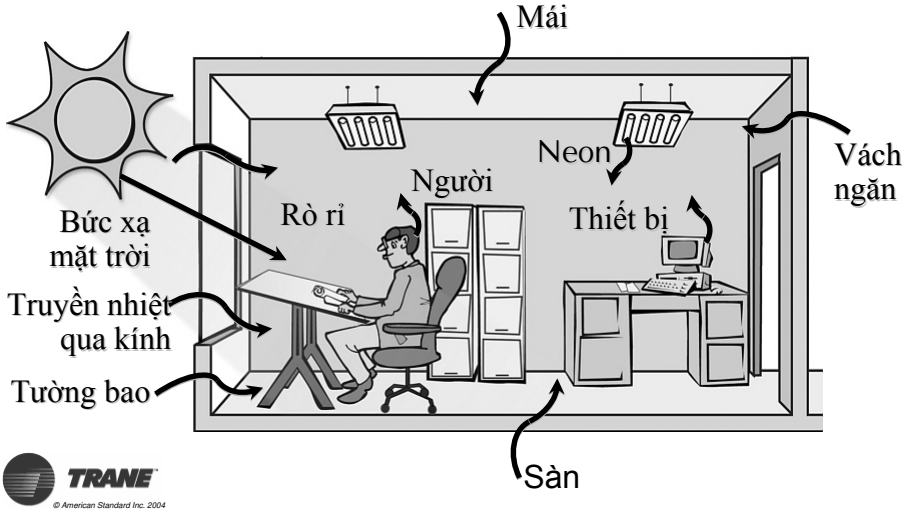



HVAC BESTEST: Sensible Coil Load
Load (kWh thermal)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
E100 dry lo IDB hi ODB
E110 as100 lo ODB
E120 as100 hiDB
E130 as100 lo PLR
E140 as130 lo ODB
E150 as110 hiSHR
E160 as150 hiDB
E165 as150 miDB mODB
E170 as150 mSHR mPLR
E180 as150 loSHR
E185 loSHR hiODB
E190 as180 loPLR
E195 as185 loPLR
E200 ARI PLR=1 hiSHR
CASIS/EDF
CLIM2000/EDF
DOE-2.1E/CIEMAT
DOE-2.1E/NREL
ENERGY+/GARD
TRNSYS-ideal/TUD
TRNSYS-real/TUD
Analytical/TUD
Analytical/HTAL1
Analytical/HTAL2
TRACE 700 V6.1.1.0


Annual Cooling
Low Mass Building
TRACE 700 v6.1.1.0
MWh
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
600
Base Case
610
South Shading
620
East/West
Window Orientation
630
East/West
Shading
640
Thermostat
Setback
650
Night
Ventilation
Case No. & Title
ESP UK-DMU
BLAST US/IT
DOE2 USA
SRES/SUN USA
SERIRES UK-BRE
S3PAS SPAIN
TRNSYS BEL/UK
TASE FINLAND
TRACE 700 V6.1.1.0

TRACE™ 700

Các Thành Phần Nhiệt Tác Động vào Không Gian Điều Hòa



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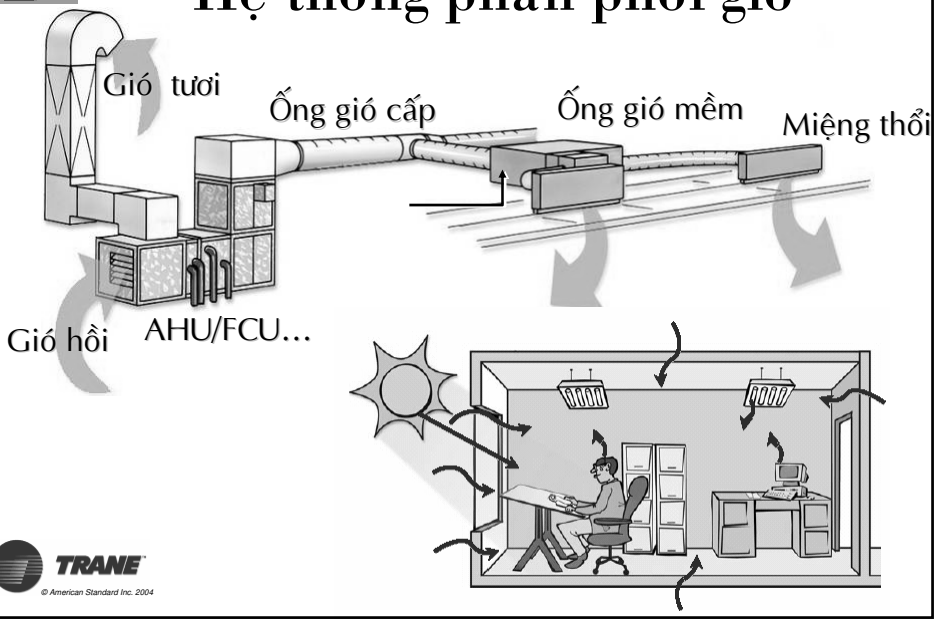
Hệ thống phân phối gió



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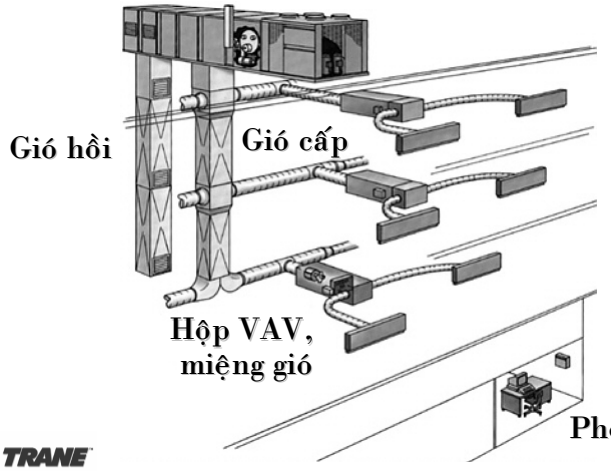
Hệ thống phân phối gió



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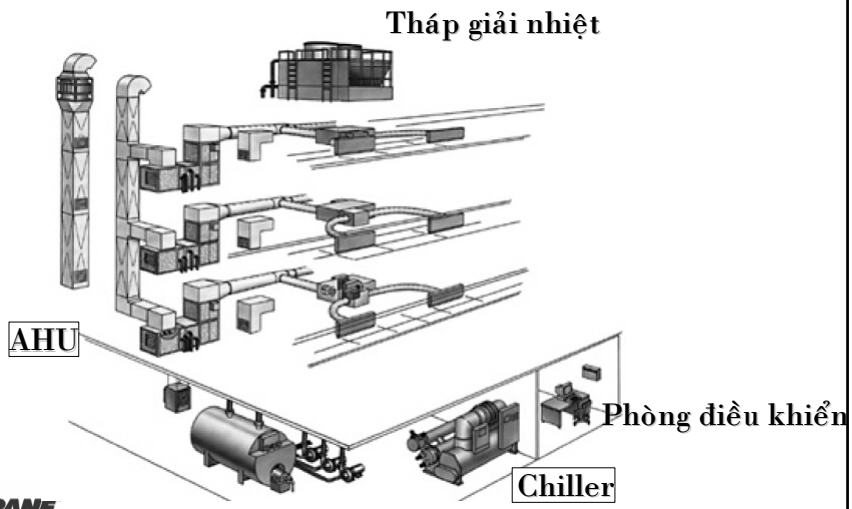
Hệ thống phân phối gió



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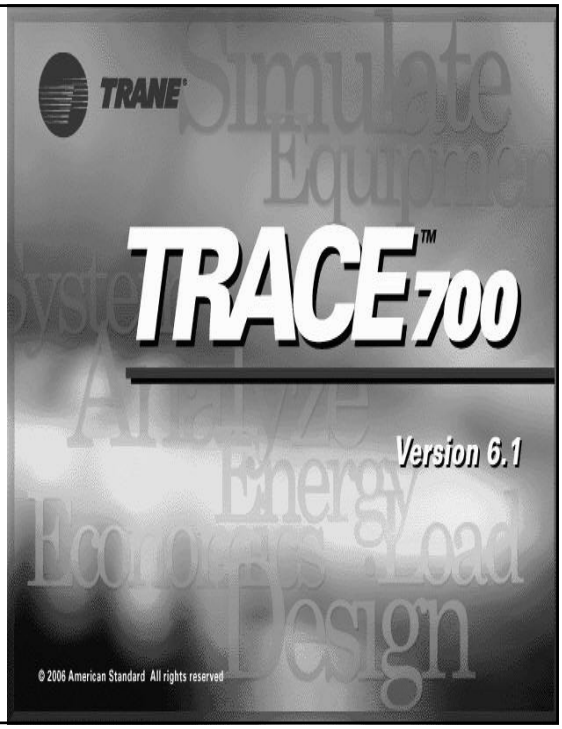
PHẦN MỀM TRACE 700

Phiên bản mới nhất
6.1.2



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- Thông tin về dự án
- Lựa chọn thời tiết
- Tạo dựng các mẫu (Templates)
- Nhập số liệu tạo các phòng
- Tạo hệ thống phân phối gió
- Chỉ định phòng vào hệ thống p.phối gió
- Tạo hệ thống thiết bị
- Chỉ định h.thống p.phối gió vào h.thống thiết bị.
- Xác lập các thông tin về kinh tế
- Tính toán và xem kết quả

Tính tải lạnh

Điện năng & Kinh tế

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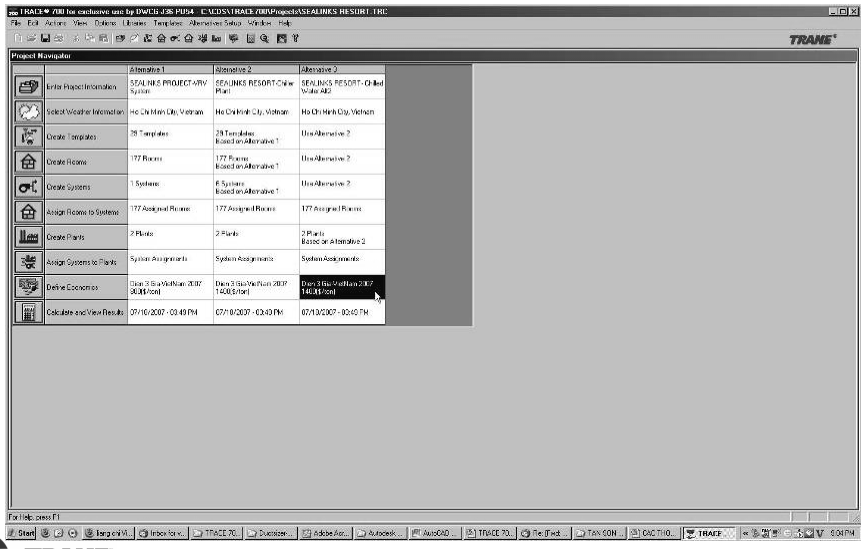
Giao diện chính của phần mềm



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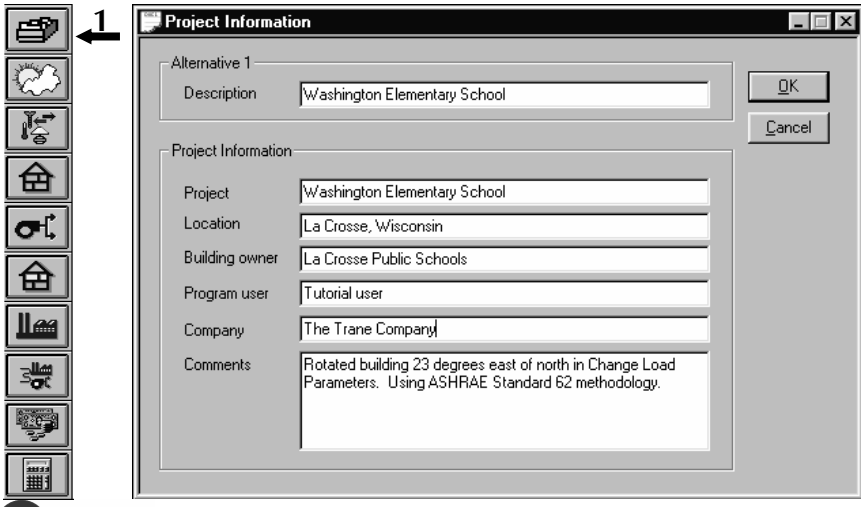
Thông tin dự án



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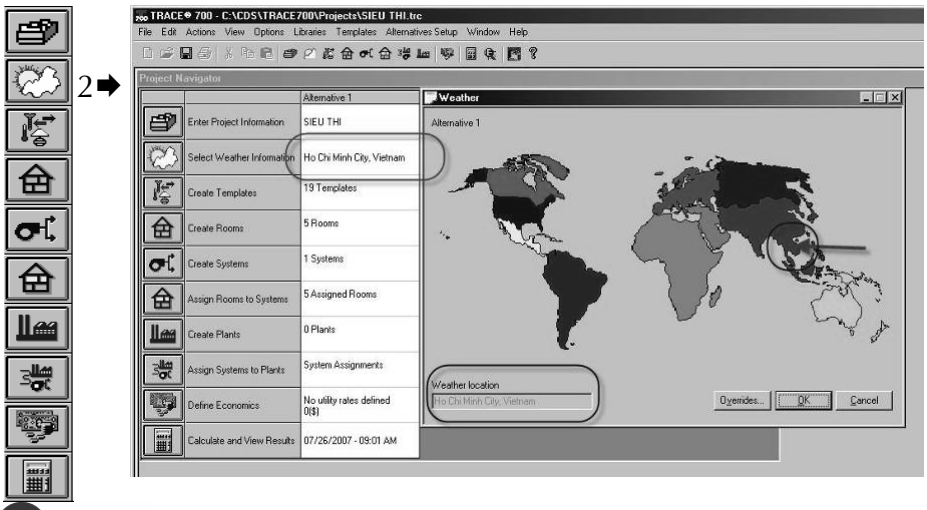
Thời tiết



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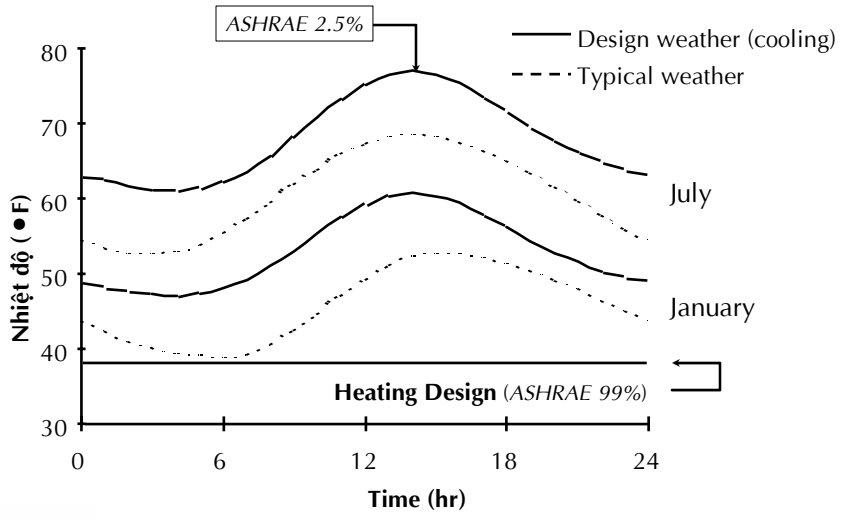
Dữ liệu thời tiết



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Chép cả 5 file thư viện thời tiết của Việt Nam là HoChhour.tm2; DaNahour.tm2 và Hanoi.IWC, Nhathour.tm2, Canthour.tm2 vào đường dẫn sau:

C: / CDS/ Trace 700/ Projects

Thư viện thời tiết của HCMC, Đà Nẵng, Hà nội, Nha Trang và Cần Thơ được xây dựng theo cơ sở dữ liệu thu thập từ vệ tinh trong khoảng 1996-2005 của tổ chức Meteotest của Thụy Sĩ.

http://www.expeditionweather.info/

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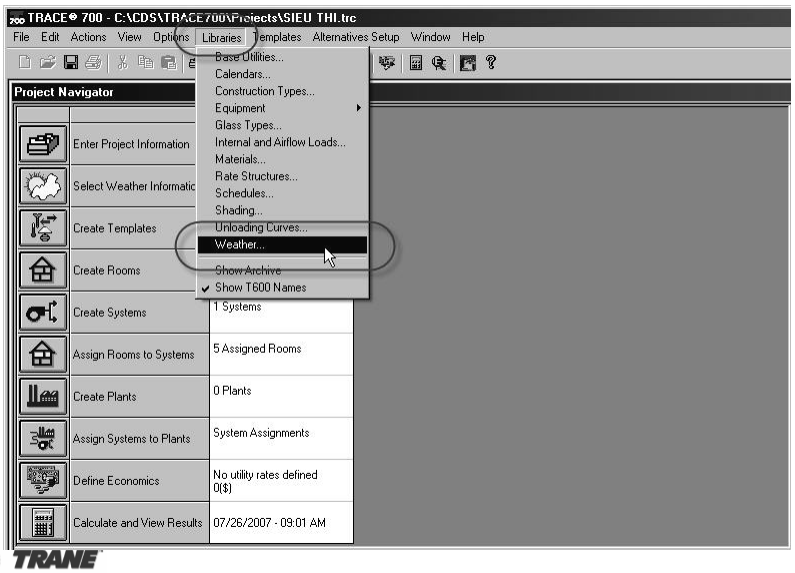

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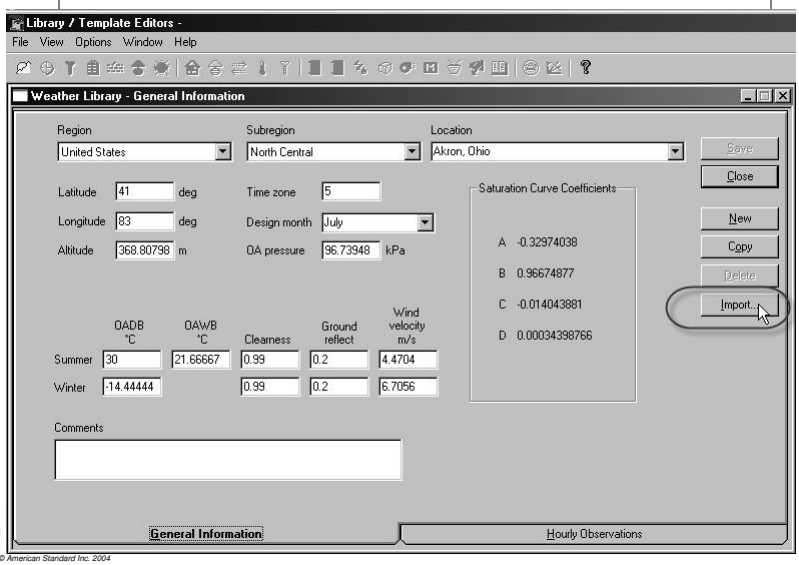
2.1 Ho Chi Minh City, VietNam



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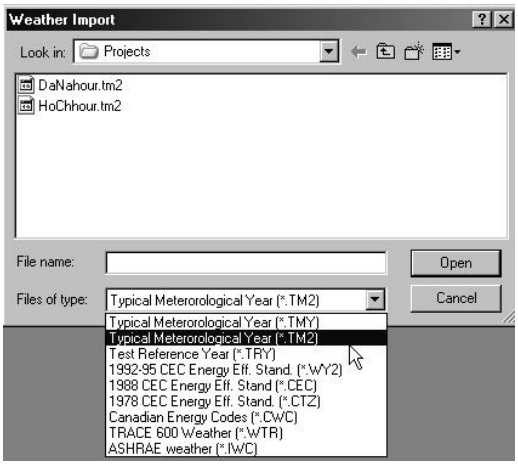

Đổi tên đuôi của file có thể mở được sang .TM2 (là thư viện thời tiết theo chuẩn của Meteotest), khi đó mới thấy được thư viện của Ho Chi Minh City va Danang City.

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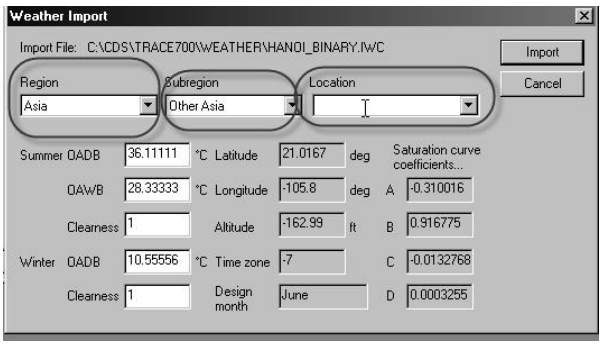

Chọn các vùng địa điểm cho HCMC tại :

Asia/Other Asia/ Ho Chi Minh City, VietNam

Làm tương tự với thư viện Danang City, Nha Trang và Cần Thơ VietNam.

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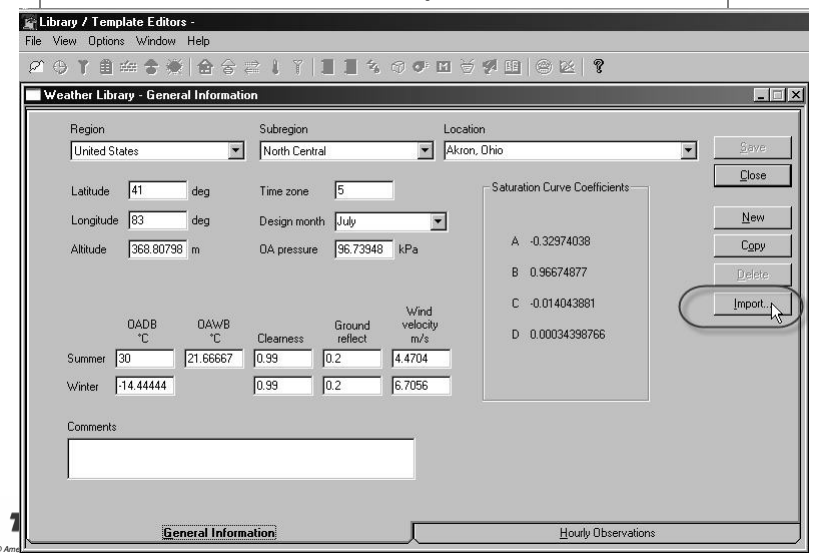
2.2 Ha Noi City, Vietnam



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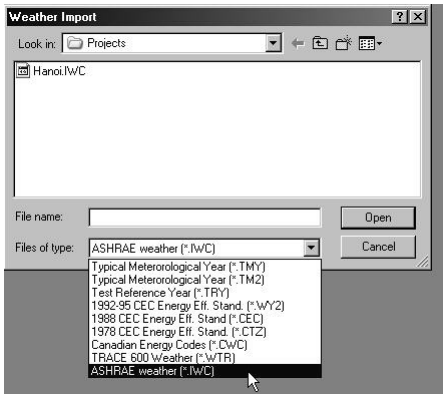

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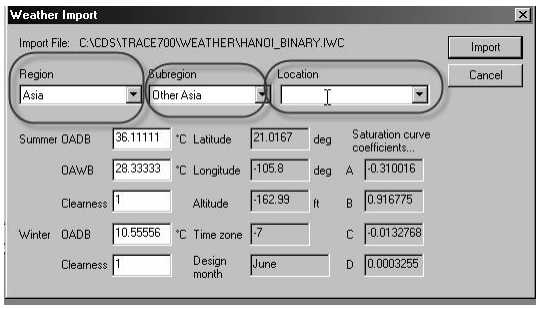

Chọn các vùng địa điểm cho Hà Nội tại : Asia/Other Asia/ Ha Noi City, Vietnam

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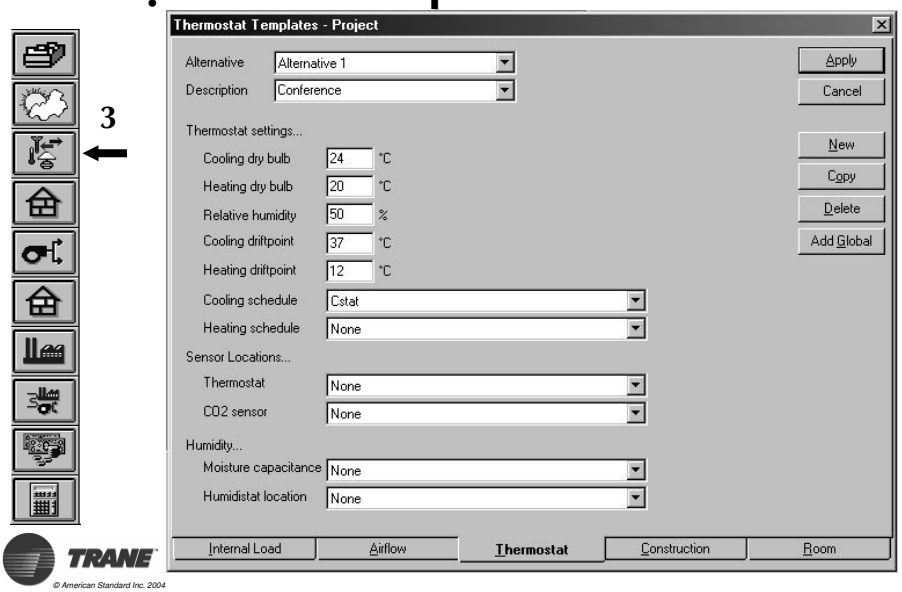
Tạo mẫu - Templates



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Phân nhóm mẫu
Template Categories

R O O M
Phòng

Internal Loads Nguồn nhiệt	Airflows L.Lượng gió	Thermostat Nhiệt độ	Construction Kết cấu
People-Người Lighting-Chiếu sáng Misc. Equipment	Ventilation-Thông gió Infiltration-Rò rỉ Main Supply – Gió cấp Aux. Supply- VAV Minimum Room Exhaust-Gió thải	Cooling DB – Nhiệt độ DB Heating DB - Sưởi Relative Humidity – Độ ẩm	Floor - Sàn Roof - Mái Wall - Tường Partition-Vách ngăn Glass Type -Kính Height – Chiều cao

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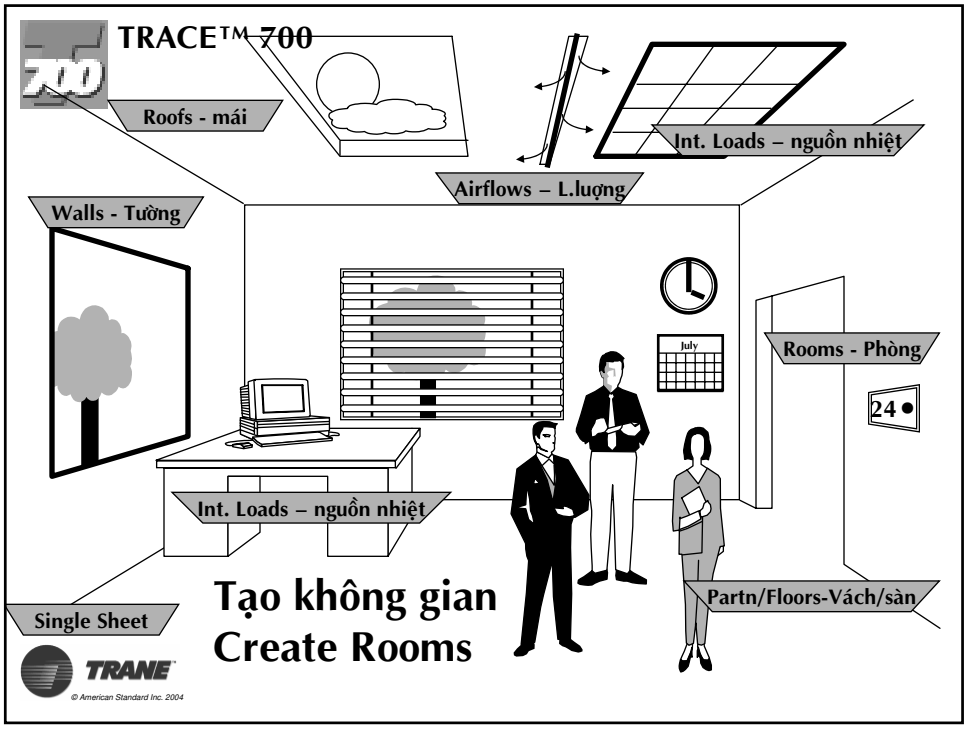
TRACE™ 700
Roofs - mái
Int. Loads – nguồn nhiệt
Airflows – L.lượng
Walls - Tường
July
Rooms - Phòng
24
Int. Loads – nguồn nhiệt
Tạo không gian
Create Rooms
Partn/Floors-Vách/sàn
Single Sheet
TRANE
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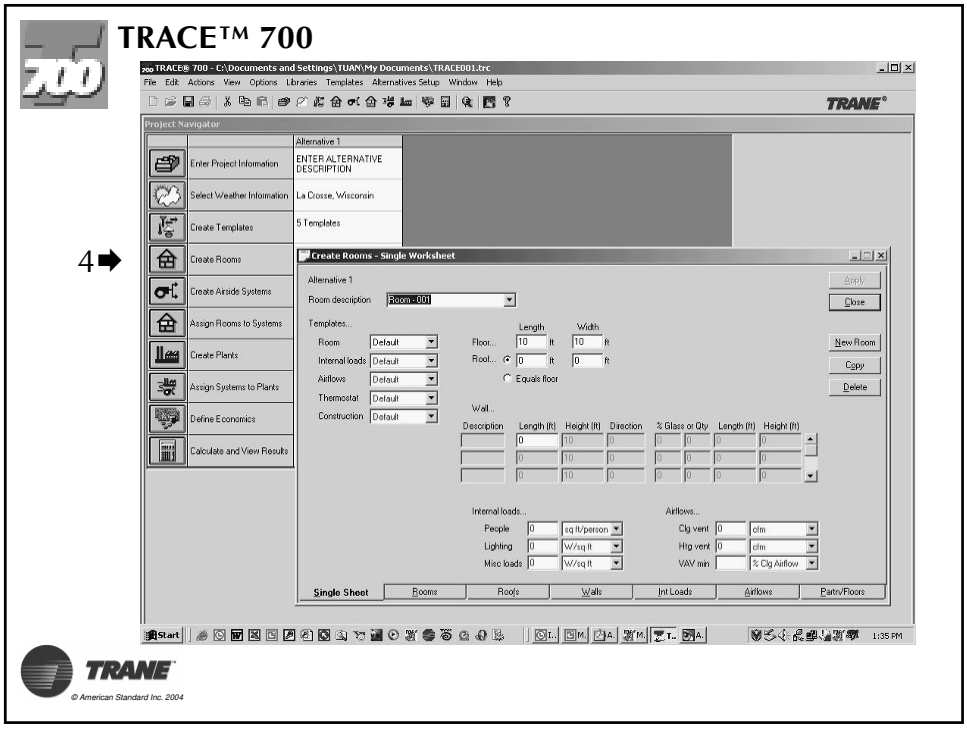
TRACE™ 700
4
Project Navigator
Enter Project Information
Select Weather Information
Create Templates
Create Rooms
Create Airside Systems
Assign Rooms to Systems
Create Plants
Assign Systems to Plants
Define Economics
Calculate and View Results
Create Rooms - Single Worksheet
Single Sheet
Rooms
Roofs
Walls
Int Loads
Airflows
Partn/Floors
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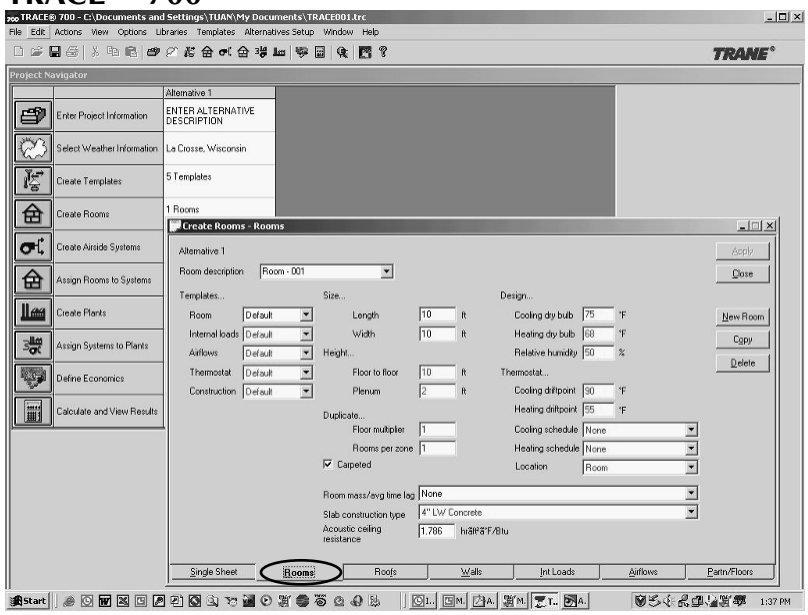
TRACE™ 700

4➡



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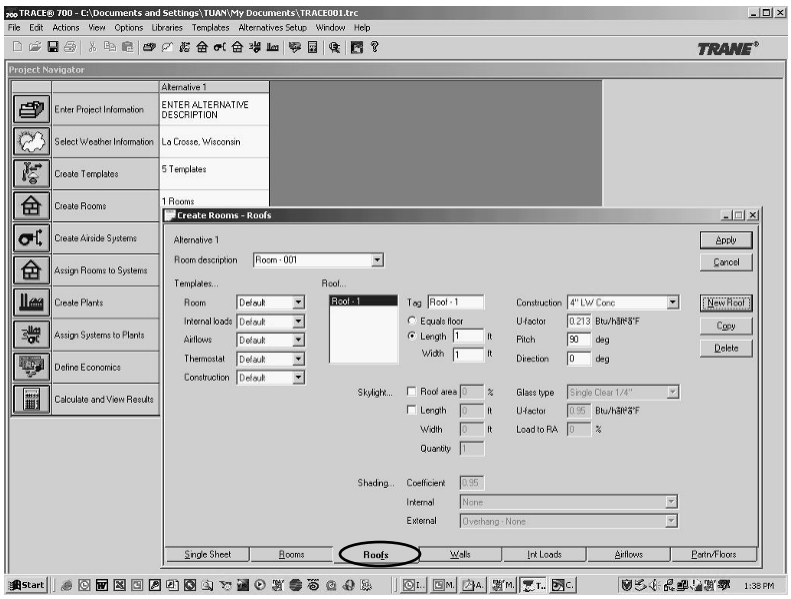
4➡



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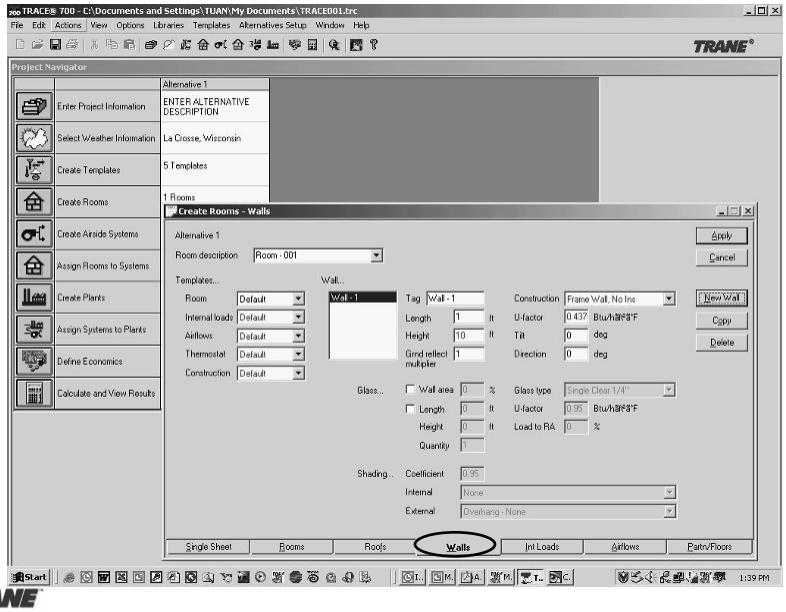
4➡



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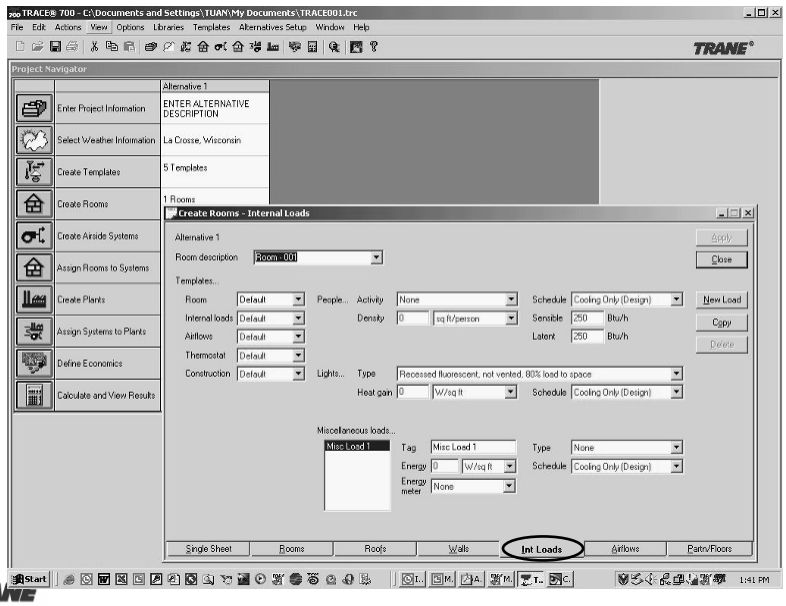
4➡



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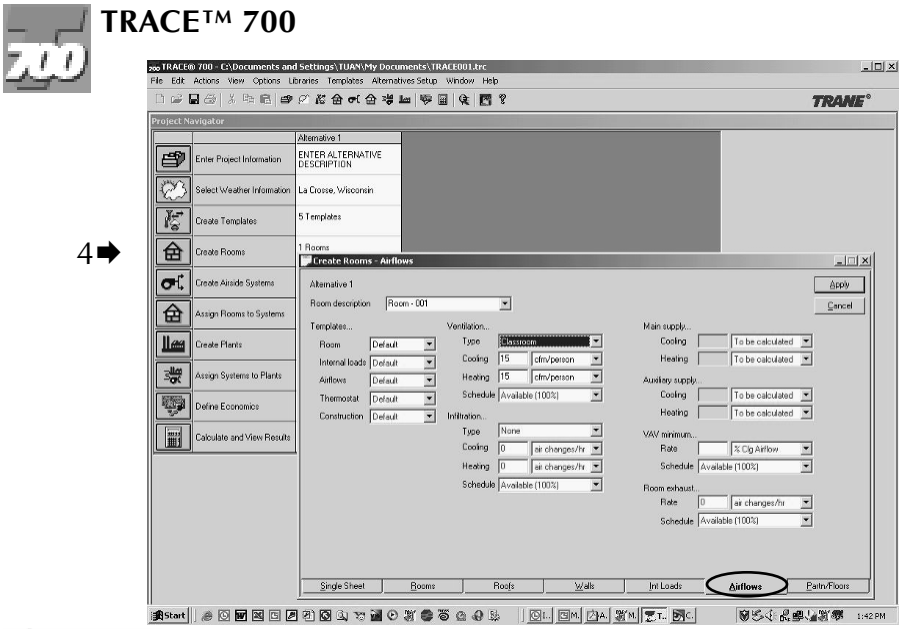
TRACE™ 700
4
TRACE® 700 - C:\Documents and Settings\TUAN\My Documents\TRACE001.trc
File Edit Actions View Options Libraries Templates Alternatives Setup Window Help
TRANE
Project Navigator
Alternative 1
Enter Project Information
ENTER ALTERNATIVE DESCRIPTION
Select Weather Information
La Crosse, Wisconsin
Create Templates
5 Templates
Create Rooms
1 Rooms
Create Airside Systems
Assign Rooms to Systems
Create Plants
Assign Systems to Plants
Define Economics
Calculate and View Results
Create Rooms - Airflows
Room description
Room - 001
Apply
Cancel
Templates...
Room
Internal loads
Airflows
Thermostat
Construction
Ventilation...
Type
Classroom
Cooling
Heating
Schedule
Available (100%)
Infiltration...
None
Main supply...
Auxiliary supply...
VAV minimum...
Room exhaust...
Single Sheet
Rooms
Roofs
Walls
Int Loads
Airflows
Partn/Floors
Start
1:42 PM
TRANE
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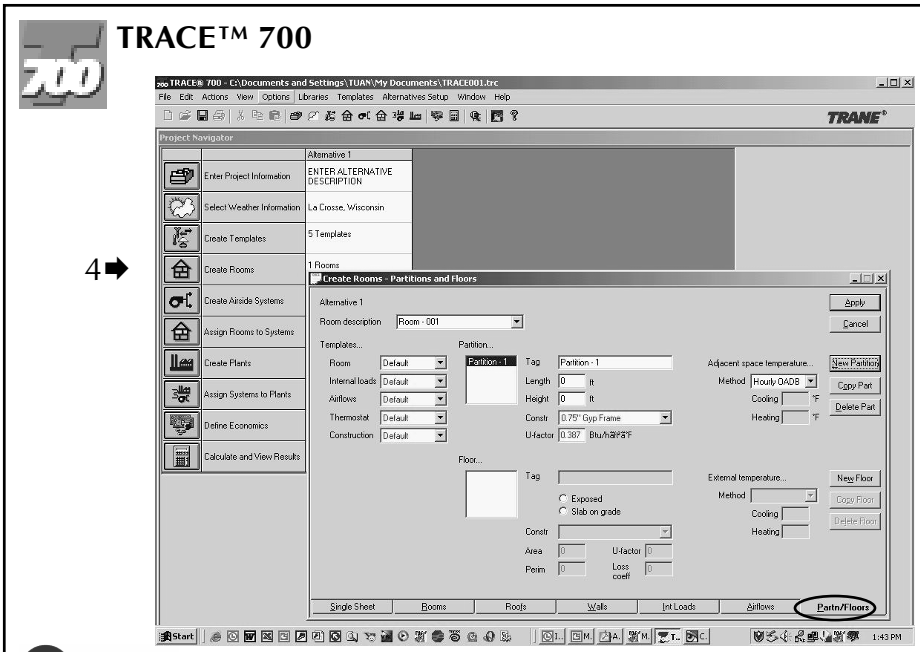
TRACE™ 700
4
TRACE® 700 - C:\Documents and Settings\TUAN\My Documents\TRACE001.trc
File Edit Actions View Options Libraries Templates Alternatives Setup Window Help
TRANE
Project Navigator
Alternative 1
Enter Project Information
ENTER ALTERNATIVE DESCRIPTION
Select Weather Information
La Crosse, Wisconsin
Create Templates
5 Templates
Create Rooms
1 Rooms
Create Airside Systems
Assign Rooms to Systems
Create Plants
Assign Systems to Plants
Define Economics
Calculate and View Results
Create Rooms - Partitions and Floors
Room description
Room - 001
Apply
Cancel
Templates...
Room
Internal loads
Airflows
Thermostat
Construction
Partition...
Partition - 1
Tag
Length
Height
Constr
U-factor
Adjacent space temperature...
Method
Hourly OADB
Cooling
Heating
New Partition
Copy Part
Delete Part
Floor...
Exposed
Slab on grade
Area
Perim
Loss coeff
External temperature...
New Floor
Copy Floor
Delete Floor
Single Sheet
Rooms
Roofs
Walls
Int Loads
Airflows
Partn/Floors
Start
1:43 PM
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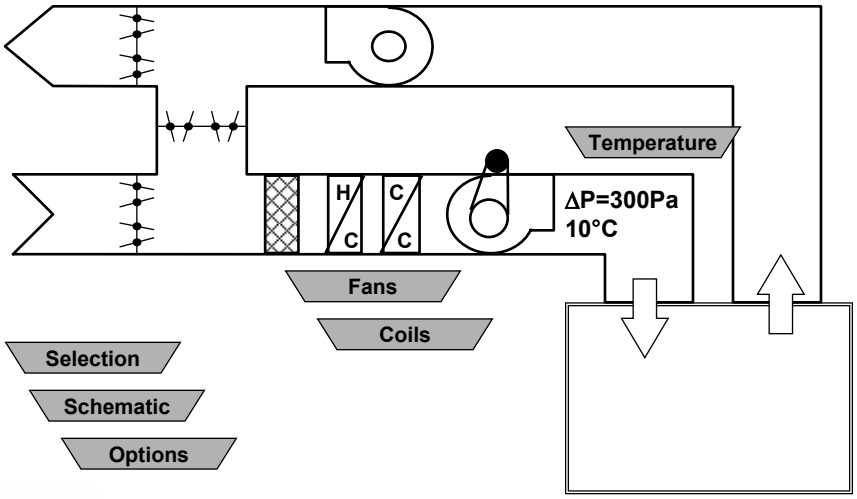
Tạo hệ thống gió- Create Systems



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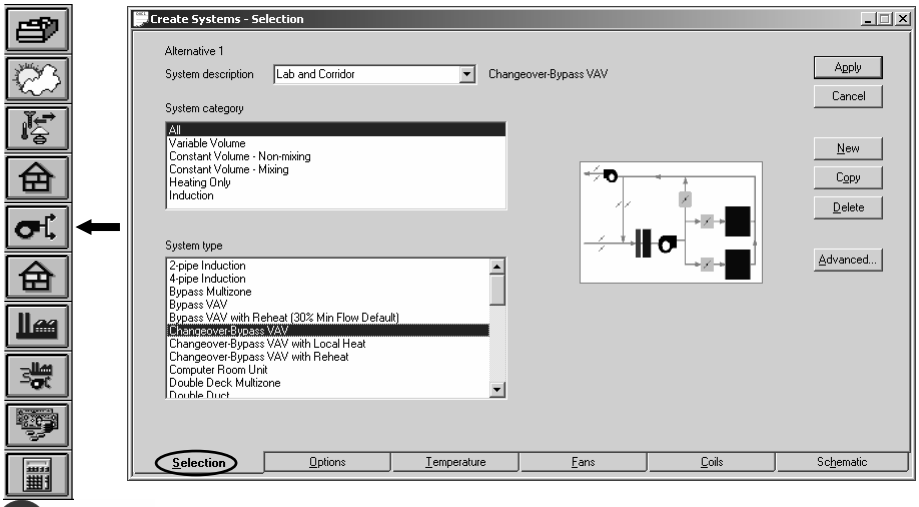
Tạo hệ thống – Create Systems



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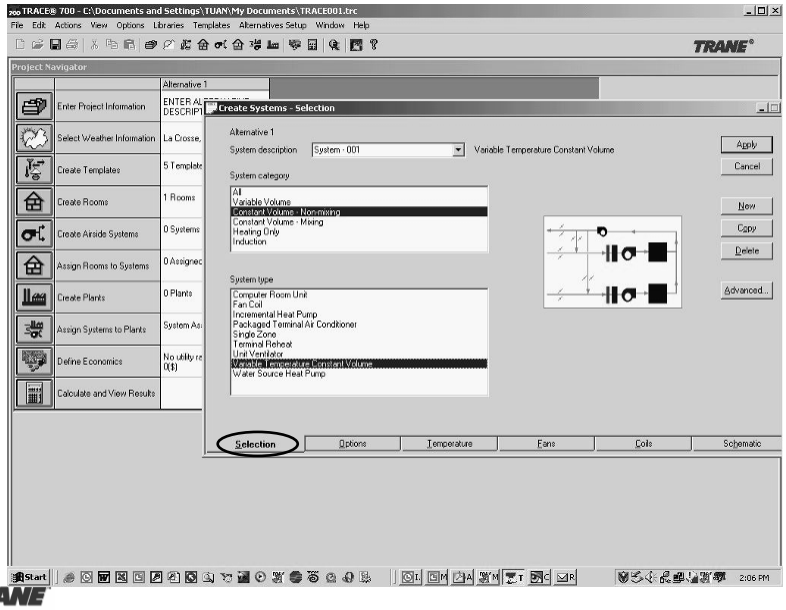

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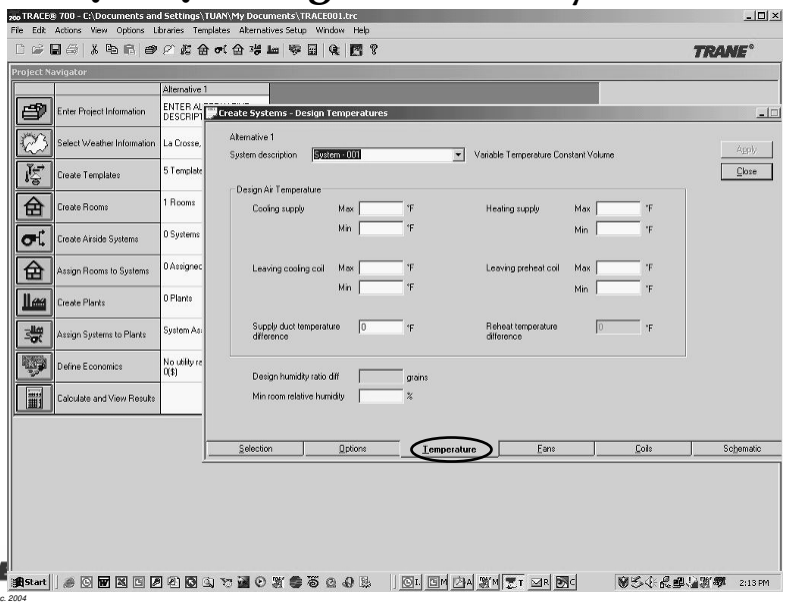
Tạo hệ thống – Create Systems



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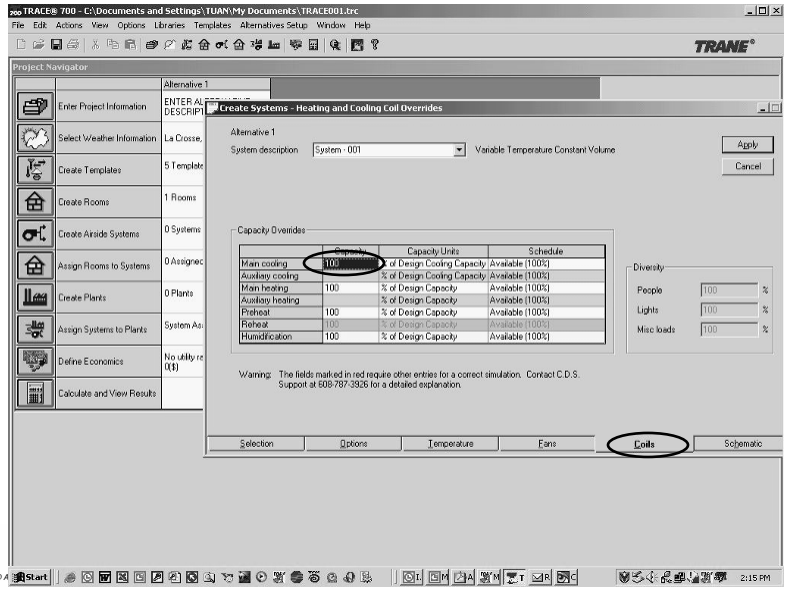
Dự phòng tải lạnh cho phòng/hệ thống

5



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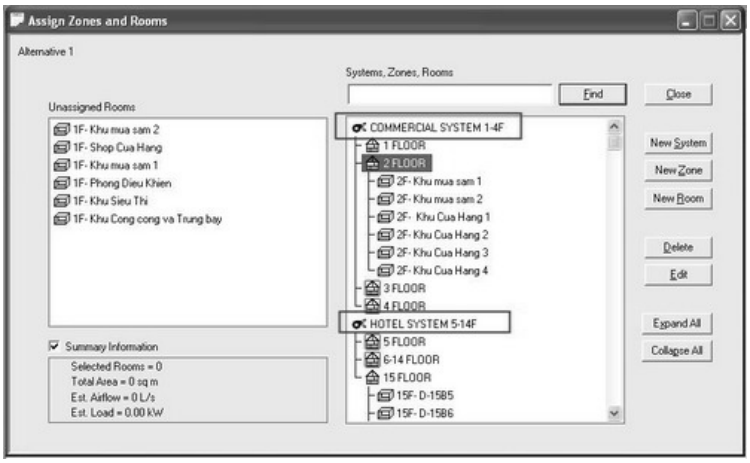
Chỉ định phòng và khu vực
Assigning Rooms and Zones

6



Đơn giản chỉ là kéo và nhả phòng vào vị trí các system bên tay phải

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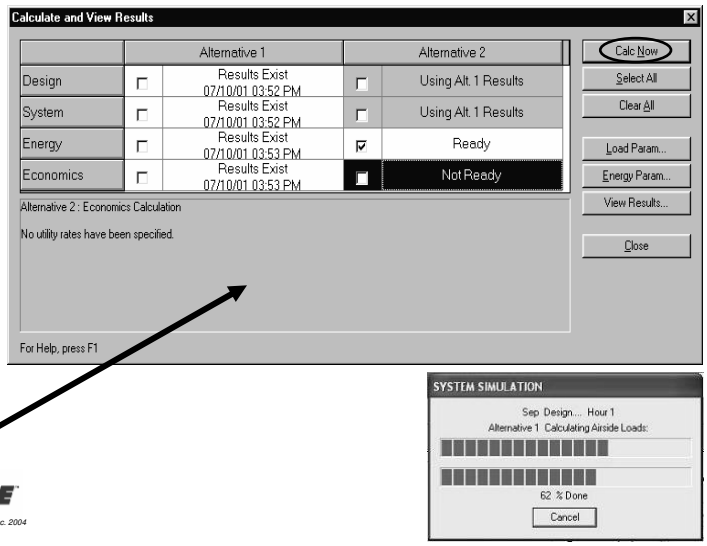
Tính toán và xem kết quả
Calculate and View Results



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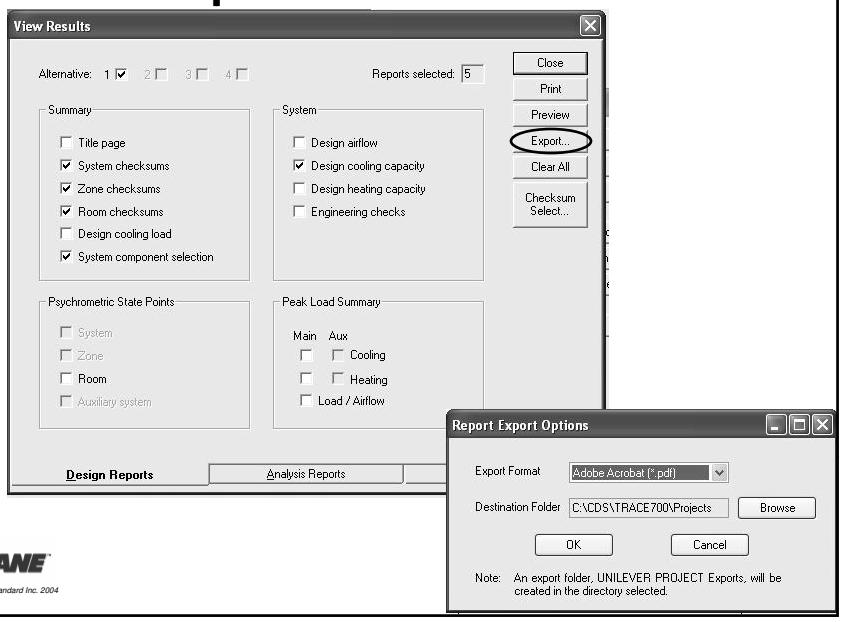
Xem kết quả –View Results



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TRACE™ 700 Xuất kết quả tính toán tải lạnh cho từng phòng

Room Checksums

By Trane

FLOOR 3-CANTEEN

COOLING COIL PEAK

Peaked at Time: Mo/Hr: 4 / 12
Outside Air: OADB/WB/HR: 31 / 29 / 24

	Space Sens. + Lat. kW	Plenum Sens. + Lat kW	Net Total kW	Percent Of Total (%)
Envelope Loads				
Skylite Solar	0.00	0.00	0.00	0
Skylite Cond	0.00	0.00	0.00	0
Roof Cond	0.00	0.00	0.00	0
Glass Solar	38.78	0.00	38.78	19
Glass Cond	6.41	0.00	6.41	3
Wall Cond	0.75	2.16	2.91	1
Partition	0.00		0.00	0
Exposed Floor	0.00		0.00	0
Infiltration	0.00		0.00	0
Sub Total ==>	45.94	2.16	48.10	24
Internal Loads				
Lights	16.90	4.22	21.12	11
People	41.25		41.25	21
Misc	0.50	0.00	0.50	0
Sub Total ==>	58.65	4.22	62.87	31
Ceiling Load	0.68	-0.68	0.00	0
Ventilation Load	0.00	0.00	90.65	45
Adj Air Trans Heat	0		0	0
Dehumid. Ov Sizing			0	0
Ov/Undr Sizing	0.00		0.00	0
Exhaust Heat		-0.79	-0.79	0
Sup. Fan Heat			0.00	0
Ret. Fan Heat		0.00	0.00	0
Duct Heat Pkup		0.00	0.00	0
Reheat at Design			0.00	0
Grand Total ==>	105.27	4.91	200.83	100.00

CLG SPACE PEAK

Mo/Hr: 5 / 11
OADB: 31

	Space Sensible kW	Percent Of Total (%)
Envelope Loads		
Skylite Solar	0.00	0
Skylite Cond	0.00	0
Roof Cond	0.00	0
Glass Solar	49.09	50
Glass Cond	5.23	5
Wall Cond	0.80	1
Partition	0.00	0
Exposed Floor	0.00	0
Infiltration	0.00	0
Sub Total ==>	55.12	56
Internal Loads		
Lights	16.90	17
People	25.27	26
Misc	0.50	1
Sub Total ==>	42.67	43
Ceiling Load	0.71	1
Ventilation Load	0.00	0
Adj Air Trans Heat	0	0
Ov/Undr Sizing	0.00	0
Exhaust Heat		
OA Preheat Diff.		
RA Preheat Diff.		
Additional Reheat		
System Plenum Heat		
Grand Total ==>	98.50	100.00

HEATING COIL PEAK

Mo/Hr: Heating Design
OADB: 21

	Space Peak Space Sens kW	Coil Peak Tot Sens kW	Percent Of Total (%)
Envelope Loads			
Skylite Solar	0.00	0.00	0
Skylite Cond	0.00	0.00	0
Roof Cond	0.00	0.00	0
Glass Solar	0.00	0.00	0
Glass Cond	1.22	1.22	47
Wall Cond	0.07	0.29	11
Partition	0.00	0.00	0
Exposed Floor	0.00	0.00	0
Infiltration	0.00	0.00	0
Sub Total ==>	1.29	1.51	59
Internal Loads			
Lights	0.00	0.00	0
People	0.00	0.00	0
Misc	0.00	0.00	0
Sub Total ==>	0.00	0.00	0
Ceiling Load	0.03	0	0
Ventilation Load	0.00	2.46	95
Adj Air Trans Heat	0	0	0
Ov/Undr Sizing	0.00	0.00	0
Exhaust Heat		-0.03	-1
OA Preheat Diff.		0.00	0
RA Preheat Diff.		-1.33	-52
Additional Reheat		0.00	0
System Plenum Heat		-0.02	-1
Grand Total ==>	1.32	2.58	100.00

TEMPERATURES

	Cooling	Heating
SADB	14.9	20.0
Plenum	24.4	20.0
Return	24.4	20.0
Ret/OA	25.8	20.2
Fn MtrTD	0.0	0.0
Fn BldTD	0.0	0.0
Fn Frict	0.0	0.0

AIRFLOWS

	Cooling	Heating
Vent	1,760	1,760
Infil	0	0
Supply	8,669	8,669
MinStop/Rh	0	0
Return	8,669	8,669
Exhaust	1,760	1,760
Rm Exh	0	0
Auxil	0	0

ENGINEERING CKS

	Cooling	Heating
% OA	20.3	20.3
Lps/m²	8.21	8.21
Lps/kW	43.15	
m²/kW	5.26	
W/m²	190.09	-2.45
No. People	352	

COOLING COIL SELECTION

	Total Capacity kW	Sens Cap. kW	Coil Airflow L/s	Enter DB °C	Enter WB °C	Enter HR g/kg	Leave DB °C	Leave WB °C	Leave HR g/kg
Main Clg	200.83	110.58	8,669	25.8	20.6	13.0	14.9	14.4	10.0
Aux Clg	0.00	0.00	0	0.0	0.0	0.0	0.0	0.0	0.0
Opt Vent	0.00	0.00	0	0.0	0.0	0.0	0.0	0.0	0.0
Total	200.83								

AREAS

	Gross Total	Glass m²	Glass (%)
Floor	1,056		
Part	0		
ExFlr	0		
Roof	0	0	0
Wall	307	170	55

HEATING COIL SELECTION

	Capacity kW	Coil Airflow L/s	Ent °C	Lvg °C
Main Htg	-2.6	8,669	20.2	20.0
Aux Htg	0.0	0	0.0	0.0
Preheat	0.0	0	0.0	0.0
Humidif	0.0	0	0.0	0.0
Opt Vent	0.0	0	0.0	0.0
Total	-2.6			

© A

Project Name: UNILEVER PROJECT
Dataset Name: C:\CDS\TRACE700\Projects\UNILEVER PROJECT.trc

TRACE® 700 v6.1.1 calculated at 09:06 PM on 09/20/2007
Alternative - 1 Room Checksums report Page 4 of 5

TRACE™ 700

Các thuật ngữ dùng trong Trace 700

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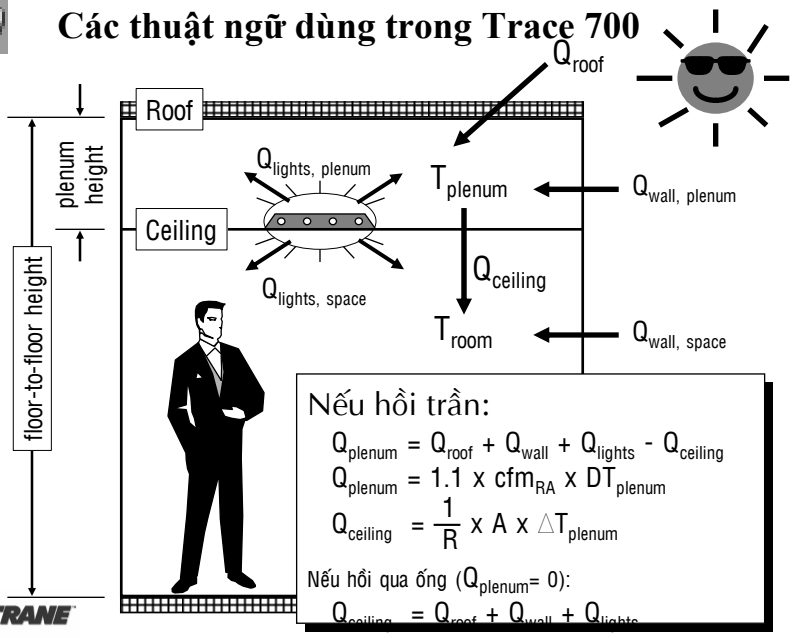
TRACE™ 700

Các thuật ngữ dùng trong Trace 700



Nếu hồi trần:

$Q_{plenum} = Q_{roof} + Q_{wall} + Q_{lights} - Q_{ceiling}$

$Q_{plenum} = 1.1 \times cfm_{RA} \times DT_{plenum}$

$Q_{ceiling} = \frac{1}{R} \times A \times \Delta T_{plenum}$

Nếu hồi qua ống ($Q_{plenum} = 0$):

$Q_{ceiling} = Q_{roof} + Q_{wall} + Q_{lights}$

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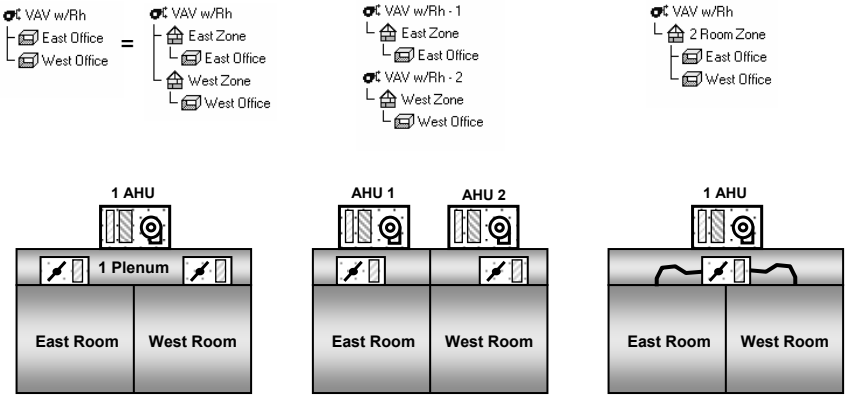
Các thuật ngữ dùng trong Trace700

Room, Zone và System



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Các thuật ngữ dùng trong Trace 700

Room, Zone và System:

Room –Là đơn vị không gian cần điều hòa nhỏ nhất cần tính toán tải nhiệt.

Zone-bao gồm 1 hay nhiều phòng (room) và zone tạo thành các khu vực cần điều khiển khác nhau trong tòa nhà.

System-bao gồm nhiều zone và Room tạo thành.

Wall, Roof và Partition:

Wall (tường bao), Roof (mái) là các bề mặt bao che (bao gồm cả cửa sổ) tiếp xúc trực tiếp với môi trường bên ngoài.

Partition (vách ngăn) là các vách ngăn bên trong khi có chênh lệch nhiệt độ với không gian bên cạnh.

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Các thuật ngữ dùng trong Trace700

AirSide System: là hệ thống phân phối gió đến và từ không gian điều hòa trong tòa nhà. Trace 700 có sẵn 30 kiểu hệ thống phân phối gió và được chia thành 4 nhóm: variable volume (lưu lượng thay đổi), constant volume (lưu lượng không đổi), heating only (sưởi) và induction (…_)

Plant – hệ thống thiết bị cần thiết để tạo nên hệ thống điều hòa không khí của tòa nhà (AHU, chiller, lò hơi, thiết bị phụ: bơm, tháp giải nhiệt..)

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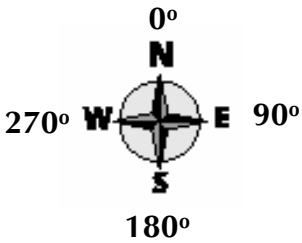
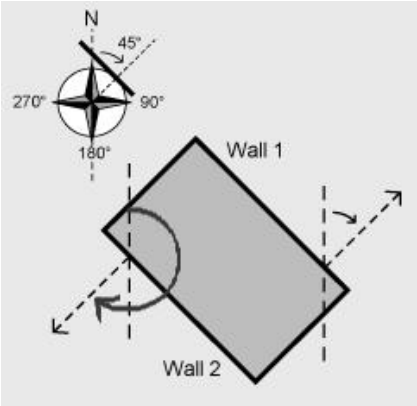
Các thuật ngữ dùng trong Trace700

Wall Direction: là hướng của tường bao che so với phương chuẩn qui định.





Hướng Bắc = 0°
Hướng Đông = 90°
Hướng Nam = 180°
Hướng Tây = 270°

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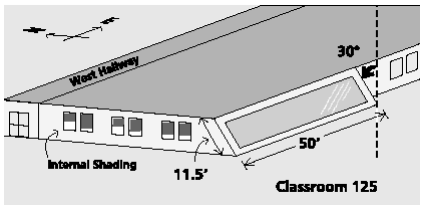
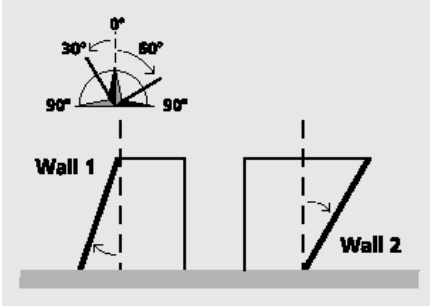
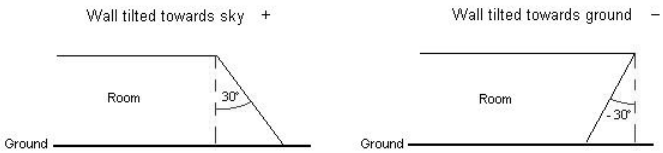
Các thuật ngữ dùng trong Trace700

Wall Tilt: là hướng nghiêng của tường bao che so với phương thẳng đứng.







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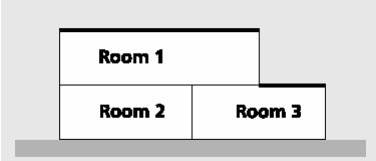
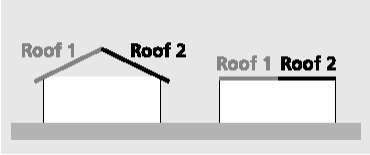
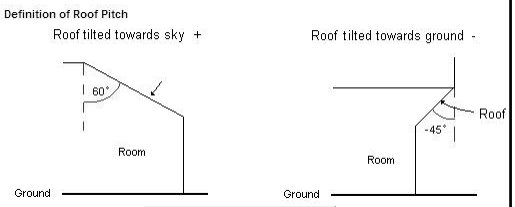
Các thuật ngữ dùng trong Trace700

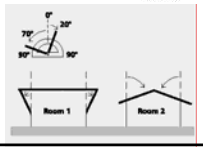
Roof: là mái nhà (có thể là mái bằng hoặc nghiêng) được xác định bằng 2 thông số: Roof Pitch (độ nghiêng) và Roof Direction (hướng).



Room 1: Roof = Floor
Room 2: No Roof
Room 3: Roof # Floor
Mái nằm ngang Pitch = 90°







Room 1: 2 Roofs

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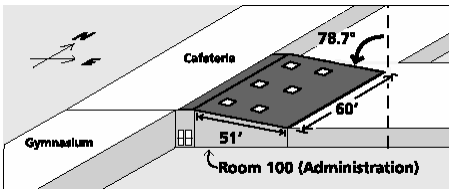
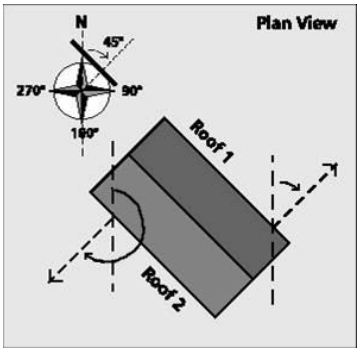
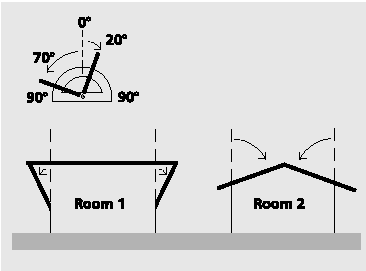
Các thuật ngữ dùng trong Trace700







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TRACE

Một vài thông số thiết kế Chiếu sáng và Thiết bị theo tc IEC.

Fluorescent lighting (corrected to cos φ = 0.86)		
Type of application	**Estimated (VA/m²) fluorescent tube with industrial reflector(1)**	**Average lighting level (lux = lm/m²)**
Roads and highways storage areas, intermittent work	7	150
Heavy-duty works: fabrication and assembly of very large work pieces	14	300
Day-to-day work: office work	24	500
Fine work: drawing offices high-precision assembly workshops	41	800
Power circuits		
Type of application	**Estimated (VA/m²)**	
Pumping station compressed air	3 to 6	
Ventilation of premises	23	
Electrical convection heaters:		
private houses	115 to 146	
flats and apartments	90	
Offices	25	
Dispatching workshop	50	
Assembly workshop	70	
Machine shop	300	
Painting workshop	350	
Heat-treatment plant	700	

(1) example: 65 W tube (ballast not included), flux 5,100 lumens (lm), luminous efficiency of the tube = 78.5 lm / W.

Fig. A9 : Estimation of installed apparent power

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Các loại hệ thống

zones served by supply fan

single zone constant volume (1 khu vực lưu lượng gió không đổi)	**single zone variable volume (1 khu vực lưu lượng gió thay đổi)**
multiple zone constant volume (nhiều khu vực lưu lượng gió không đổi)	**multiple zone variable volume (nhiều khu vực lưu lượng gió thay đổi)**

air volume delivered by supply fan

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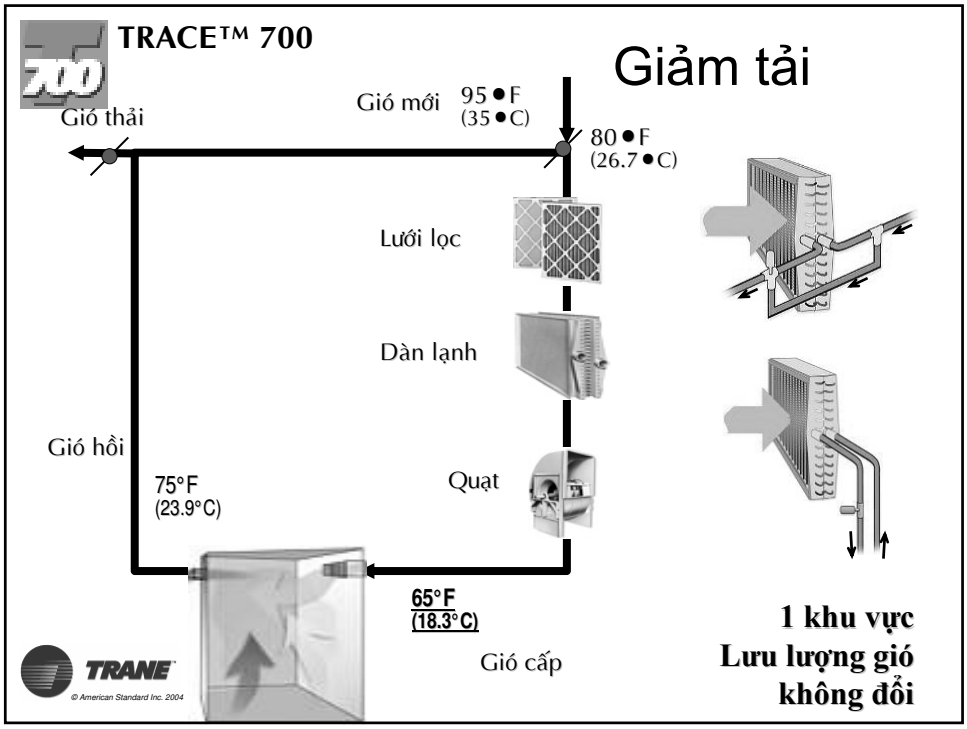
TRACE™ 700
Giảm tải
Gió thải
Gió mới
95 ●F
(35 ●C)
80 ●F
(26.7 ●C)
Lưới lọc
Dàn lạnh
Gió hồi
75°F
(23.9°C)
Quạt
65°F
(18.3°C)
Gió cấp
1 khu vực
Lưu lượng gió
không đổi
TRANE
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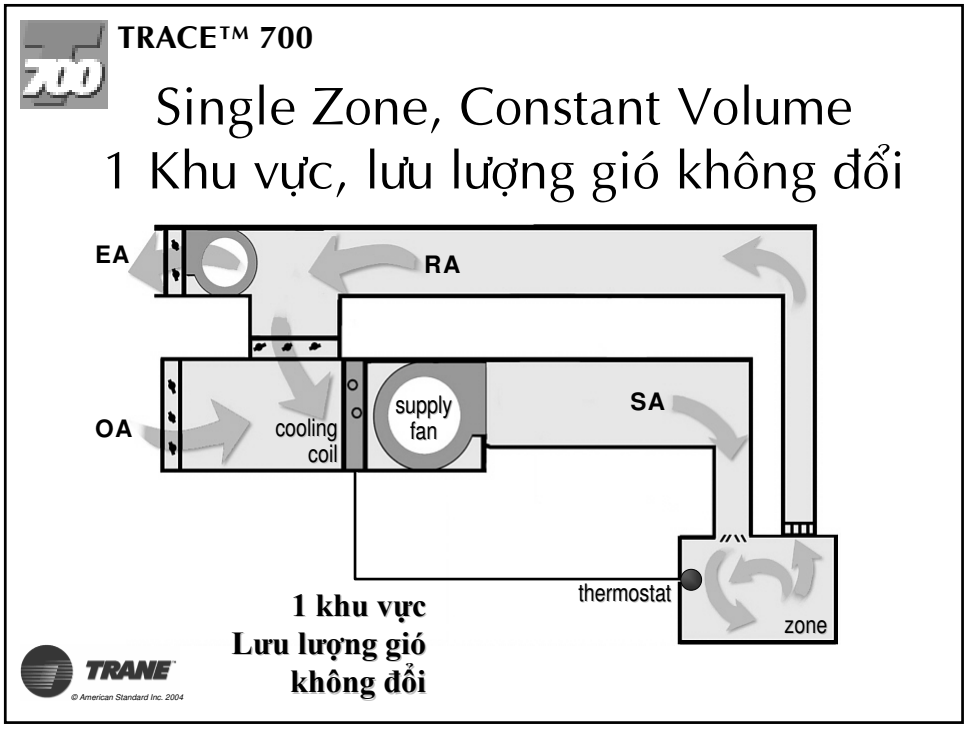
TRACE™ 700
Single Zone, Constant Volume
1 Khu vực, lưu lượng gió không đổi
EA
RA
OA
cooling
coil
supply
fan
SA
thermostat
zone
1 khu vực
Lưu lượng gió
không đổi
TRANE
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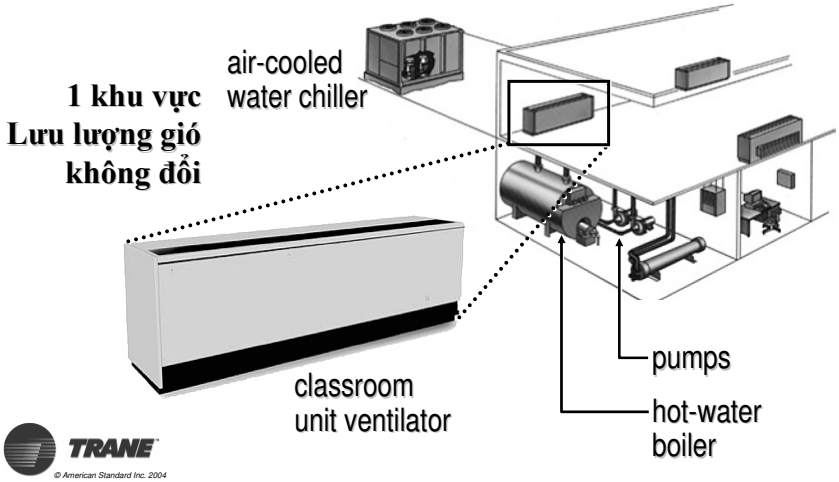
TRACE™ 700

single zone, constant volume

Chilled-Water Terminal System



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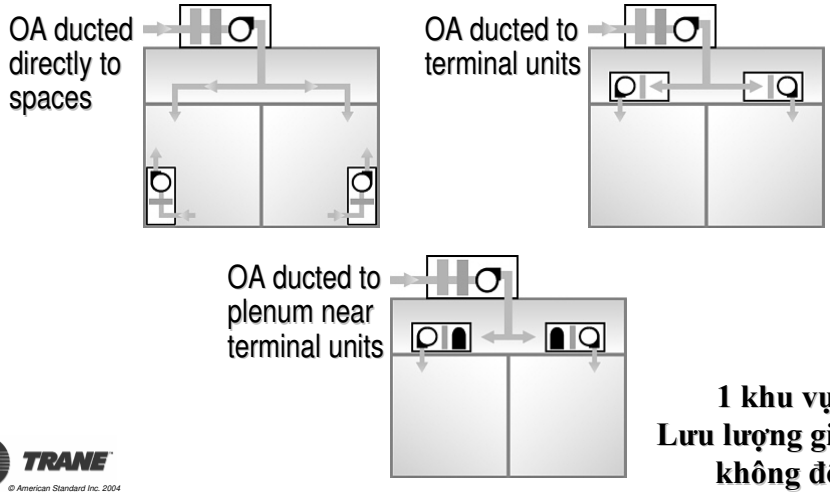
TRACE™ 700

Dedicated Outdoor-Air System



1 khu vực
Lưu lượng gió
không đổi

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