Twinning « Improvement of the Energy Efficiency in Turkey »

Presentation of the software VisualDOE.3

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Available Detailed Energy Simulation Tools

DOE-2 : Whole building analysis program

Interface as eQuest, PowerDoe, VisualDoe, etc.

BLAST: building Load Analysis and System Thermodynamics. Uses heat balance method

EnergyPlus : Combination of DOE & Blast + additional features

Energy10 : For residential and small commercial buildings I.e. buildings with one or two zones or small (<10, 000 ft^2)

Building Design Advisor: Early stages of design and optimization

TRNSYS : Designed to simulate the transient performance of thermal energy system

DOE.2

A public domain program for building energy analysis; sponsored by DOE.

Predicts hourly energy use and energy cost.

INPUTS: Hourly weather information, building description and HVAC system and utility rates

Structure

- **BDL, Loads, Systems, Plants and Economics**
- **Sequential method to link these models**
- **Uses weighting factor method**

Default libraries for building construction

Can use Metric and English units

Uses

- **Energy conservation studies**
- **Building design studies**

What is VisualDOE 3.1

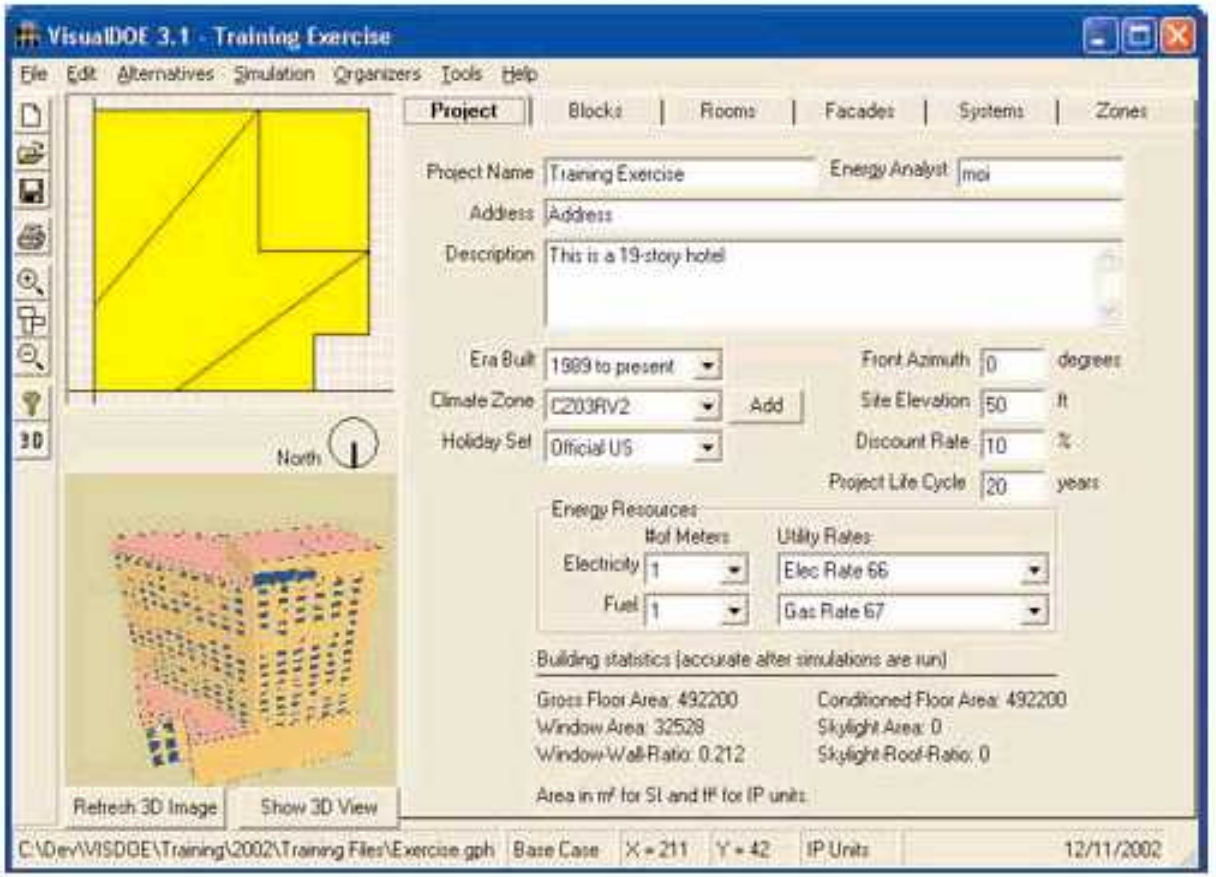
VisualDOE 3.0 is a third generation Windows . application that enables architects, engineers, energy analysts and utility personnel to quickly evaluate the energy savings of building design options.
. VisualDOE is designed so that more advanced calculation engines such as EnergyPlus can be used with the interface.
The VisualDOE 3.0 Windows . interface is truly graphic. Pictures of your building and HVAC system diagrams are produced as you create your model..

Acrobat Reader - [acc.pdf]

File Edit Document View Window Help

WHAT IS VISUALDOE 3.1?

VisualDOE 3.1 is a green building design tool that helps users quickly and accurately evaluate energy and demand impacts of design alternatives using the powerful DOE-2 simulation engine developed by Lawrence Berkeley National Laboratory. The program covers major building systems, including building envelope, lighting, daylighting, service water heating, HVAC and central plant. VisualDOE runs on PCs with the Microsoft



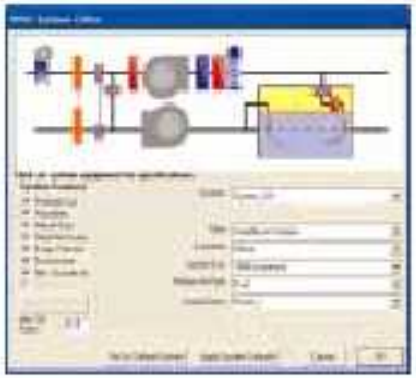
VisualDOE 3.1 Main Form

VisualDOE emphasizes the balance between the ease-of-use and the flexibility for users with different levels of simula-

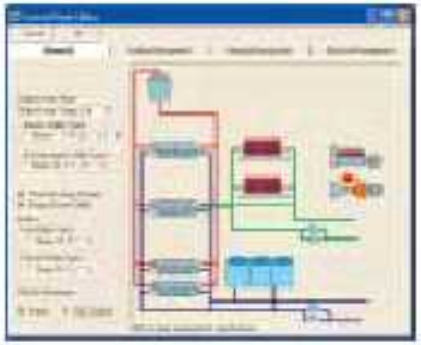
125% 1 of 2 8.5 x 11 in

Acrobat Reader - [acc.pdf]

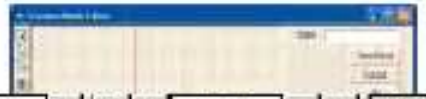
File Edit Document View Window Help



HVAC Editor - Click on images of system components to define properties.



Central Plant Editor - Options include air and water cooled chillers, absorption chillers, thermal energy storage and cogeneration.



WHO'S USING VISUALDOE?

VisualDOE has more than one thousand licensed users in more than thirty five countries. The program is targeted for use by architects, engineers, MEP firms, energy consultants, utilities, national laboratories, universities, energy service companies, HVAC equipment manufacturers, and building product manufacturers.

ENERGY CONSERVATION MEASURES (ECMS)

A wide variety of ECMs can be studied with VisualDOE.

Envelope

Insulation for walls, roofs and floors, mass walls and roofs, cool roofs, exterior shades, coating on walls, building shape and orientation.

Windows and Skylights

Type of windows and skylights, interior and exterior window shades, window orientation, window area, skylight area.

Lighting and Daylighting

Lighting systems, lighting controls, daylighting controls, occupancy sensor.

HVAC System and Equipment

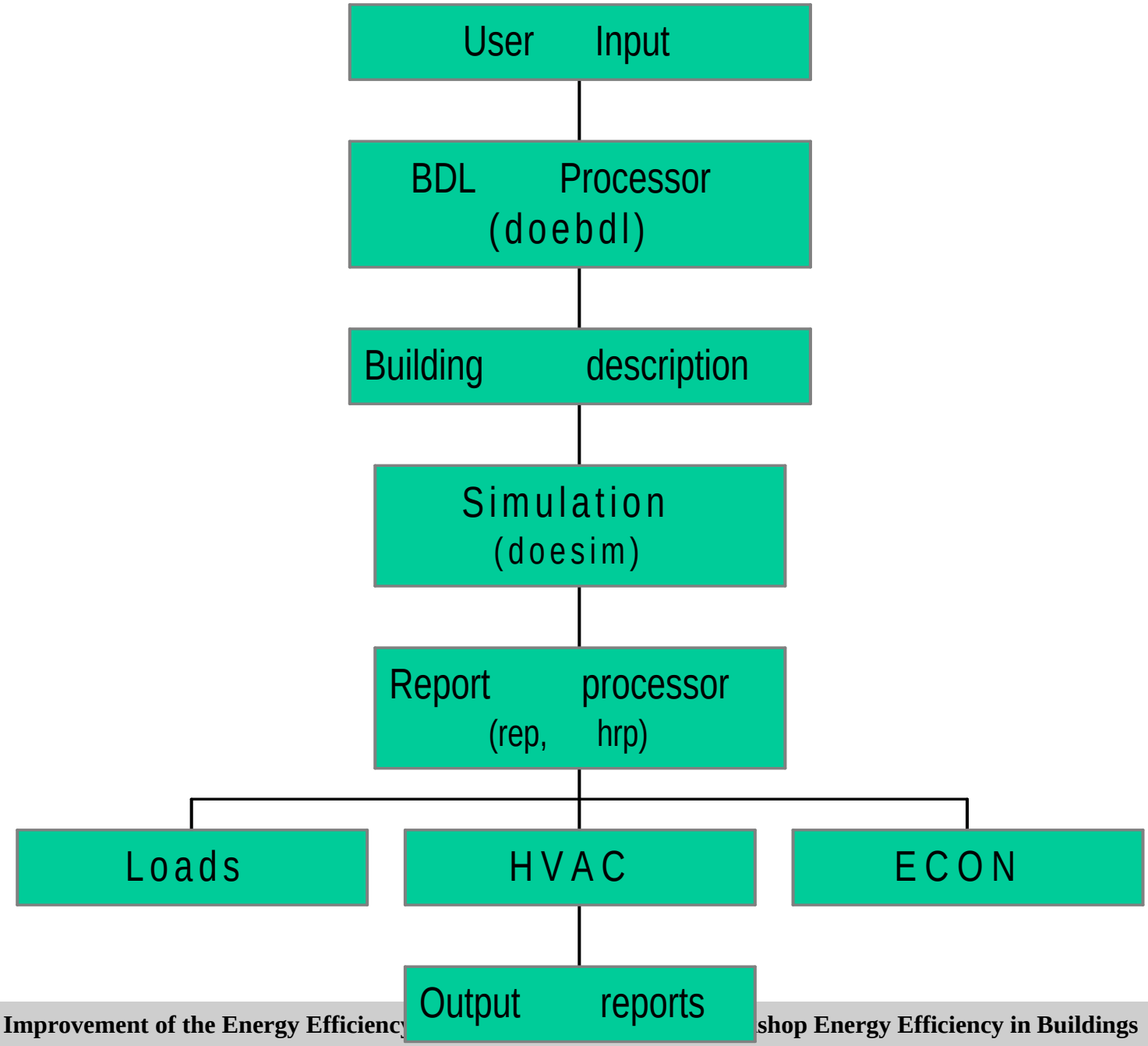
System type, economizer, fan efficiency and control, supply air temperature set point and control, demand control ventilation, heat recovery, zoning and reheat.

Central Plant

Chillers: types, sizing and selection, capacity control, staging, efficiency, CHW loop design and pumping control. Cooling Tower: efficiency, CWS setpoint, approach, CWS reset, capacity control. Boiler: efficiency, HW loop design and pumping control. Thermal Energy Storage system and Co-generation system.

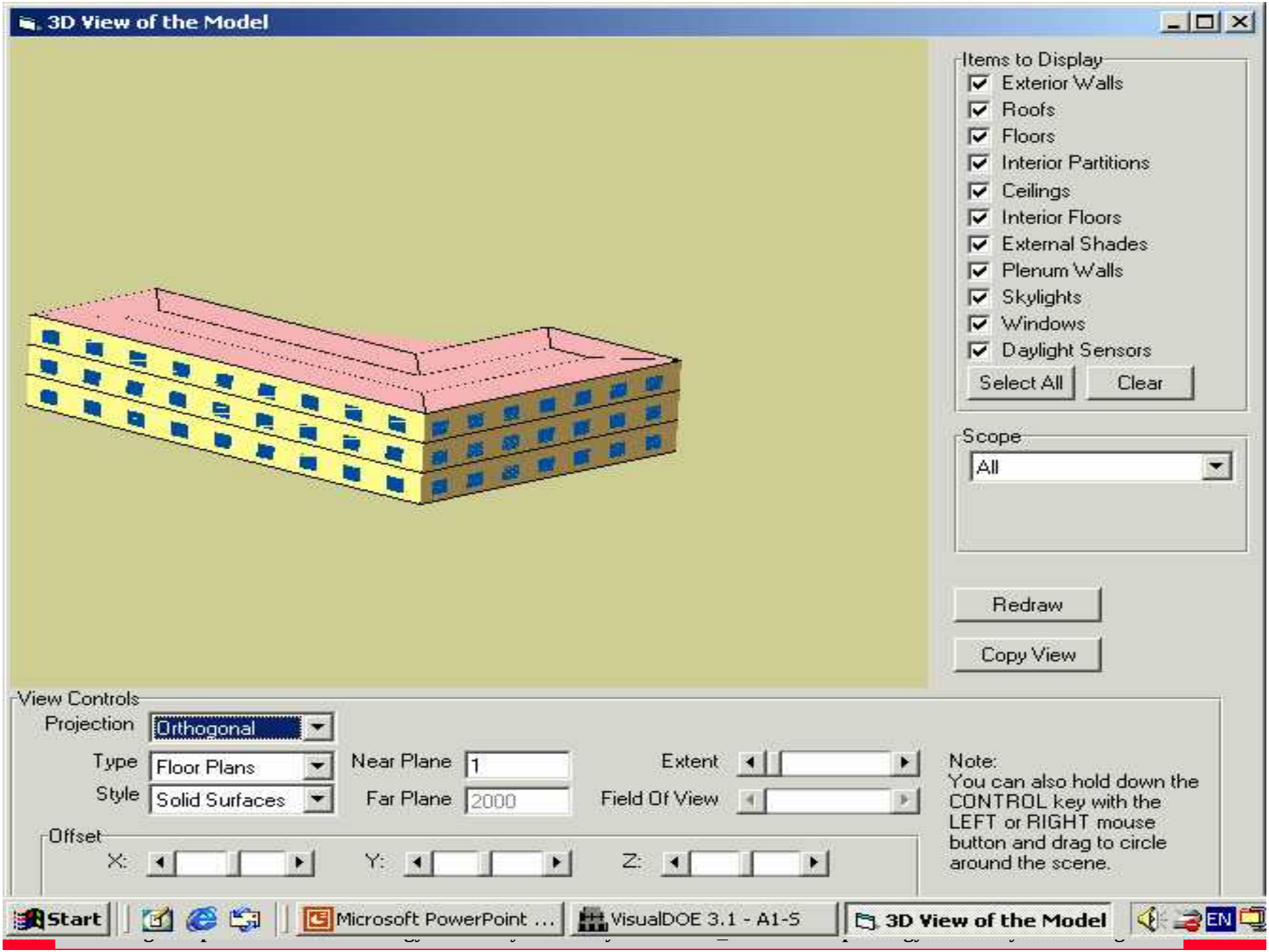
125% 2 of 2 8.5 x 11 in

DOE.3 flow diagram



Arranging Blocks

Blocks can be located on the same level or stacked on top of each other. models that are constructed with standard block shapes.


3D View of the Model
Items to Display
Exterior Walls
Roofs
Floors
Interior Partitions
Ceilings
Interior Floors
External Shades
Plenum Walls
Skylights
Windows
Daylight Sensors
Select All
Clear
Scope
All
Redraw
Copy View
View Controls
Projection
Orthogonal
Type
Floor Plans
Style
Solid Surfaces
Near Plane
1
Far Plane
2000
Extent
Field Of View
Offset
X:
Y:
Z:
Note:
You can also hold down the CONTROL key with the LEFT or RIGHT mouse button and drag to circle around the scene.
Start
Microsoft PowerPoint ...
VisualDOE 3.1 - A1-S
3D View of the Model
EN

Project Folder

The Project folder is used to enter general information about your project.

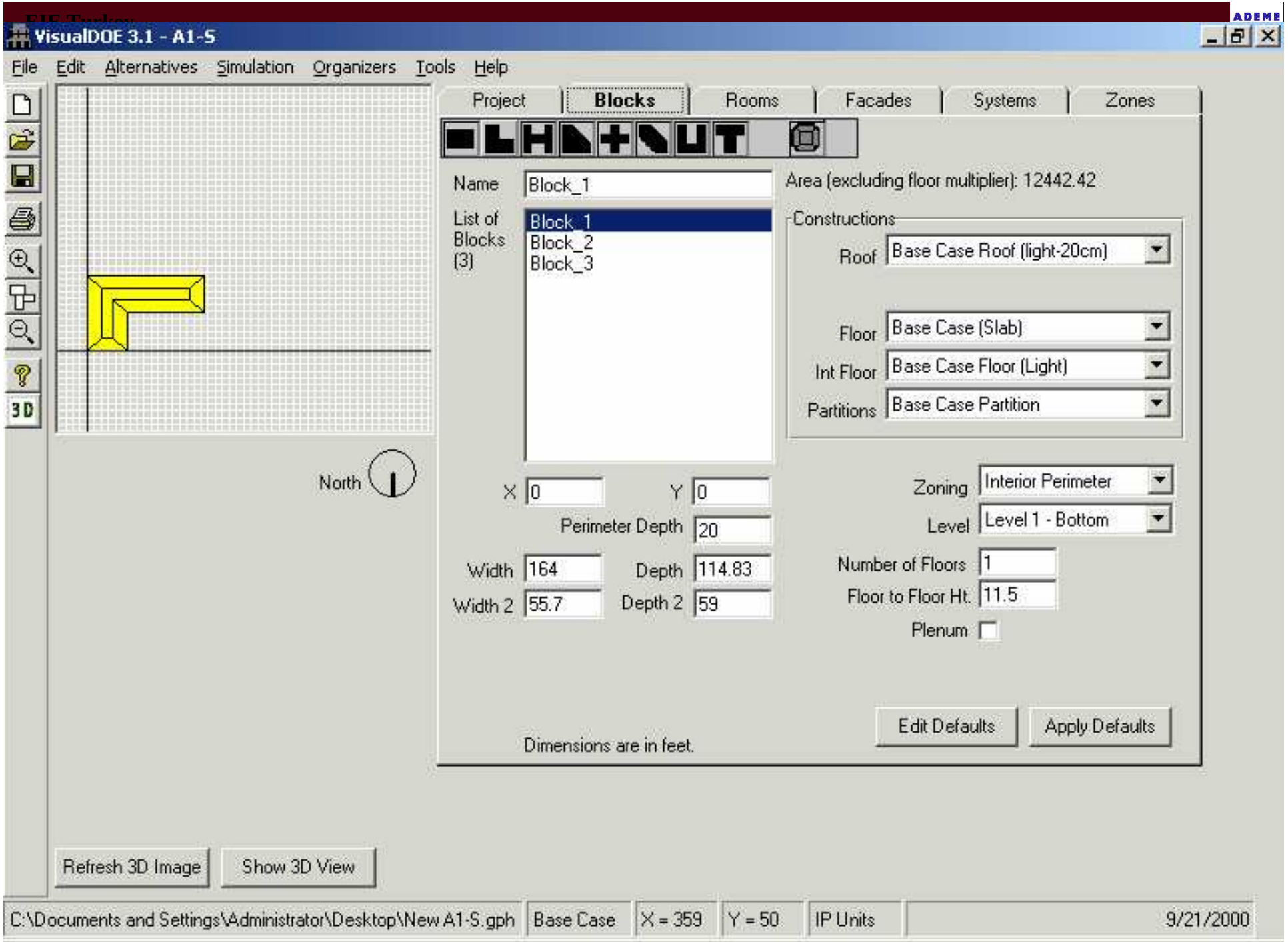
Name. A descriptive project name.

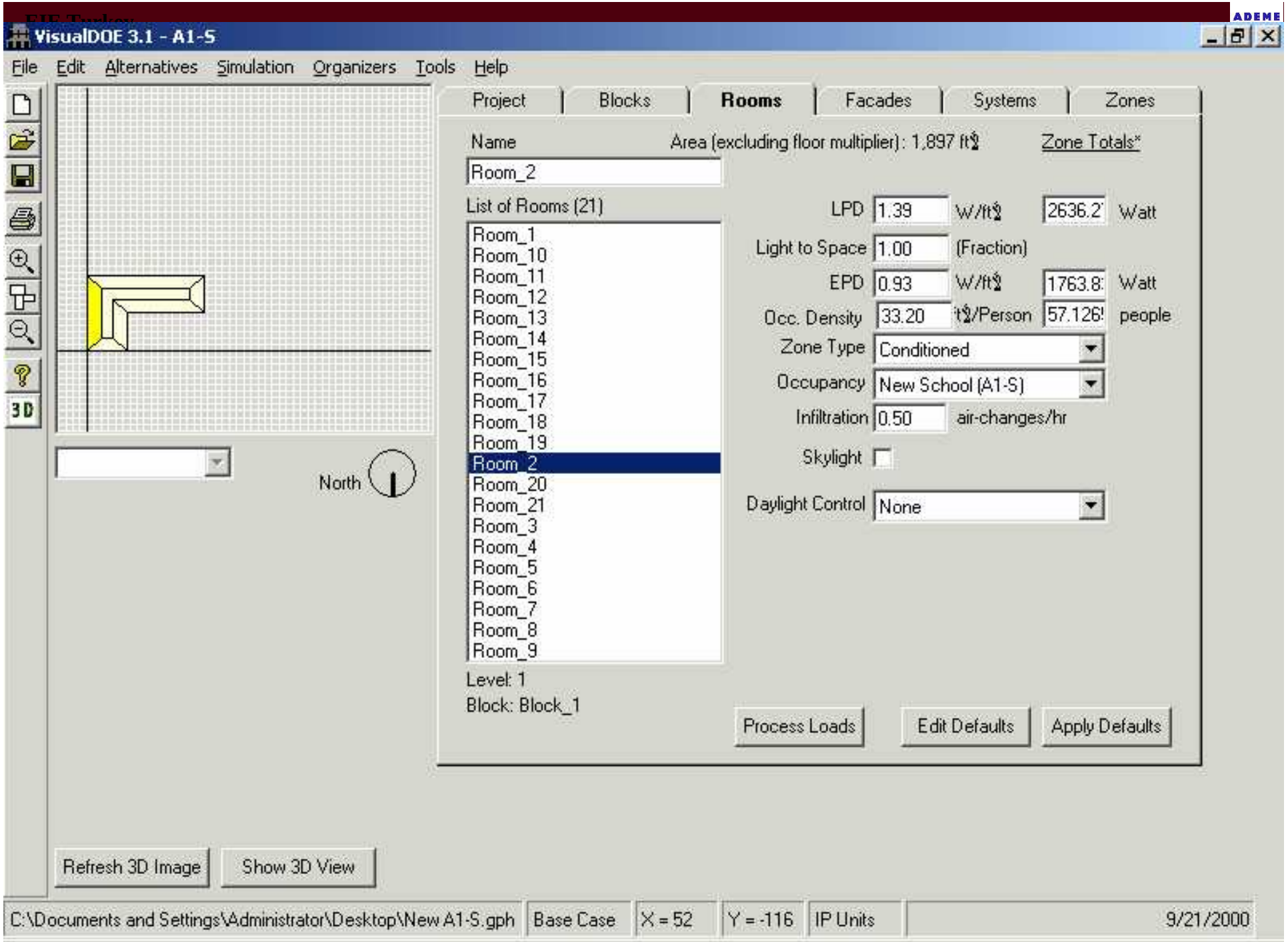
Address. The address of your project,.

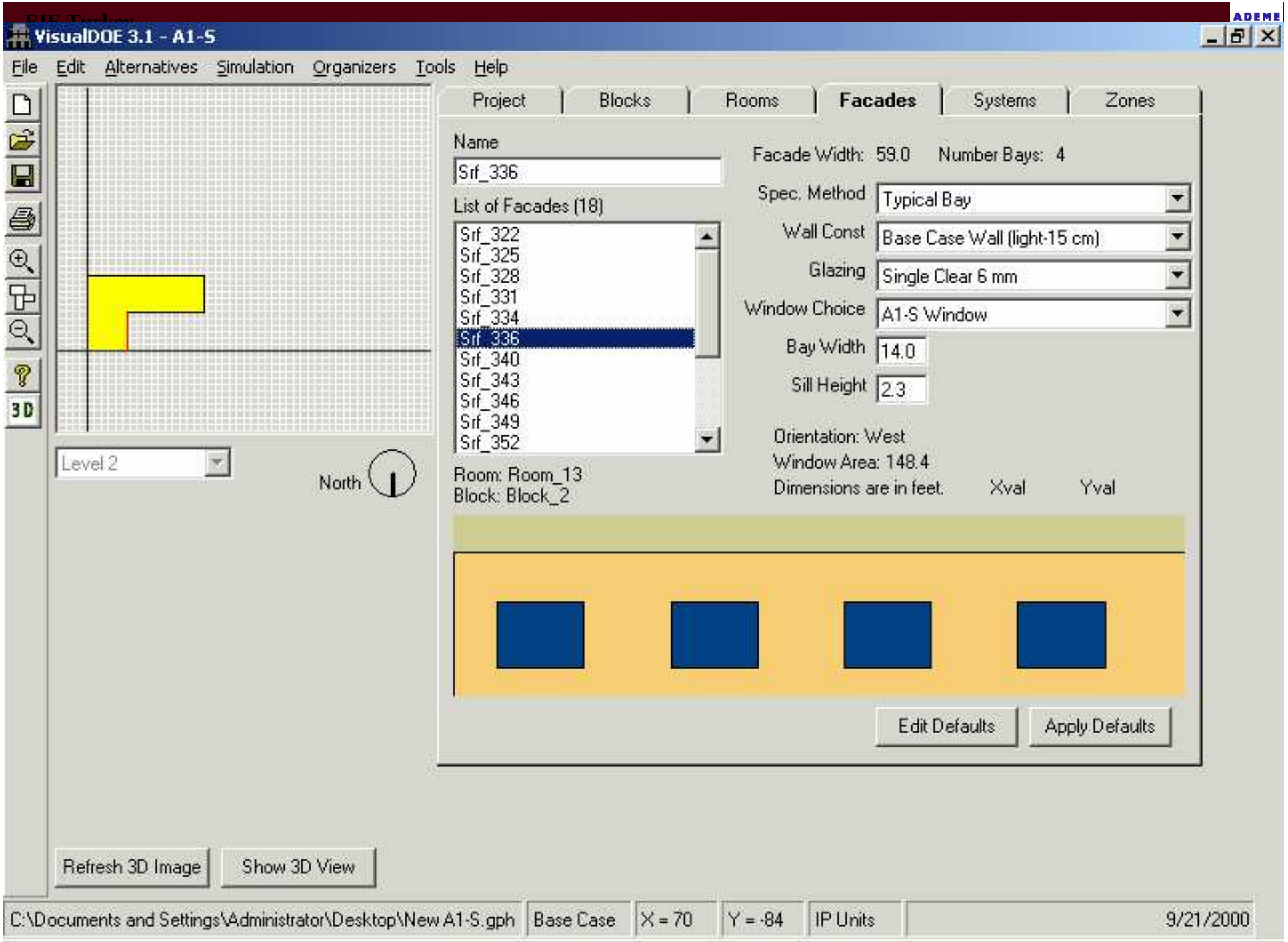
Description. A description of your project,

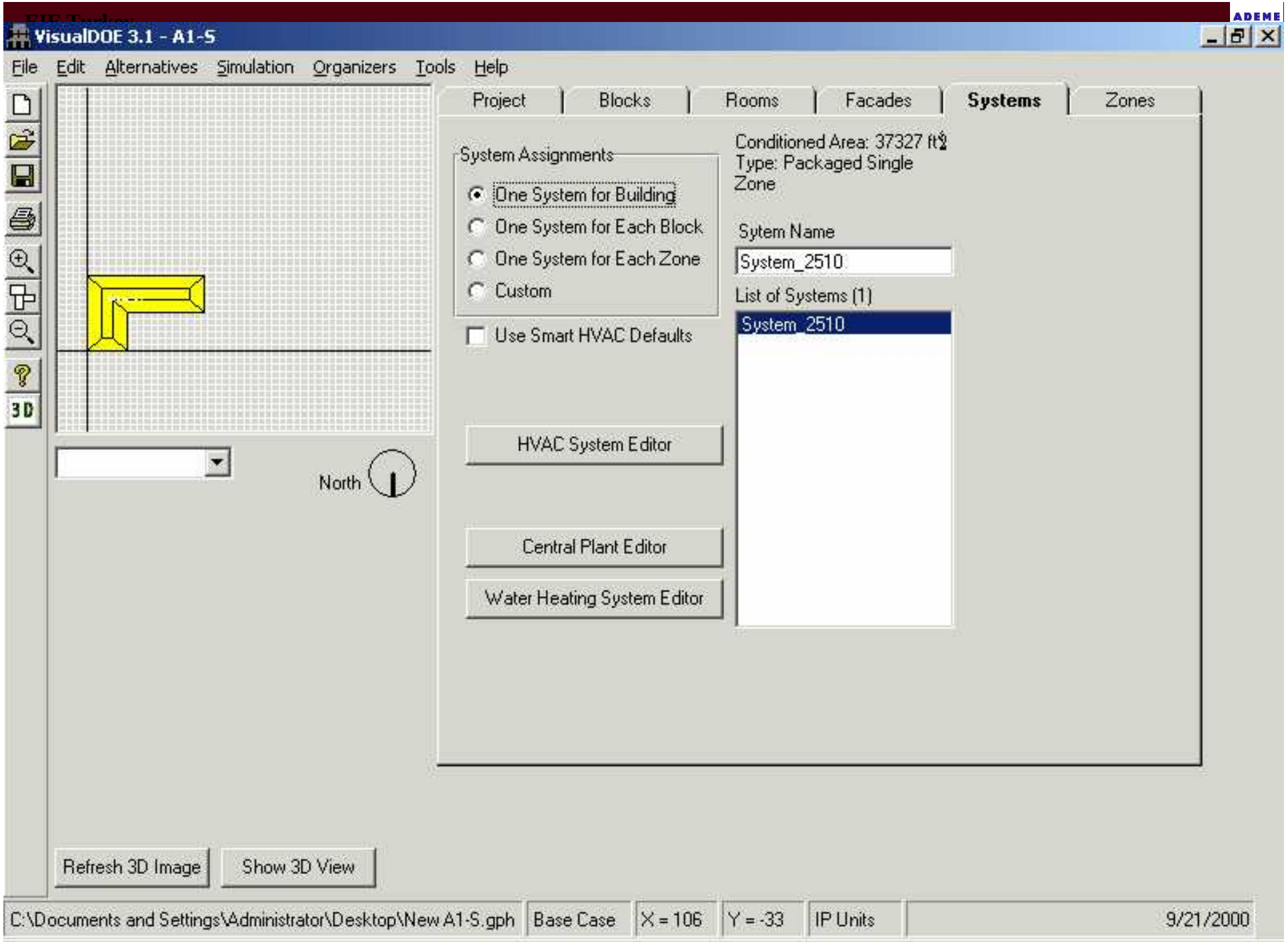
Energy Analyst. The name of the person who is responsible for performing the energy analysis.

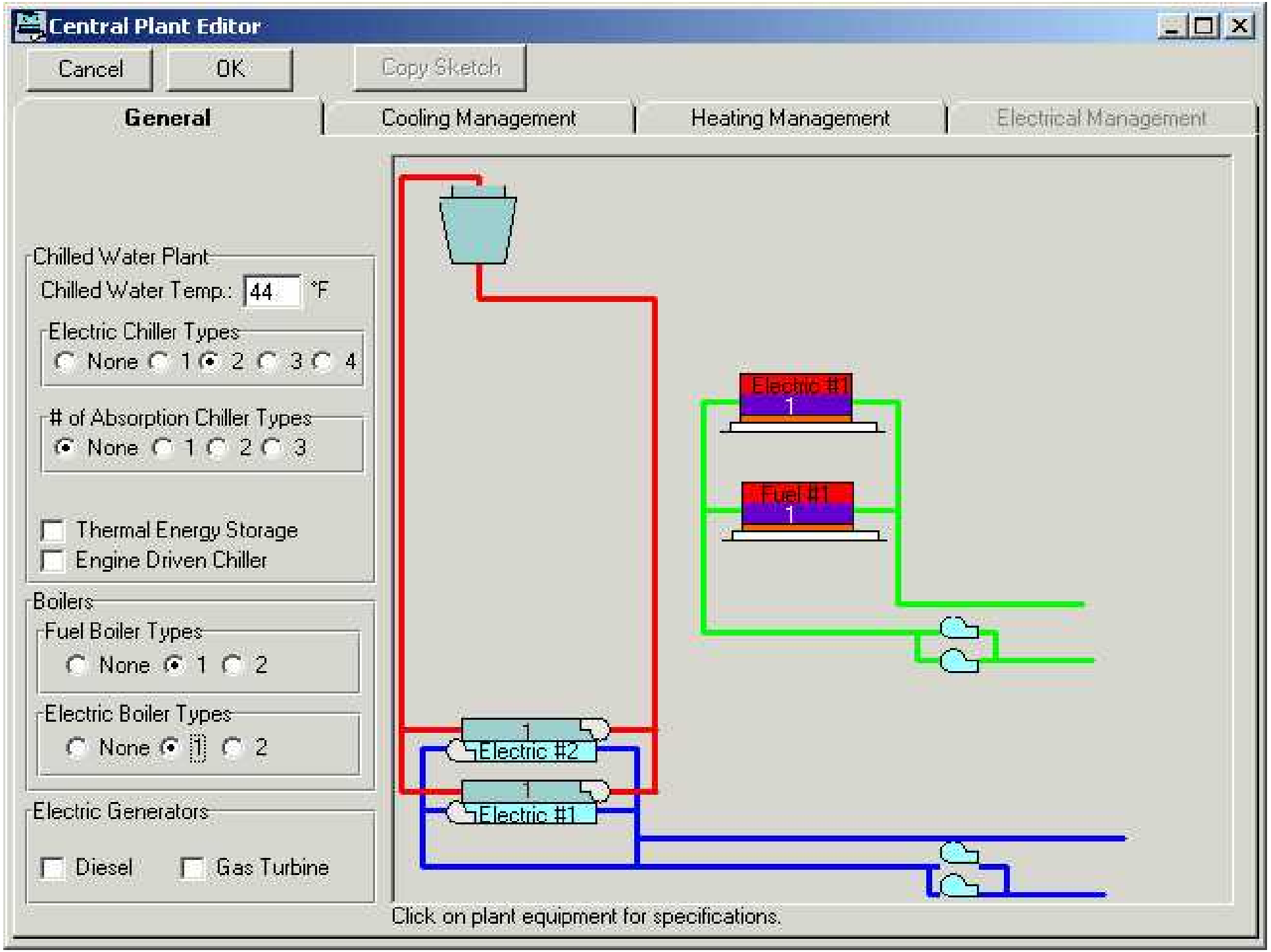
Climate Zone (list box). Select a climate from the list of available choices.


VisualDOE 3.1 - A1-S
File Edit Alternatives Simulation Organizers Tools Help
Project Blocks Rooms Facades Systems Zones
Name Block_1
Area (excluding floor multiplier): 12442.42
List of Blocks (3)
Block_1
Block_2
Block_3
Constructions
Roof Base Case Roof (light-20cm)
Floor Base Case (Slab)
Int Floor Base Case Floor (Light)
Partitions Base Case Partition
North
X 0
Y 0
Perimeter Depth 20
Width 164
Depth 114.83
Width 2 55.7
Depth 2 59
Zoning Interior Perimeter
Level Level 1 - Bottom
Number of Floors 1
Floor to Floor Ht. 11.5
Plenum
Edit Defaults
Apply Defaults
Dimensions are in feet.
Refresh 3D Image
Show 3D View
C:\Documents and Settings\Administrator\Desktop\New A1-S.gph
Base Case
X = 359
Y = 50
IP Units
9/21/2000

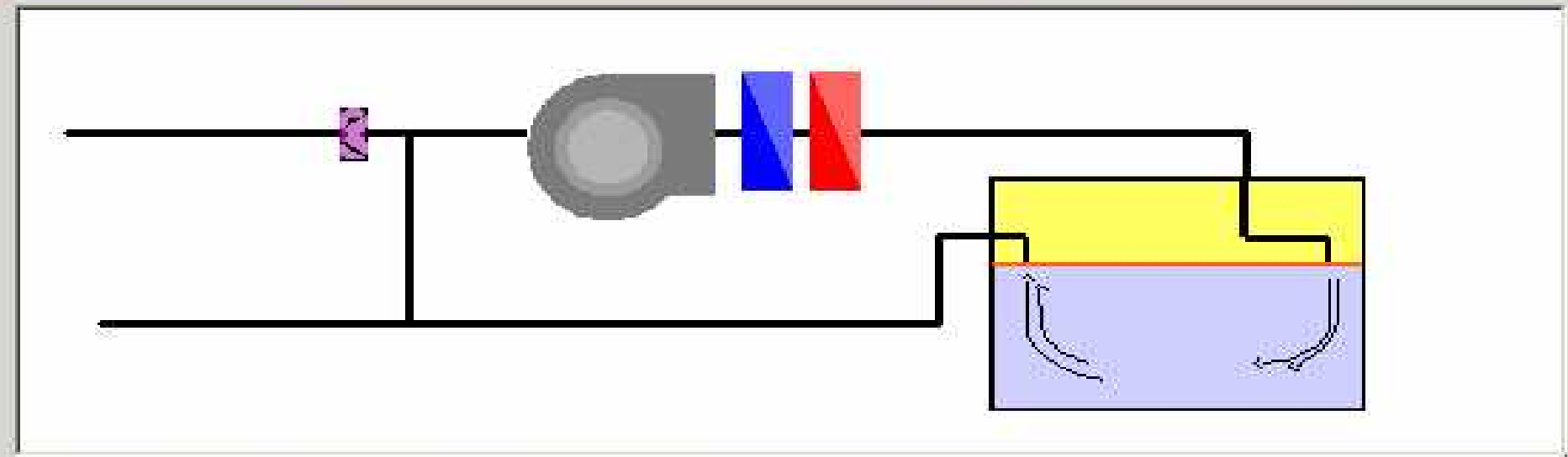

VisualDOE 3.1 - A1-S
File Edit Alternatives Simulation Organizers Tools Help
Project Blocks Rooms Facades Systems Zones
Name
Area (excluding floor multiplier): 1,897 ft²
Zone Totals*
Room_2
List of Rooms (21)
Room_1
Room_10
Room_11
Room_12
Room_13
Room_14
Room_15
Room_16
Room_17
Room_18
Room_19
Room_2
Room_20
Room_21
Room_3
Room_4
Room_5
Room_6
Room_7
Room_8
Room_9
Level: 1
Block: Block_1
LPD 1.39 W/ft² 2636.2 Watt
Light to Space 1.00 (Fraction)
EPD 0.93 W/ft² 1763.8 Watt
Occ. Density 33.20 ft²/Person 57.126 people
Zone Type Conditioned
Occupancy New School (A1-S)
Infiltration 0.50 air-changes/hr
Skylight
Daylight Control None
Process Loads
Edit Defaults
Apply Defaults
North
Refresh 3D Image
Show 3D View
C:\Documents and Settings\Administrator\Desktop\New A1-S.gph
Base Case
X = 52
Y = -116
IP Units
9/21/2000


VisualDOE 3.1 - A1-S
File Edit Alternatives Simulation Organizers Tools Help
Project Blocks Rooms Facades Systems Zones
Name
Srf_336
List of Facades (18)
Srf_322
Srf_325
Srf_328
Srf_331
Srf_334
Srf_336
Srf_340
Srf_343
Srf_346
Srf_349
Srf_352
Facade Width: 59.0 Number Bays: 4
Spec. Method Typical Bay
Wall Const Base Case Wall (light-15 cm)
Glazing Single Clear 6 mm
Window Choice A1-S Window
Bay Width 14.0
Sill Height 2.3
Orientation: West
Window Area: 148.4
Dimensions are in feet. Xval Yval
Room: Room_13
Block: Block_2
Level 2
North
Edit Defaults
Apply Defaults
Refresh 3D Image
Show 3D View
C:\Documents and Settings\Administrator\Desktop\New A1-S.gph
Base Case
X = 70
Y = -84
IP Units
9/21/2000


VisualDOE 3.1 - A1-S
File Edit Alternatives Simulation Organizers Tools Help
Project Blocks Rooms Facades Systems Zones
System Assignments
One System for Building
One System for Each Block
One System for Each Zone
Custom
Use Smart HVAC Defaults
Conditioned Area: 37327 ft²
Type: Packaged Single Zone
Sytem Name
System_2510
List of Systems (1)
System_2510
HVAC System Editor
Central Plant Editor
Water Heating System Editor
North
Refresh 3D Image
Show 3D View
C:\Documents and Settings\Administrator\Desktop\New A1-S.gph
Base Case
X = 106
Y = -33
IP Units
9/21/2000


Central Plant Editor
Cancel
OK
Copy Sketch
General
Cooling Management
Heating Management
Electrical Management
Chilled Water Plant
Chilled Water Temp.: 44 °F
Electric Chiller Types
None 1 2 3 4
# of Absorption Chiller Types
None 1 2 3
Thermal Energy Storage
Engine Driven Chiller
Boilers
Fuel Boiler Types
None 1 2
Electric Boiler Types
None 1 2
Electric Generators
Diesel
Gas Turbine
Electric #1
1
Fuel #1
1
1
Electric #2
1
Electric #1
Click on plant equipment for specifications.

HVAC Systems Editor



Click on system equipment for specifications.

Copy Sketch

System Features

- [ ] Preheat Coil
- [ ] Humidifier
- [ ] Return Fan
- [ ] Heat Recovery
- [ ] Evap. Precool
- [ ] Economizer
- [ ] Min. Outside Air
- [x] Natural Vent.

Natural Ventilation

Min. OA Ratio: 0.427

System: System_2510

Type: Packaged Single Zone

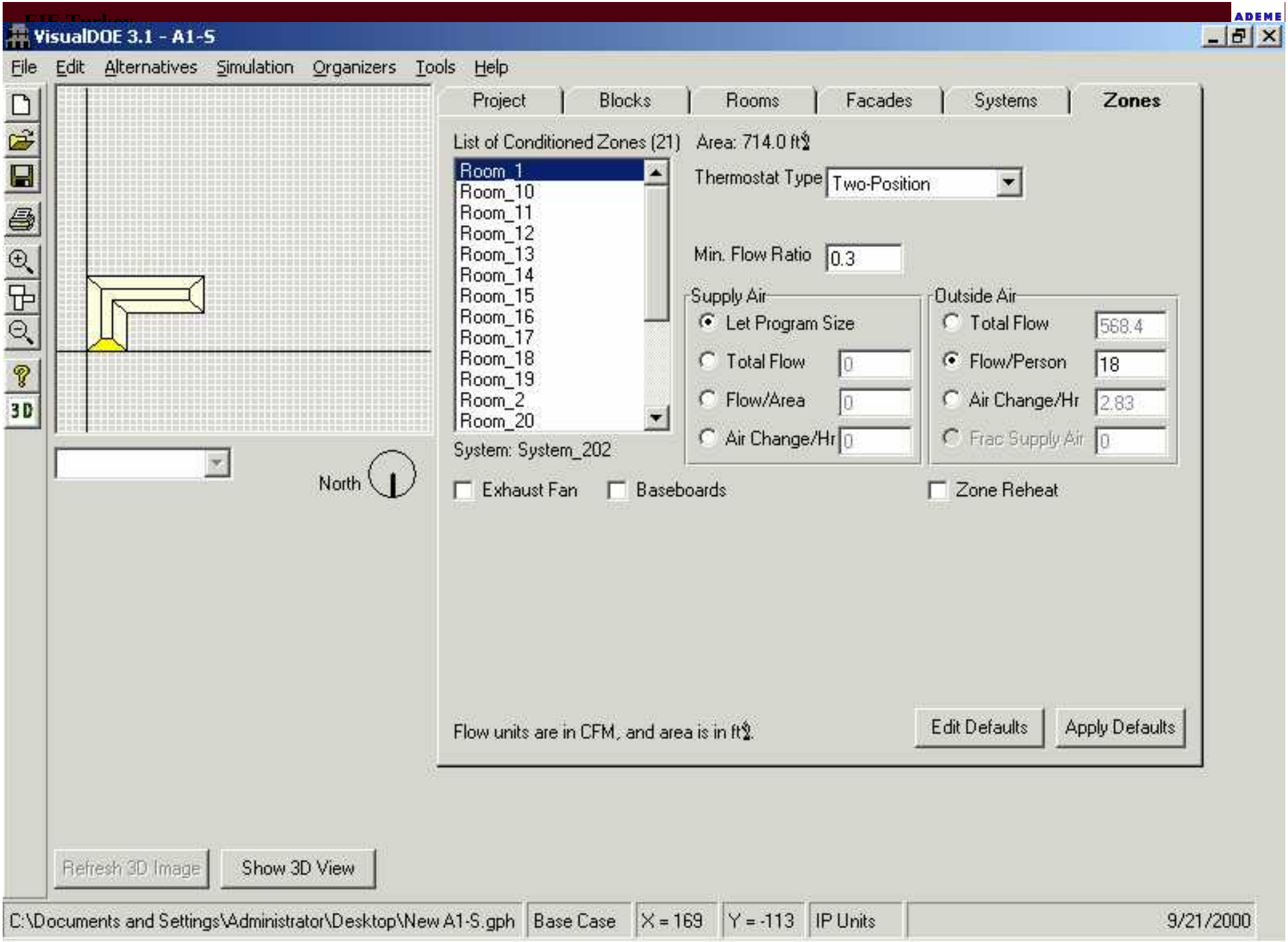
Schedule: New School (A1-S)

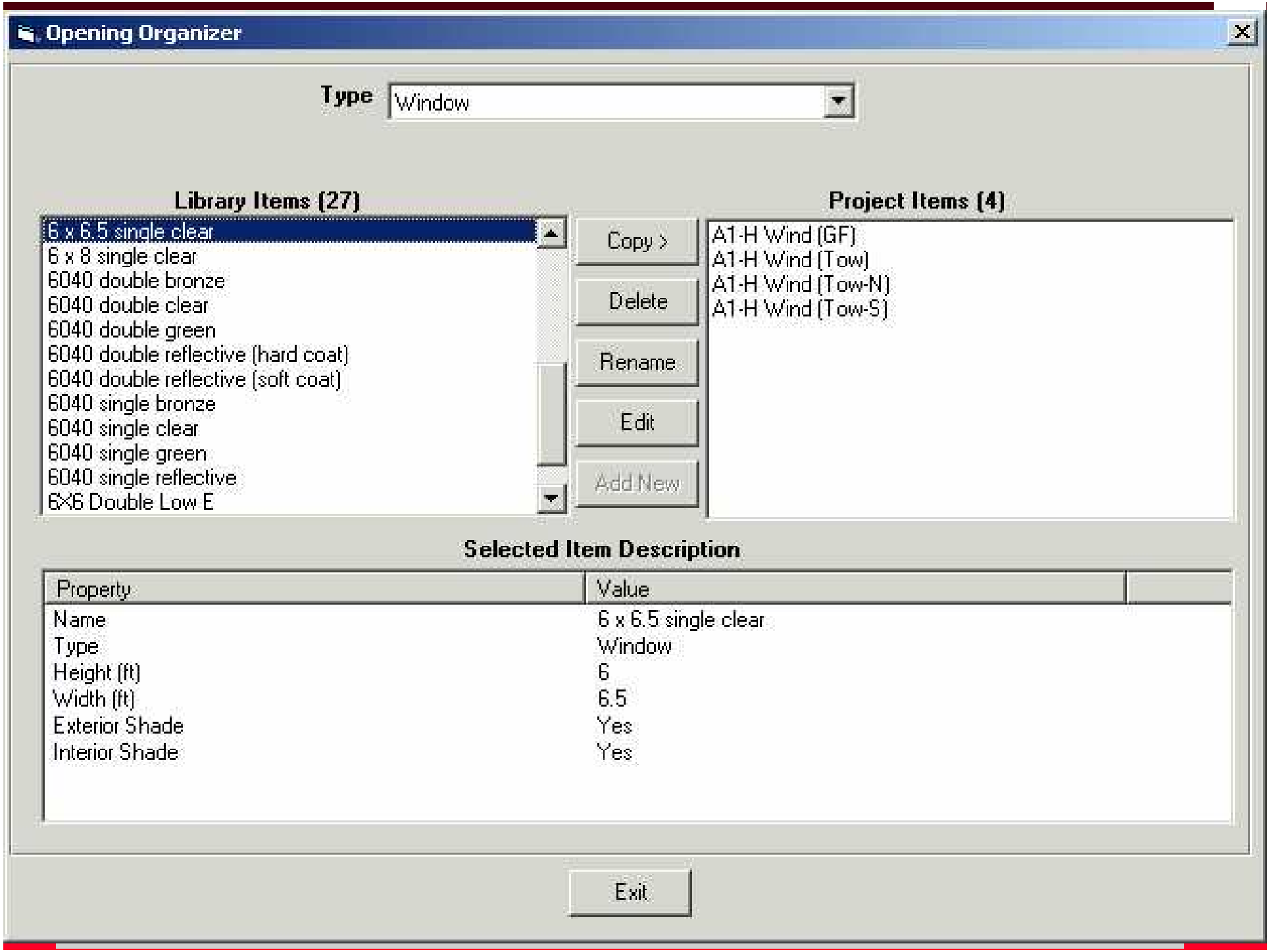
System Era: 1989 to present

Return Air Path: Duct

Control Zone: Room_1

Set As Default System | Apply System Defaults | Cancel | OK


VisualDOE 3.1 - A1-S
File Edit Alternatives Simulation Organizers Tools Help
Project Blocks Rooms Facades Systems Zones
List of Conditioned Zones (21)
Area: 714.0 ft²
Room_1
Room_10
Room_11
Room_12
Room_13
Room_14
Room_15
Room_16
Room_17
Room_18
Room_19
Room_2
Room_20
Thermostat Type
Two-Position
Min. Flow Ratio
0.3
Supply Air
Let Program Size
Total Flow
Flow/Area
Air Change/Hr
Outside Air
Total Flow
568.4
Flow/Person
18
Air Change/Hr
2.83
Frac Supply Air
System: System_202
North
Exhaust Fan
Baseboards
Zone Reheat
Flow units are in CFM, and area is in ft².
Edit Defaults
Apply Defaults
Refresh 3D Image
Show 3D View
C:\Documents and Settings\Administrator\Desktop\New A1-S.gph
Base Case
X = 169
Y = -113
IP Units
9/21/2000


Opening Organizer
Type
Window
Library Items (27)
6 x 6.5 single clear
6 x 8 single clear
6040 double bronze
6040 double clear
6040 double green
6040 double reflective (hard coat)
6040 double reflective (soft coat)
6040 single bronze
6040 single clear
6040 single green
6040 single reflective
6X6 Double Low E
Copy >
Delete
Rename
Edit
Add New
Project Items (4)
A1-H Wind (GF)
A1-H Wind (Tow)
A1-H Wind (Tow-N)
A1-H Wind (Tow-S)
Selected Item Description
Property
Value
Name
6 x 6.5 single clear
Type
Window
Height (ft)
6
Width (ft)
6.5
Exterior Shade
Yes
Interior Shade
Yes
Exit

Opening Editor

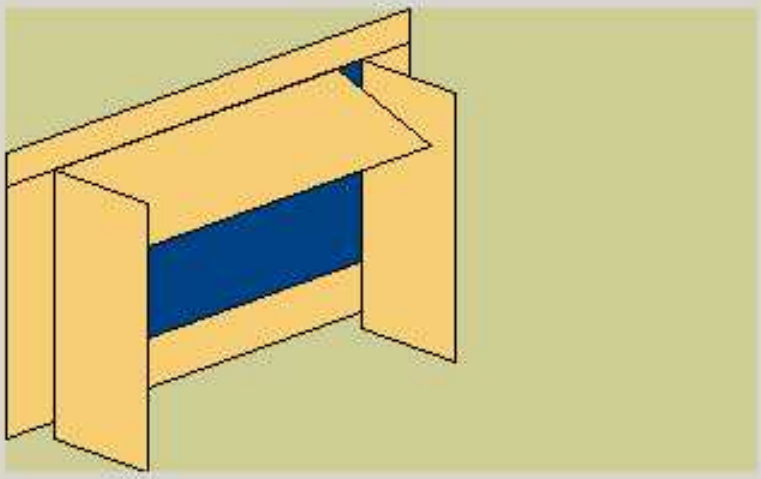
Window | **Exterior Shade** | Interior Shade | Frame

	Fin Left	Fin Right
Projection	2	2
Height	8	8
Head to Top Fin	2	2
Jamb to Fin	0	0

Overhang

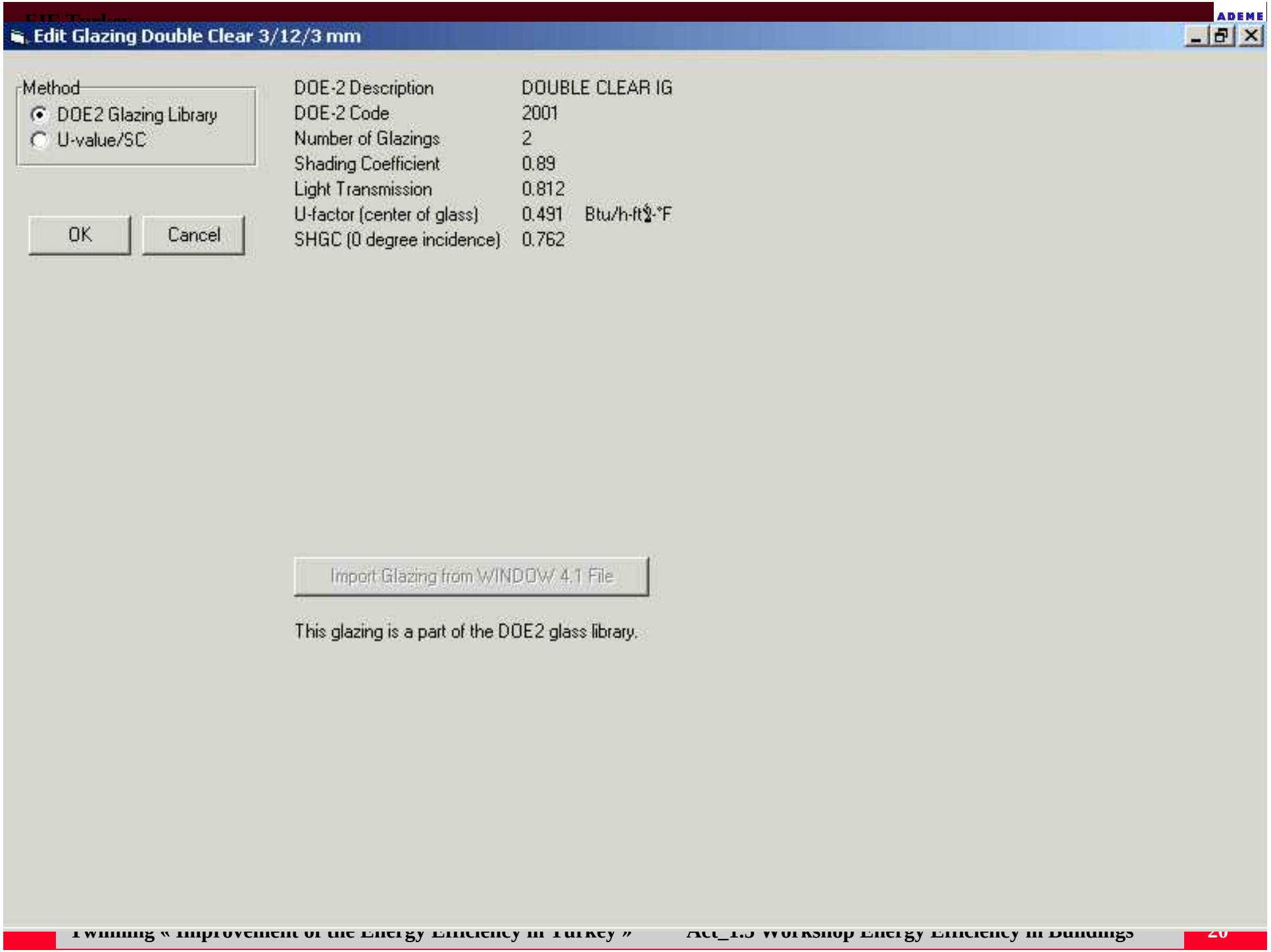
Projection	2
Width	6
Edge to Jamb Left	0
Head to Bottom OH	0
Angle	45

Window Recess: 0.10



All dimensions are in feet.

Redraw | Cancel | OK


Edit Glazing Double Clear 3/12/3 mm
Method
DOE2 Glazing Library
U-value/SC
OK
Cancel
DOE-2 Description DOUBLE CLEAR IG
DOE-2 Code 2001
Number of Glazings 2
Shading Coefficient 0.89
Light Transmission 0.812
U-factor (center of glass) 0.491 Btu/h-ft²-°F
SHGC (0 degree incidence) 0.762
Import Glazing from WINDOW 4.1 File
This glazing is a part of the DOE2 glass library.

Construction Editor

Name: Wd. Frm. 24" o.c. R-0 + 2" EI

Type: Wall

Absorptance: 70%

Roughness: 3 - Textured

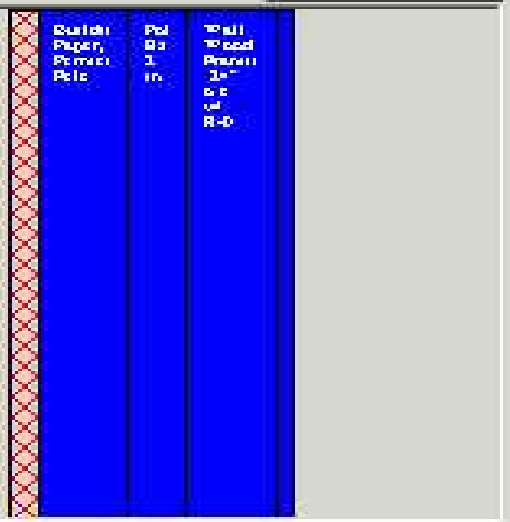
Inside Surface: Non Refl. Wall

Enter U-factor

Outside Emissivity: 0.9

Sketch of Construction (left exterior)

Clear Construction



Construction Details

Property	Value
Name	Wd. Frm. 24" o.c....
ID	279
Type	Wall
Fixed	False
NameD...	Asm185

Materials

Classes

All
Insulation
Exterior Finishes
Framing/Insulation

Organizer

Edit Material

Choices

Stucco 1 in.
Building Paper, Permeable Felt
Polystyrene, Expanded, 2 in.
Wall Wood Framing 24" o.c. w/ R-0
Gypsum Board 5/8 in.

Sketch of Selected Material

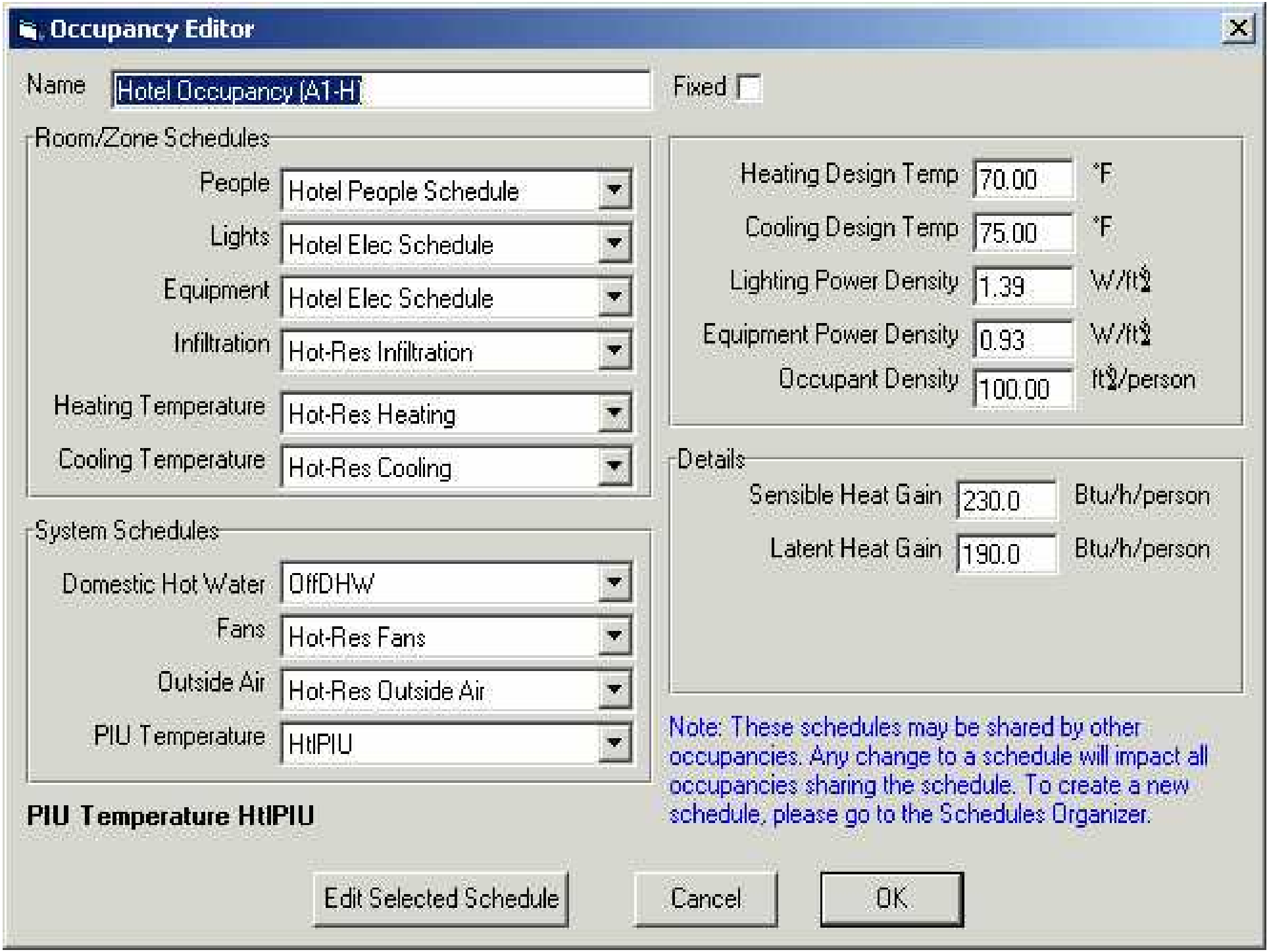
Material Details

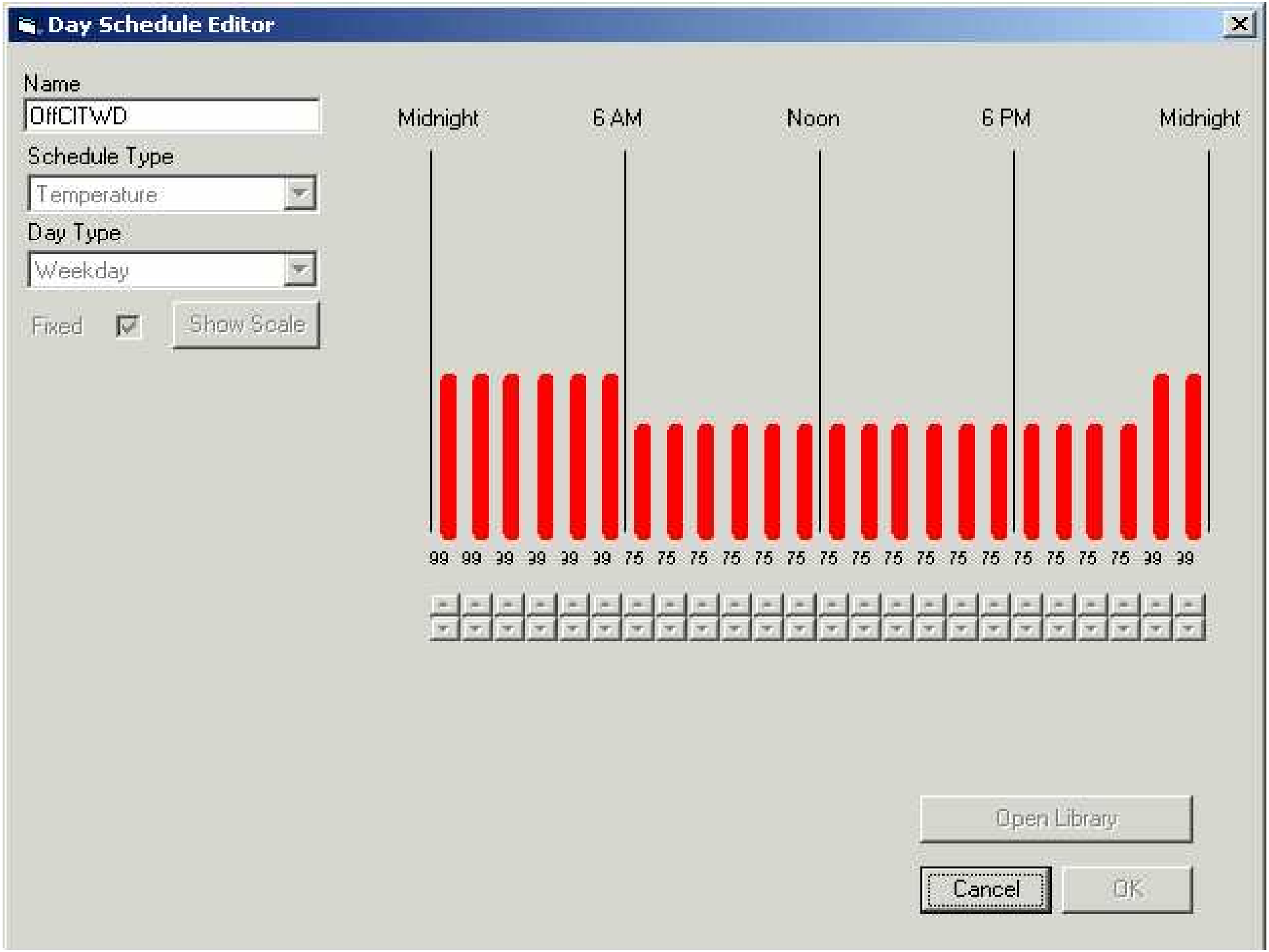
Property	Value
Name	Stucco 1 in.
Type	ExteriorFinishes
DOE-2 ...	True
Fixed	True

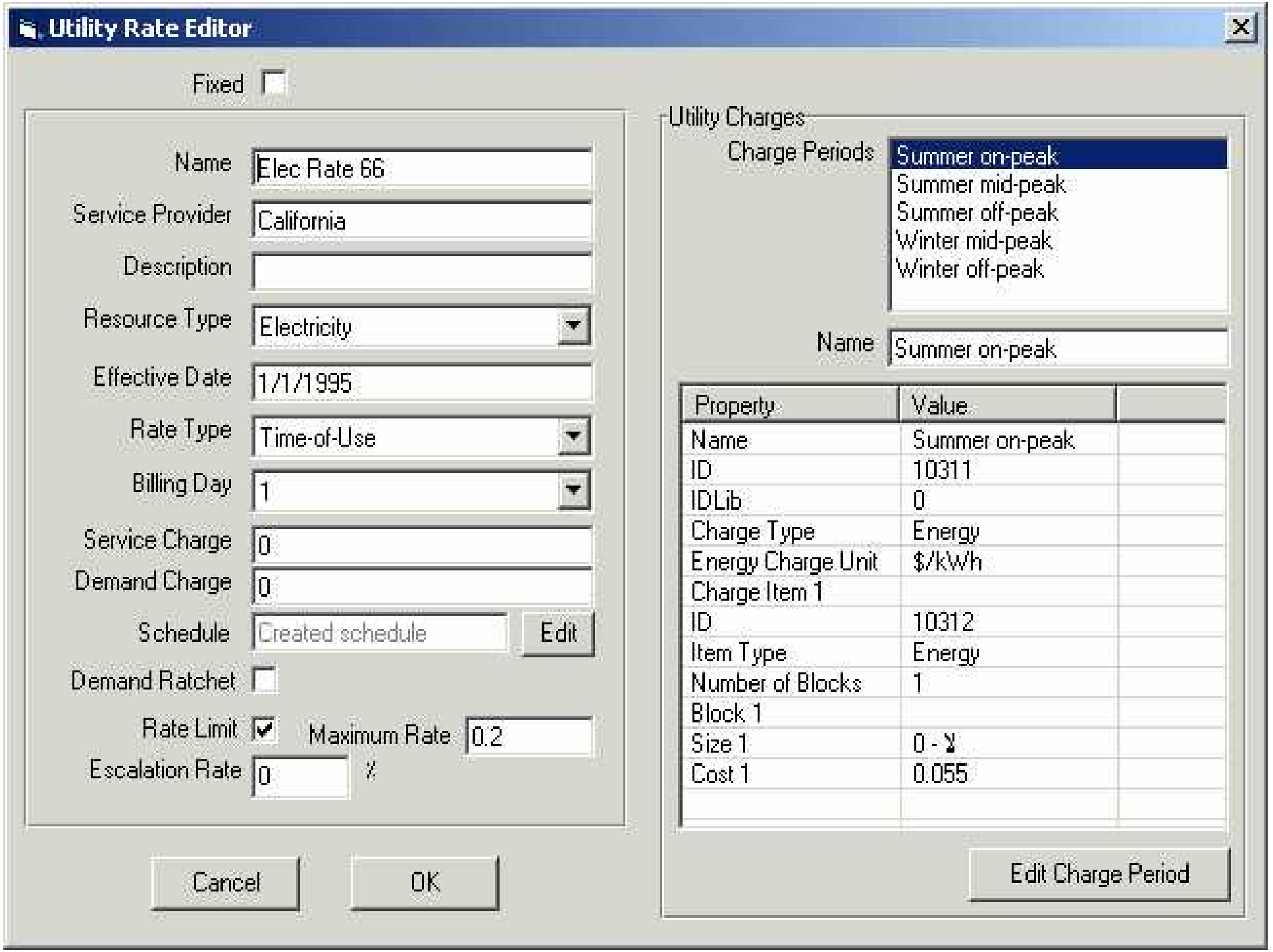
Copy Sketch

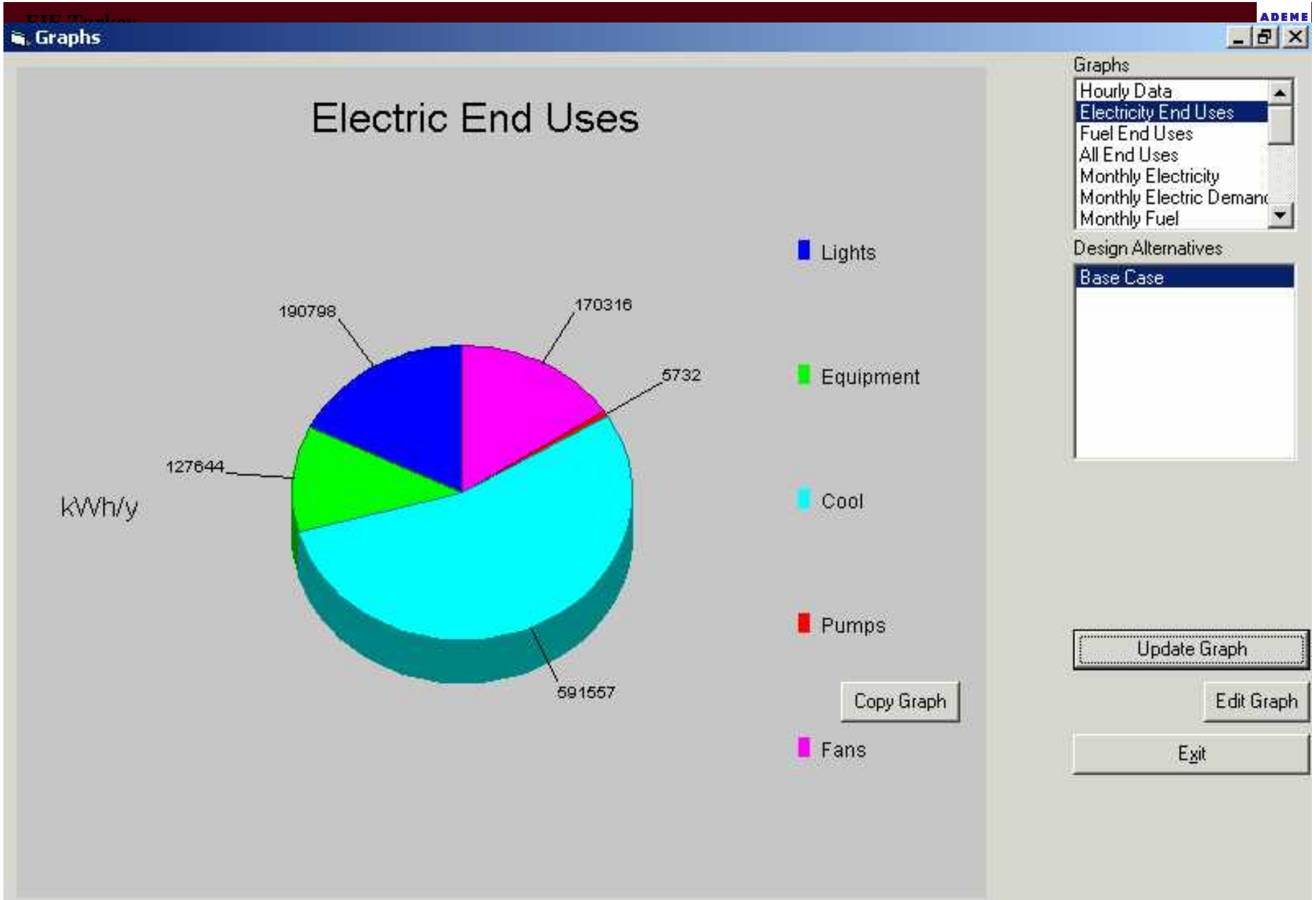
OK

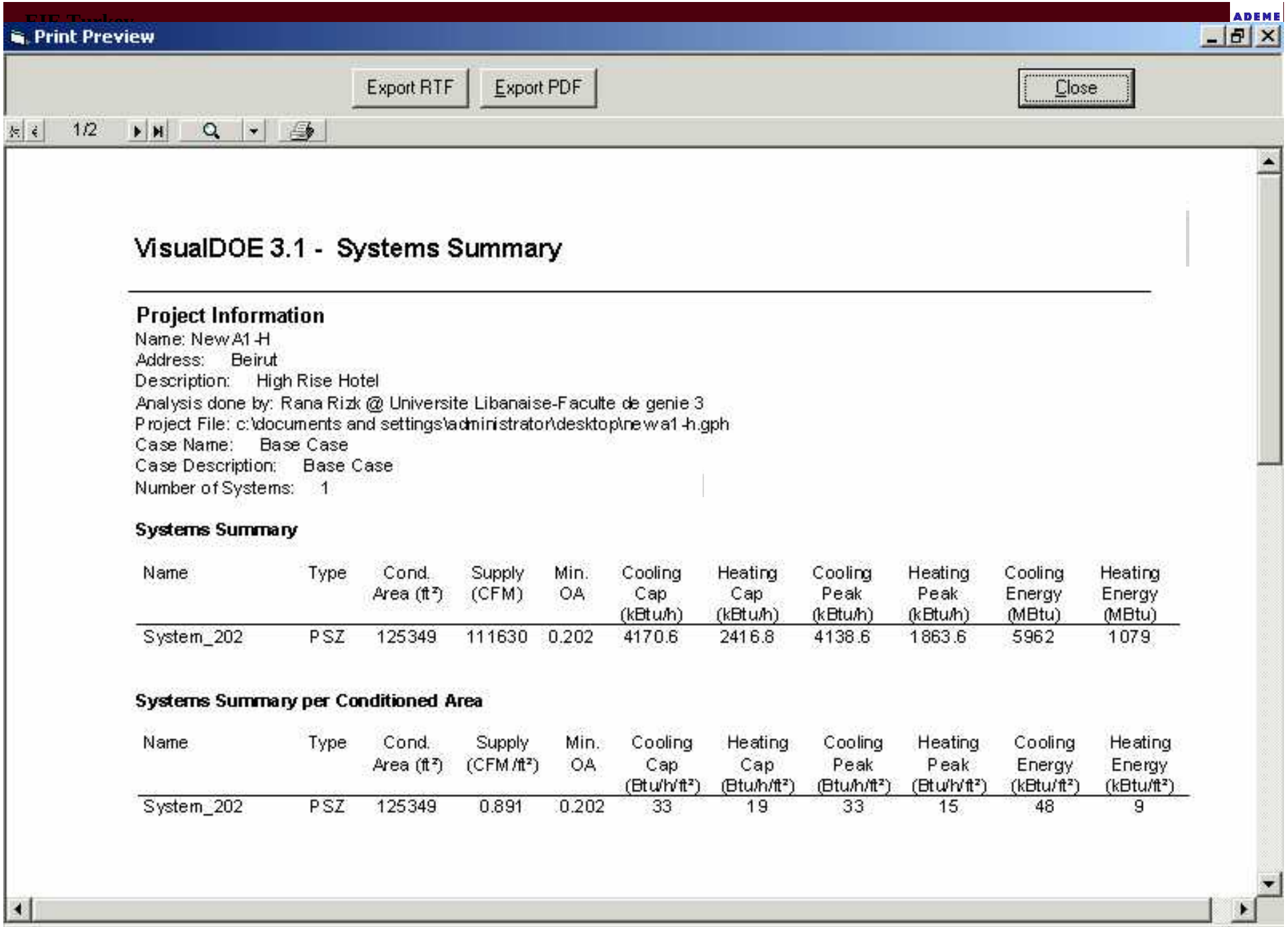
Cancel


Occupancy Editor
Name
Hotel Occupancy [A1-H]
Fixed
Room/Zone Schedules
People
Hotel People Schedule
Lights
Hotel Elec Schedule
Equipment
Hotel Elec Schedule
Infiltration
Hot-Res Infiltration
Heating Temperature
Hot-Res Heating
Cooling Temperature
Hot-Res Cooling
System Schedules
Domestic Hot Water
OffDHW
Fans
Hot-Res Fans
Outside Air
Hot-Res Outside Air
PIU Temperature
HtlPIU
PIU Temperature HtlPIU
Heating Design Temp
70.00
°F
Cooling Design Temp
75.00
°F
Lighting Power Density
1.39
W/ft²
Equipment Power Density
0.93
W/ft²
Occupant Density
100.00
ft²/person
Details
Sensible Heat Gain
230.0
Btu/h/person
Latent Heat Gain
190.0
Btu/h/person
Note: These schedules may be shared by other occupancies. Any change to a schedule will impact all occupancies sharing the schedule. To create a new schedule, please go to the Schedules Organizer.
Edit Selected Schedule
Cancel
OK


Day Schedule Editor
Name
OffCITWD
Schedule Type
Temperature
Day Type
Weekday
Fixed
Show Scale
Midnight
6 AM
Noon
6 PM
Midnight
99 99 99 99 99 99 75 75 75 75 75 75 75 75 75 75 75 75 75 75 75 75 99 99
Open Library
Cancel
OK


Utility Rate Editor
Fixed
Name
Elec Rate 66
Service Provider
California
Description
Resource Type
Electricity
Effective Date
1/1/1995
Rate Type
Time-of-Use
Billing Day
1
Service Charge
0
Demand Charge
0
Schedule
Created schedule
Edit
Demand Ratchet
Rate Limit
Maximum Rate
0.2
Escalation Rate
0
%
Cancel
OK
Utility Charges
Charge Periods
Summer on-peak
Summer mid-peak
Summer off-peak
Winter mid-peak
Winter off-peak
Name
Summer on-peak
Property
Value
Name
Summer on-peak
ID
10311
IDLib
0
Charge Type
Energy
Energy Charge Unit
$/kWh
Charge Item 1
ID
10312
Item Type
Energy
Number of Blocks
1
Block 1
Size 1
0 - ∞
Cost 1
0.055
Edit Charge Period


Graphs
Electric End Uses
190798
170316
5732
127644
kWh/y
591557
Lights
Equipment
Cool
Pumps
Fans
Copy Graph
Graphs
Hourly Data
Electricity End Uses
Fuel End Uses
All End Uses
Monthly Electricity
Monthly Electric Demand
Monthly Fuel
Design Alternatives
Base Case
Update Graph
Edit Graph
Exit



VisualDOE 3.1 - Systems Summary

Project Information

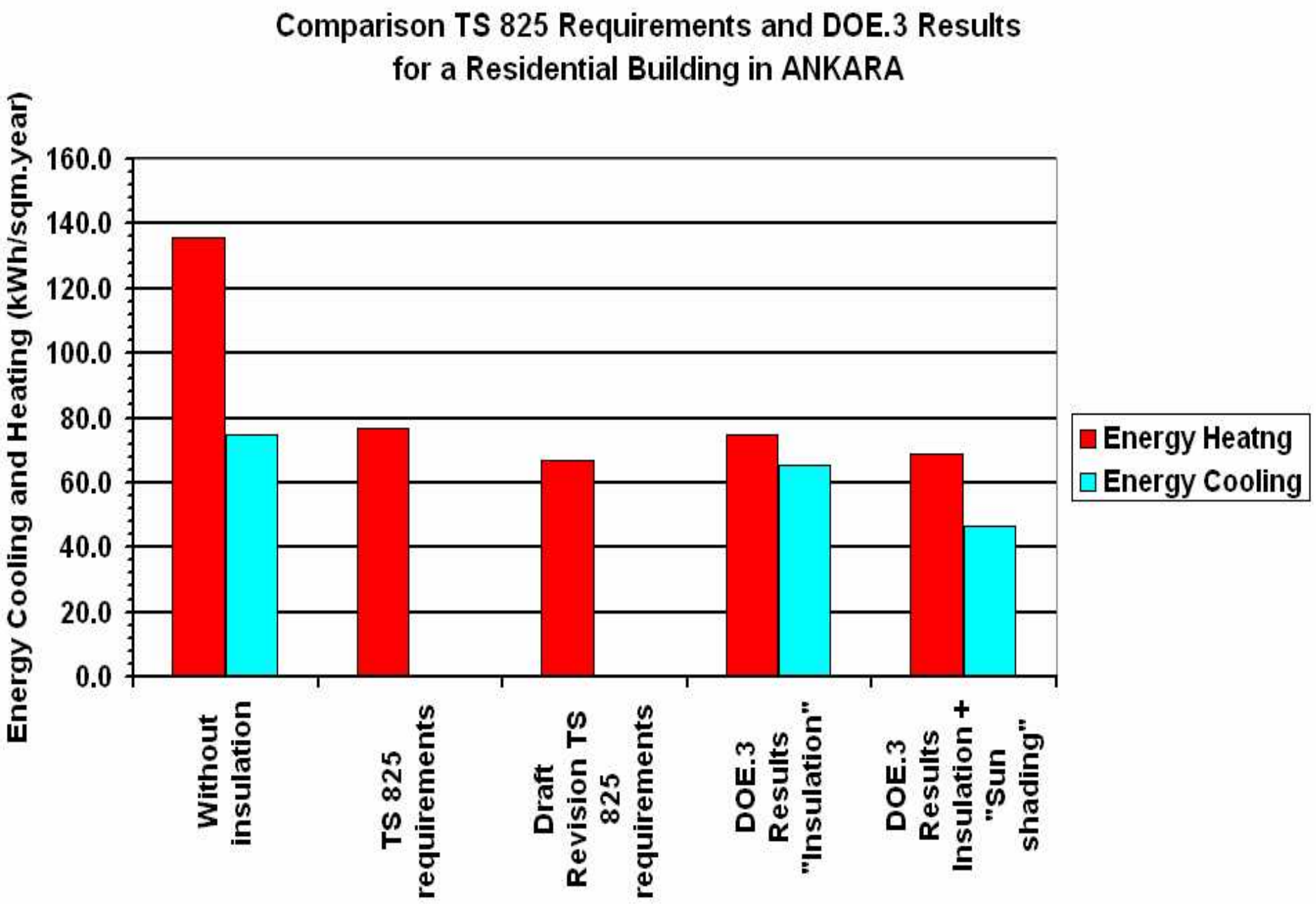
Name: NewA1-H
Address: Beirut
Description: High Rise Hotel
Analysis done by: Rana Rizk @ Universite Libanaise-Faculte de genie 3
Project File: c:\documents and settings\administrator\desktop\newa1-h.gph
Case Name: Base Case
Case Description: Base Case
Number of Systems: 1

Systems Summary

Name	Type	Cond. Area (ft²)	Supply (CFM)	Min. OA	Cooling Cap (kBtu/h)	Heating Cap (kBtu/h)	Cooling Peak (kBtu/h)	Heating Peak (kBtu/h)	Cooling Energy (MBtu)	Heating Energy (MBtu)
System_202	PSZ	125349	111630	0.202	4170.6	2416.8	4138.6	1863.6	5962	1079

Systems Summary per Conditioned Area

Name	Type	Cond. Area (ft²)	Supply (CFM/ft²)	Min. OA	Cooling Cap (Btu/h/ft²)	Heating Cap (Btu/h/ft²)	Cooling Peak (Btu/h/ft²)	Heating Peak (Btu/h/ft²)	Cooling Energy (kBtu/ft²)	Heating Energy (kBtu/ft²)
System_202	PSZ	125349	0.891	0.202	33	19	33	15	48	9


Comparison TS 825 Requirements and DOE.3 Results
for a Residential Building in ANKARA
Energy Cooling and Heating (kWh/sqm.year)
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
Without insulation
TS 825 requirements
Draft Revision TS 825 requirements
DOE.3 Results "Insulation"
DOE.3 Results Insulation + "Sun shading"
Energy Heatng
Energy Cooling

What's New in Version 3.1

- Easier simulation results diagnosis
- LEED style end -use report
- Life cycle cost analysis of design alternatives
- Revised all reports for SI units
- Modeling Tips to save your time and help diagnose simulation results
- Weather File Converter to pack and unpack DOE -2 weather files
- Create a big energy model with 1024 zones and 256 systems
- Shows building statistics while you build an energy model
- Improved custom block editor and DXF file import to create complicated building shapes
- New 3D view controls
- Enhanced VisualDOE Reports for more useful information of the building, zones and systems
- Share library file to make VisualDOE network compatible
- One-stop editor showing files of input, BDL, output, hourly reports, and weather statistics
- Flexible data input of room internal heat gains in either power density or total power use
- Flexible data input of zone air flow. Air flow autosized or manually sized
- Define source energy use and process loads of a room
- Adds escalation rate at the utility rate editor for life cycle cost calculation

Thank you

Questions ?