ENERGYPLUS™

Output Details and Examples

EnergyPlus Outputs (including error messages), Example Inputs and Data Set Files

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Introduction

This document is intended to give an in-depth look at the various output files produced by EnergyPlus. Some of these may be referenced in various other parts of the documentation but are presented here with more details.

The scripts that assist in running EnergyPlus will usually rename the standard names used in the program. The two scripts that are distributed with EnergyPlus are: **EPL-Run.bat** (which is used by the EP-Launch program) and **RunEPlus.bat** (which can be used from the command line). The RunEPlus batch file can also be used to string together several runs such as usually termed “batch processing”. In renaming the files created by the program or its post-processing program(s), usually the file extension will be retained. The following table will illustrate the native EnergyPlus file name, a description of its contents and the EP-Launch “version” of the file. In this table, <filename> refers to the source/original file name (without extension) selected. Files are presented in alphabetic order. For output purposes, the most important files to understand are the eplusout.eso, eplusout.mtr and eplusout.err files. The first two are manipulated with the ReadVarsESO post processing program. The latter will contain any critical errors that were encountered during the run.

Output File List

Table 1. EnergyPlus Basic Output Files

Output File Name	Description	EP-Launch File Name
eplusout.audit	Echo of input, includes both IDD echo and IDF echo – may have errors shown in context with IDD or IDF statements	<filename>.audit (without echoing IDD unless errors in IDD).
eplusout.bnd	This file contains details about the nodes and branches. Useful in determining if all your nodes are connected correctly. May be used to diagram the network/ nodes of the HVAC system.	<filename>.bnd
eplusout.dbg	From Debug Output object – may be useful to support to help track down problems	<filename>.dbg
eplusout.dxf	DXF (from Report,Surfaces,DXF;)	<filename>.dxf
eplusout.eio	Contains several standard and optional “report” elements. CSV format – may be read directly into spreadsheet program for better formatting.	<filename>.eio
eplusout.end	A one line summary of success or failure (useful for Interface programs)	Not saved in the standard EPL-Run script file.
eplusout.epmidf	Output from EPMacro program – contains the idf created from the input imf file	<filename>.epmidf
eplusout.epmdet	Output from EPMacro program – the audit/details of the EPMacro processing	<filename>.epmdet
eplusout.err	Error file – contains very important information from running the program.	<filename>.err
eplusout.eso	Standard Output File (contains results from both Output:Variable and Output:Meter objects).	<filename>.eso
eplusout.log	Log of items that appear in the command file output from the run.	<filename>.log

Output File Name	Description	EP-Launch File Name
eplusout.mtd	Meter details report – what variables are on what meters and vice versa.	<filename>.mtd
eplusout.mtr	Similar to .eso but only has Output:Meter outputs.	<filename>.mtr
eplusout.rdd	Variable names that are applicable for reporting in the current simulation.	<filename>.rdd
eplusout.mdd	Meter names that are applicable for reporting in the current simulation.	<filename>.mdd
eplusout.shd	Surface shadowing combinations report	<filename>.shd
eplusout.sln	Similar to DXF output but less structured. Results of Output:Reports,Surface, Lines object.	<filename>.sln
eplusout.sql	Mirrors the data in the .eso and .mtr files but is in SQLite format (for viewing with SQLite tools).	<filename>.sql
eplusssz.<ext>	Results from the Sizing:System object. This file is “spreadsheet” ready. Different extensions (csv, tab, and txt) denote different “separators” in the file.	<filename>Ssz.<ext>
epluszsz.<ext>	Results from the Sizing:Zone object. This file is “spreadsheet” ready. Different extensions (csv, tab, and txt) denote different “separators” in the file.	<filename>Zsz.<ext>
eplusmap.<ext>	Daylighting intensity “map” output. Different extensions (csv, tab, and txt) denote different “separators” in the file.	<filename>Map.<ext>
eplusscreen.csv	Window screen transmittance (direct and reflected) “map” output.	<filename>Screen.csv
eplustbl.<ext>	Results of tabular and economics requests. Different extensions (csv, tab, and txt) denote different “separators” in the file.	<filename>Table.<ext>
eplusout.svg	Results from the HVAC-Diagram application. SVG is a Scalable Vector Graphics file for which several viewers can be found.	<filename>.svg
eplusout.sci	File of cost information	<filename>.sci
eplusout.delightin	File produced during DElight simulations – descriptive of EnergyPlus inputs into DElight inputs.	<filename>delight.in
eplusout.delightout	File produced during DElight simulations – basic results from DElight simulation.	<filename>delight.out
Error! Reference source not found.	File produced during simulations of SPARK component models – includes statistics as well as any warning or error message from the SPARK link.	<filename>Spark.log
eplusout.wrl	VRML output from (Output:Reports, Surfaces, VRML)	<filename>.wrl

In addition to the basic output files from EnergyPlus there are three standard “hybrid” output files. These are called “hybrid” because they are a result of post-processing after EnergyPlus has completed. Note that if there is an error during processing, these will not normally be "complete".

Table 2. "Hybrid" EnergyPlus Output Files

Output File Name	Description	EP-Launch File Name
eplusout.<ext>	"spreadsheet" ready file that contains either all the report variables requested (default: up to limit of 255) from the input file or specific ones specified by the user. Different extensions (csv, tab, and txt denote different "separators" in the file.	<filename>.csv or <filename>.tab or <filename>.txt
eplusmtr.<ext>	"spreadsheet" ready file that contains either all the report meter requests (default: up to 255) from the input file or specific ones specified by the user. Different extensions (csv, tab, and txt denote different "separators" in the file.	<filename>Meter.csv or <filename>Meter.tab or <filename>Meter.txt
readvars.rvaudit	Results of any "ReadVarsESO" execution in the current batch run.	<filename>.rvaudit

Now, each file will be described in more detail with some examples of use.

eplusout.audit

This file is simply the echo of the inputs to the EnergyPlus program – the Energy+.idd (data dictionary) and in.idf (<filename>.idf – the input data file). Every attempt has been made to not require this file to be saved – errors are interpreted as much as possible and encapsulated onto the eplusout.err file. Any errors in the data dictionary processing should be accomplished during development – users should never see errors there. Thus, this file is not "saved" after processing by the standard script file. Occasionally, you may wish to view this file because of something obscure.

An excerpt of the file follows. Lines in green are notes produced from EnergyPlus (some of these are more useful to developers than users). Lines in red are lines with error messages shown to illustrate context. The other lines are echoes from inputs (with line numbers).

In all the examples, the actual version of the EnergyPlus exe would appear. In the examples these will be shown as: <version>.

```
  Processing Data Dictionary (Energy+.idd) File -- Start
     1 !IDD_Version <version>
     2 ! **************************************************************************
     3 !
<reduced for brevity>
 13000        \key DETAILS
 13001        \key Vertices
 13002        \key DetailsWithVertices
  Processing Data Dictionary (Energy+.idd) File -- Complete
  Maximum number of Alpha Args=        4500
  Maximum number of Numeric Args=        1800
  Number of Object Definitions=        473
  Number of Section Definitions=          2
  Processing Input Data File (in.idf) -- Start
     1 ! Basic file description: Basic illustration of using Purchased Air as a system
     2 ! Run:       2 design days.
     3 !            2 annual run periods, 2 summer days and 3 winter days.
<reduced for brevity>
    63      RunPeriod,          ! 3 day winter simulation
    64               1,                  1,    ! Start Month ,Day
    65               1,                  3;    ! End Month ,Day
   ** Warning ** Object=RUNPERIOD, entered with less than minimum number of fields.
   **   ~~~   ** Attempting fill to minimum.
    66  MATERIAL:Regular,A1 - 1 IN STUCCO,  !- Material Name
<reduced for brevity>
   784 End Simulation Data;
  Processing Input Data File (in.idf) -- Complete
  Number of IDF "Lines"=         359
  Maximum number of Alpha IDF Args=           29
  Maximum number of Numeric IDF Args=           20
 Getting object=VERSION
 Getting object=TIMESTEP
 Getting object=SIMULATIONCONTROL
 Getting object=SIZING:PARAMETERS
 Getting object=SIZING:ZONE
 Getting object=SIZING:SYSTEM
 Getting object=SIZING:PLANT
<etc>
MaxRVariable=        5000
MaxIVariable=         100
NumEnergyMeters=         108
NumVarMeterArrays=         106
```

eplusout.bnd

The “branch node details” (bnd) file is intended to give enough information that one could (with a chosen software) diagram the nodes and components of the HVAC system. It may or may not achieve that objective. Of more use may be its illustration of node connection/branch errors that aren’t detected by the software. This file has the details to support any “node connection” errors that will be noted in the eplusout.err file. Branch validation is shown in this file. Branches are checked to assure that each output node of the branch element is an input node to the next branch element. Cross-branch checking is not done directly within the program though the details will illustrate some problems of that nature.

Supply and Return Air Paths are also checked and feedback about each item are shown.

As is standard with many EnergyPlus output files, this file is CSV (comma-delimited) such that it can be read by spreadsheet programs for further manipulation by the user.

An example will illustrate. Notes about the reporting are highlighted in green.

```
Program Version,EnergyPlus, <version>
! This file shows details about the branches, nodes, and other
! elements of the flow connections.
! This file is intended for use in "debugging" potential problems
! that may also be detected by the program, but may be more easily
! identified by "eye".
! This file is also intended to support software which draws a
! schematic diagram of the HVAC system.
! ===============================================================
! #Nodes,<Number of Unique Nodes>
 #Nodes,44
List of all nodes follows.  # references may be an indication of faulty node spec (or not)
! <Node>,<NodeNumber>,<Node Name>,<Node Fluid Type>,<# Times Node Referenced After Definition>
 Node,1,HW SUPPLY OUTLET NODE,Water,6
 Node,2,ZONE1WINDACOAINNODE,Air,2
<reduced for brevity>
 Node,43,ZONE3WINDACDXOUTLETNODE,Air,1
 Node,44,ZONE1WINDACFANOUTLETNODE,Air,1
! ===============================================================
! Suspicious nodes have 0 references.  It is normal for some nodes, however.
! Listing nodes with 0 references (culled from previous list):
! <Suspicious Node>,<NodeNumber>,<Node Name>,<Node Fluid Type>,<# Times Node Referenced After Definition>
 Suspicious Node,30,ZONE 1 NODE,Air,0
 Suspicious Node,31,ZONE 1 OUTLET NODE,Air,0
 Suspicious Node,32,ZONE 2 NODE,Air,0
 Suspicious Node,33,ZONE 2 OUTLET NODE,Air,0
 Suspicious Node,34,ZONE 3 NODE,Air,0
 Suspicious Node,35,ZONE 3 OUTLET NODE,Air,0
List of branches follow.
! <#Branch Lists>,<Number of Branch Lists>
 #Branch Lists,2
! <Branch List>,<Branch List Count>,<Branch List Name>,<Loop Name>,<Loop Type>
! <#Branches on Branch List>,<Number of Branches>
! <Branch>,<Branch Count>,<Branch Name>,<Loop Name>
! <Branch Inlet/Outlet Nodes>,<Branch Inlet Node Name>,<Branch Outlet Node Name>
 Branch List,1,HEATING SUPPLY SIDE BRANCHES,HOT WATER LOOP,Plant Supply
 #Branches on Branch List,4
 ..Branch,1,HEATING SUPPLY INLET BRANCH,HOT WATER LOOP
 ....Branch Inlet/Outlet Nodes,HW SUPPLY INLET NODE,HW PUMP OUTLET NODE
 ..Branch,2,HEATING PURCHASED HOT WATER BRANCH,HOT WATER LOOP
 ....Branch Inlet/Outlet Nodes,PURCHASED HEAT INLET NODE,PURCHASED HEAT OUTLET NODE
 ..Branch,3,HEATING SUPPLY BYPASS BRANCH,HOT WATER LOOP
 ....Branch Inlet/Outlet Nodes,HEATING SUPPLY BYPASS INLET NODE,HEATING SUPPLY BYPASS OUTLET NODE
 ..Branch,4,HEATING SUPPLY OUTLET BRANCH,HOT WATER LOOP
 ....Branch Inlet/Outlet Nodes,HEATING SUPPLY EXIT PIPE INLET NODE,HW SUPPLY OUTLET NODE
 Branch List,2,HEATING DEMAND SIDE BRANCHES,HOT WATER LOOP,Plant Demand
 #Branches on Branch List,6
 ..Branch,1,ZONESHWINLETBRANCH,HOT WATER LOOP
 ....Branch Inlet/Outlet Nodes,HW DEMAND INLET NODE,HW DEMAND ENTRANCE PIPE OUTLET NODE
 ..Branch,2,ZONE1HWBRANCH,HOT WATER LOOP
 ....Branch Inlet/Outlet Nodes,ZONE1BBHWINLETNODE,ZONE1BBHWOUTLETNODE
 ..Branch,3,ZONE2HWBRANCH,HOT WATER LOOP
 ....Branch Inlet/Outlet Nodes,ZONE2BBHWINLETNODE,ZONE2BBHWOUTLETNODE
 ..Branch,4,ZONE3HWBRANCH,HOT WATER LOOP
 ....Branch Inlet/Outlet Nodes,ZONE3BBHWINLETNODE,ZONE3BBHWOUTLETNODE
 ..Branch,5,ZONESHWBYPASSBRANCH,HOT WATER LOOP
 ....Branch Inlet/Outlet Nodes,ZONESHWBYPASSINLETNODE,ZONESHWBYPASSOUTLETNODE
 ..Branch,6,ZONESHWOUTLETBRANCH,HOT WATER LOOP
 ....Branch Inlet/Outlet Nodes,HW DEMAND EXIT PIPE INLET NODE,HW DEMAND OUTLET NODE
! ===============================================================
! <#Supply Air Paths>,<Number of Supply Air Paths>
 #Supply Air Paths,0
! <Supply Air Path>,<Supply Air Path Count>,<Supply Air Path Name>,<Air Primary Loop Name>
! <#Components on Supply Air Path>,<Number of Components>
! <Supply Air Path Component>,<Component Count>,<Component Type>,<Component Name>,<Air Primary Loop Name>
! <#Outlet Nodes on Supply Air Path Component>,<Number of Nodes>
! <Supply Air Path Component Nodes>,<Node Count>,<Component Type>,<Component Name>,<Inlet Node
Name>,<Outlet Node Name>,<Air Primary Loop Name>
! ===============================================================
! <#Return Air Paths>,<Number of Return Air Paths>
 #Return Air Paths,0
```

```
! <Return Air Path>,<Return Air Path Count>,<Return Air Path Name>,<Air Primary Loop Name>
! <#Components on Return Air Path>,<Number of Components>
! <Return Air Path Component>,<Component Count>,<Component Type>,<Component Name>,<Air Primary Loop Name>
! <#Inlet Nodes on Return Air Path Component>,<Number of Nodes>
! <Return Air Path Component Nodes>,<Node Count>,<Component Type>,<Component Name>,<Inlet Node
Name>,<Outlet Node Name>,<Air Primary Loop Name>
! ===============================================================
! #Outside Air Nodes,<Number of Outside Air Nodes>
 #Outside Air Nodes,3
! <Outside Air Node>,<NodeNumber>,<Node Name>
 Outside Air Node,2,ZONE1WINDACOAINNODE
 Outside Air Node,3,ZONE2WINDACOAINNODE
 Outside Air Node,4,ZONE3WINDACOAINNODE
! ===============================================================
Component sets.  Very important for node connection error detection.
! <#Component Sets>,<Number of Component Sets>
 #Component Sets,16
! <Component Set>,<Component Set Count>,<Parent Object Type>,<Parent Object Name>,<Component
Type>,<Component Name>,<Inlet Node ID>,<Outlet Node ID>,<Description>
 Component Set,1,BRANCH,HEATING SUPPLY INLET BRANCH,PUMP:VARIABLE SPEED,HW CIRC PUMP,HW SUPPLY INLET
NODE,HW PUMP OUTLET NODE,Water Nodes
 Component Set,2,BRANCH,HEATING PURCHASED HOT WATER BRANCH,PURCHASED:HOT WATER,PURCHASED HEATING,PURCHASED
HEAT INLET NODE,PURCHASED HEAT OUTLET NODE,Hot Water Nodes
 Component Set,3,BRANCH,HEATING SUPPLY BYPASS BRANCH,PIPE,HEATING SUPPLY SIDE BYPASS,HEATING SUPPLY BYPASS
INLET NODE,HEATING SUPPLY BYPASS OUTLET NODE,Pipe Nodes
 Component Set,4,BRANCH,HEATING SUPPLY OUTLET BRANCH,PIPE,HEATING SUPPLY OUTLET,HEATING SUPPLY EXIT PIPE
INLET NODE,HW SUPPLY OUTLET NODE,Pipe Nodes
 Component Set,5,BRANCH,ZONESHWINLETBRANCH,PIPE,ZONESHWINLETPIPE,HW DEMAND INLET NODE,HW DEMAND ENTRANCE
PIPE OUTLET NODE,Pipe Nodes
 Component Set,6,BRANCH,ZONESHWOUTLETBRANCH,PIPE,ZONESHWOUTLETPIPE,HW DEMAND EXIT PIPE INLET NODE,HW
DEMAND OUTLET NODE,Pipe Nodes
 Component Set,7,BRANCH,ZONE1HWBRANCH,BASEBOARD
HEATER:WATER:CONVECTIVE,ZONE1BASEBOARD,ZONE1BBHWINLETNODE,ZONE1BBHWOUTLETNODE,Hot Water Nodes
 Component Set,8,BRANCH,ZONE2HWBRANCH,BASEBOARD
HEATER:WATER:CONVECTIVE,ZONE2BASEBOARD,ZONE2BBHWINLETNODE,ZONE2BBHWOUTLETNODE,Hot Water Nodes
 Component Set,9,BRANCH,ZONE3HWBRANCH,BASEBOARD
HEATER:WATER:CONVECTIVE,ZONE3BASEBOARD,ZONE3BBHWINLETNODE,ZONE3BBHWOUTLETNODE,Hot Water Nodes
 Component
Set,10,BRANCH,ZONESHWBYPASSBRANCH,PIPE,ZONESHWBYPASSPIPE,ZONESHWBYPASSINLETNODE,ZONESHWBYPASSOUTLETNODE,Pi
pe Nodes
 Component Set,11,AIR
CONDITIONER:WINDOW:CYCLING,ZONE1WINDAC,FAN:SIMPLE:CONSTVOLUME,ZONE1WINDACFAN,ZONE1WINDACOAMIXEROUTLETNODE,
ZONE1WINDACFANOUTLETNODE,Air Nodes
 Component Set,12,AIR
CONDITIONER:WINDOW:CYCLING,ZONE1WINDAC,COIL:DX:COOLINGBYPASSFACTOREMPIRICAL,ZONE1WINDACDXCOIL,ZONE1WINDACF
ANOUTLETNODE,ZONE1WINDACAIROUTLETNODE,Air Nodes
 Component Set,13,AIR
CONDITIONER:WINDOW:CYCLING,ZONE2WINDAC,FAN:SIMPLE:CONSTVOLUME,ZONE2WINDACFAN,ZONE2WINDACOAMIXEROUTLETNODE,
ZONE2WINDACFANOUTLETNODE,Air Nodes
 Component Set,14,AIR
CONDITIONER:WINDOW:CYCLING,ZONE2WINDAC,COIL:DX:COOLINGBYPASSFACTOREMPIRICAL,ZONE2WINDACDXCOIL,ZONE2WINDACF
ANOUTLETNODE,ZONE2WINDACAIROUTLETNODE,Air Nodes
 Component Set,15,AIR
CONDITIONER:WINDOW:CYCLING,ZONE3WINDAC,FAN:SIMPLE:CONSTVOLUME,ZONE3WINDACFAN,ZONE3WINDACDXOUTLETNODE,ZONE3
WINDACAIROUTLETNODE,Air Nodes
 Component Set,16,AIR
CONDITIONER:WINDOW:CYCLING,ZONE3WINDAC,COIL:DX:COOLINGBYPASSFACTOREMPIRICAL,ZONE3WINDACDXCOIL,ZONE3WINDACO
AMIXEROUTLETNODE,ZONE3WINDACDXOUTLETNODE,Air Nodes
Similar details for Plant Loops, Condenser Loops, Controlled Zones, etc.
```

eplusout.dbg

Developers use this file during debugging and can be “turned on” by the DEBUG OUTPUT object in the input file. The only reason a user might specify this flag would be to send a file to the support group.

```
Output:DebuggingData, 1, 0;     ! standard debug output, during simulation days
```

The standard debug output appears like this:

```
Day of Sim     Hour of Day    Time
          1            1   0.166666666666667
node #    Temp       MassMinAv  MassMaxAv TempSP    MassFlow   MassMin    MassMax    MassSP      Press        Enthal     HumRat    Fluid Type
   1     -12.500     0.000     0.000     0.000     0.0000     0.0000     0.0000     0.0000    100344.00      -9363.63    0.00129  Air
   2     -12.500     0.000     0.000     0.000     0.0000     0.0000     0.0000     0.0000    100344.00      -9363.63    0.00129  Air
   3     -12.500     0.000     0.000     0.000     0.0000     0.0000     0.0000     0.0000    100344.00      -9363.63    0.00129  Air
   4     -12.500     0.000     0.000     0.000     0.0000     0.0000     0.0000     0.0000    100344.00      -9363.63    0.00129  Air
   5      50.000     0.000     0.000     0.000     0.0320     0.0000     0.0000     0.0000    100344.00      60617.55    0.00400  Air
   6      50.000     0.000     0.000     0.000     0.0326     0.0000     0.0000     0.0000    100344.00      60617.55    0.00400  Air
   7      50.000     0.000     0.000     0.000     0.1636     0.0000     0.0000     0.0000    100344.00      60617.55    0.00400  Air
   8      50.000     0.000     0.000     0.000     0.1648     0.0000     0.0000     0.0000    100344.00      60617.55    0.00400  Air
   9       0.000     0.000     0.000     0.000     0.0000     0.0000     0.0000     0.0000         0.00          0.00    0.00000  blank
  10       0.000     0.000     0.000     0.000     0.0000     0.0000     0.0000     0.0000         0.00          0.00    0.00000  blank
  11       0.000     0.000     0.000     0.000     0.0000     0.0000     0.0000     0.0000         0.00          0.00    0.00000  blank
  12       0.000     0.000     0.000     0.000     0.0000     0.0000     0.0000     0.0000         0.00          0.00    0.00000  blank
```

eplusout.dxf

The DXF output report file is formatted according to the “Data Exchange Format” standard rules for representing CADD type coordinates. The file can be used in several inexpensive, shareware or freeware viewers. Quickview Plus ™ can display DXF files as shown in Figure 1 below. A free program originally from Autocad™, Voloview Express™, can display solid model rendering as shown in Figure 2. Other viewers are available from Microstation™, Visio™ and other shareware or freeware vendors.

This file is generated when the following line is included in the IDF.

```
Output:Reports, Surfaces, DXF;
```

You can ask it to triangulate surfaces with >4 sides:

```
Output:Reports, Surfaces, DXF, Triangulate3dface;
```

In addition to the building shape (including detached shading elements), the DXF view includes a “true north” arrow (at ground level) and the name from the BUILDING object.

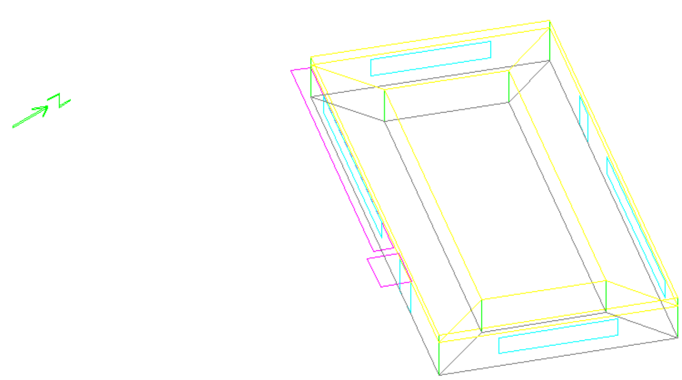


Figure 1. Quick View Plus version of DXF file

Even in the Quick View version, you can see that the different building elements have different colors. These are the “original” colors used in EnergyPlus. The current default color scheme is shown in the following figure of the solid model.

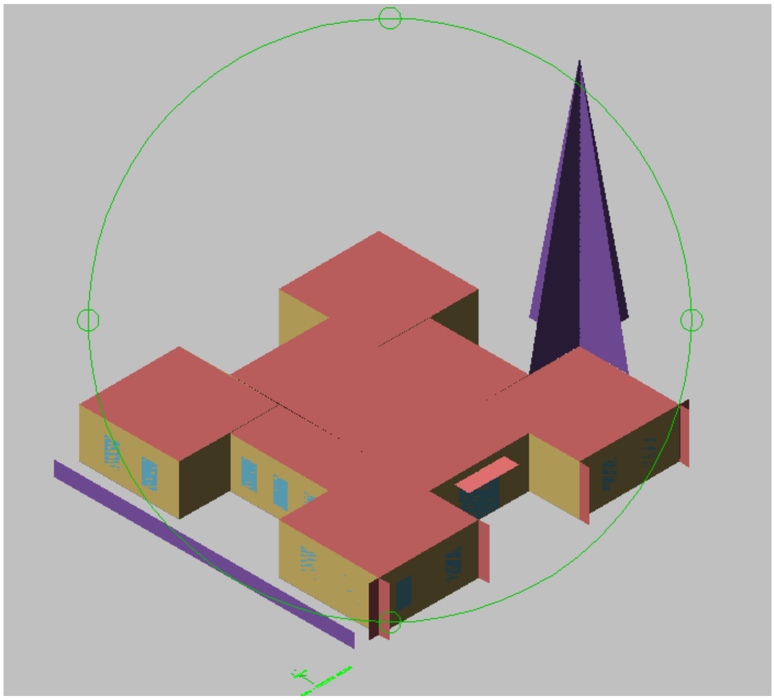


Figure 2. Voloview 3D Solid view

The DXF file of itself is an ASCII file, with a specific structure as specified in the standard. An excerpt of the file is shown below:

```
SECTION
  2
ENTITIES
  0
TEXT
  8
1
  6
CONTINUOUS
 62
  3
 10
      -11.00000
 20
        3.00000
 30
        0.10000
 40
 .25
  1
True North
 41
 0.0
  7
MONOTXT
210
0.0
220
0.0
230
1.0
  0
<reduced for brevity>
```

```
3DFACE
  8
1
 62
  3
 10
      -10.00000
 20
        3.00000
 30
        0.10000
 11
      -10.00000
 21
        3.00000
 31
        0.00000
 12
      -10.00000
 22
        0.00000
 32
        0.00000
 13
      -10.00000
 23
        0.00000
 33
        0.10000
  0
ENDSEC
  0
EOF
999
DXF created from EnergyPlus
999
Program Version,EnergyPlus, <version>
```

eplusout.eio

This file contains some standard and some optional “reports”. It is intended to be a somewhat intelligent report of input conditions when they don’t fit well in other places or when they aren’t substantial enough for their own “file”. (e.g. **eplusout.bnd**) Contents of the file are somewhat documented in various places in the Input Output Reference document – as results of objects. This file or portions of it can be easily imported into spreadsheet programs and more analysis done there. Contents of this file include construction details, location information, “environment” information, number of “warmup” days required in each environment.

The form of the file is a data dictionary followed by the data. In this case, the data dictionary line precedes the first “data” line though there may be several defining “dictionary lines”. Each dictionary line will show the field as <field name> followed by other fields that will be in the data lines. Data will be displayed similarly. Each field of dictionary or data will be separated from the next by a comma “,” – and produce a comma delimited file.

> Note that the lines in the eplusout.eio file can be extremely long (current limit is 500 characters).

Simulation Parameters

```
! <Version>, Version ID
 Version, <version>
! <Timesteps per Hour>, #TimeSteps, Minutes per TimeStep
 Timesteps Per Hour,  4, 15
! <Run Control>, Do Zone Sizing, Do System Sizing, Do Plant Sizing, Do Design Days, Do Weather Simulation
 Run Control, Yes, Yes, No, No, Yes
! <GroundTemperatures>, Months From Jan to Dec {Deg C}
 GroundTemperatures,  20.03,  20.03,  20.13,  20.30,  20.43,  20.52,  20.62,  20.77,  20.78,  20.55,
20.44,  20.20
! <GroundTemperatures:Surface>, Months From Jan to Dec {Deg C}
 GroundTemperatures:Surface,  18.00,  18.00,  18.00,  18.00,  18.00,  18.00,  18.00,  18.00,  18.00,
18.00,  18.00,  18.00
! <GroundTemperatures:Deep>, Months From Jan to Dec {Deg C}
 GroundTemperatures:Deep,  16.00,  16.00,  16.00,  16.00,  16.00,  16.00,  16.00,  16.00,  16.00,  16.00,
16.00,  16.00
! <GroundReflectances>, Months From Jan to Dec {dimensionless}
 GroundReflectances,  0.20,  0.20,  0.20,  0.20,  0.20,  0.20,  0.20,  0.20,  0.20,  0.20,  0.20,  0.20
! <Snow Ground Reflectance Modifiers>, Normal, Daylighting {dimensionless}
 Snow Ground Reflectance Modifiers,   1.000,   1.000
! <Snow GroundReflectances>, Months From Jan to Dec {dimensionless}
 Snow GroundReflectances,  0.20,  0.20,  0.20,  0.20,  0.20,  0.20,  0.20,  0.20,  0.20,  0.20,  0.20,
0.20
! <Snow GroundReflectances For Daylighting>, Months From Jan to Dec {dimensionless}
 Snow GroundReflectances For Daylighting,  0.20,  0.20,  0.20,  0.20,  0.20,  0.20,  0.20,  0.20,  0.20,
0.20,  0.20,  0.20
! <Location>, Location Name, Latitude {N+/S- Deg}, Longitude {E+/W- Deg},  Time Zone Number {GMT+/-},
Elevation {m},  Standard Pressure at Elevation {Pa}
Location,CHICAGO IL USA TMY2-94846 WMO#=725300,41.78,-87.75,-6.00,190.00,99063.
! <Building Information>, Building Name,North Axis {deg},Terrain,  Loads Convergence Tolerance
Value,Temperature Convergence Tolerance Value,  Solar Distribution,Maximum Number of Warmup Days,
Calculate Solar Reflection From Exterior Surfaces
 Building, BUILDING,  30.000,City,   0.04000,   0.40000,FullExterior,25,NO
```

```
! Inside Convection Algorithm, Value {Simple | Detailed | CeilingDiffuser}
Inside Convection Algorithm,Simple
! Outside Convection Algorithm, Value {Simple | Detailed}
Outside Convection Algorithm,Simple
! Solution Algorithm, Value {CTF | EMPD | CONDFD | HAMT}
Solution Algorithm, CTF
! Sky Radiance Distribution, Value {Anisotropic}
Sky Radiance Distribution,Anisotropic
! <Environment:Site Atmospheric Variation>,Wind Speed Profile Exponent {},Wind Speed Profile Boundary
Layer Thickness {m},Air Temperature Gradient Coefficient {K/m}
Environment:Site Atmospheric Variation,0.330,460.000,6.500000E-003
! < Input Surface Geometry Information>,Starting Corner,Vertex Input Direction,Coordinate System
 SurfaceGeometry,UpperLeftCorner,CounterClockwise,RelativeCoordinateSystem
```

The simulation parameters output is the simplest form of reporting in the **eplusout.eio** file. Each of the "header" records (lines starting with an "!") are followed immediately by the one and only data line. By and large, these data lines are all merely echoes of the entries in the IDF (or defaulted for blank fields). For most of these descriptions, you can look at the object fields (of same name) in the Input Output Reference document.

Version

```
! <Version>, Version ID
 Version, <version>
```

This is the version of the IDF as entered in the IDF file. If it does not match the current EnergyPlus Version, a warning will be issued and show in the **eplusout.err** file.

Timestep

```
! <Timesteps per Hour>, #TimeSteps, Minutes per TimeStep
 Timesteps Per Hour,  4, 15
```

This is the number of timesteps in hour as entered in the IDF file as well as showing how many minutes will encompass each timestep (i.e. 4 timesteps in hour = 15 minutes per timestep).

SimulationControl

```
! <Run Control>, Do Zone Sizing, Do System Sizing, Do Plant Sizing, Do Design Days, Do Weather Simulation
 Run Control, Yes, Yes, Yes, No, Yes
```

This shows how the sizing and running (design days vs. weather file) will be accomplished. Design days are required for sizing but do not necessarily need to be "run" after sizing has completed. Thus, the user can choose to do sizing, not do a "normal" calculation with the design day definitions but then go ahead and run the full simulation year.

Building

```
! <Building Information>, Building Name,North Axis {deg},Terrain,  Loads Convergence Tolerance
Value,Temperature Convergence Tolerance Value,  Solar Distribution,Maximum Number of Warmup Days
 Building Information, BUILDING,  30.000,City,   0.04000,   0.40000,FullExterior,25
```

This shows the values put in for the Building Object in the IDF.

Inside Convection Algorithm

```
! <Inside Convection Algorithm>, Value {Simple | Detailed | CeilingDiffuser}
Inside Convection Algorithm,Simple
```

This shows the global inside (interior) convection algorithm selected by the IDF value. This may be overridden by zone entries or even surface entries.

Outside Convection Algorithm

```
! <Outside Convection Algorithm>, Value {Simple | Detailed ! TARP ! MoWitt ! DOE-2 ! BLAST}
Outside Convection Algorithm,Simple
```

This shows the global outside (exterior) convection algorithm selected by the IDF value. This may be overridden by zone entries or even surface entries.

Solution Algorithm

```
! <Solution Algorithm>, Value {CTF | EMPD | CONDFD | HAMT},Inside Surface Max Temperature Limit{C}
Solution Algorithm, CTF,200
```

This shows the solution algorithm approach selected by the IDF value and Inside Surface Max Temperature override or default value.

Sky Radiance Distribution

```
! <Sky Radiance Distribution>, Value {Anisotropic}
Sky Radiance Distribution,Anisotropic
```

This shows the solution algorithm approach used in the simulation. As this value cannot be changed by the user, it is shown for information only.

Site Atmospheric Variation

```
! <Environment:Site Atmospheric Variation>,Wind Speed Profile Exponent {},Wind Speed Profile Boundary
Layer Thickness {m},Air Temperature Gradient Coefficient {K/m}
Environment:Site Atmospheric Variation,0.330,460.000,6.500000E-003
```

This shows actual values used for Site Atmospheric Variations.

Shadowing/Sun Position Calculations

```
! <Shadowing/Sun Position Calculations> [Annual Simulations], Value {days}, Allowable Number Figures in
Shadow Overlap {}
Shadowing/Sun Position Calculations, 20, 15000
```

This shows how many days between the re-calculation of solar position during a weather file simulation. While a smaller number of days will lead to a more accurate solar position estimation (solar position is important in shadowing as well as determining how much solar enters the space), it also increases the calculation time necessarily to complete the simulation. The default, re-calculating every 20 days, gives a good compromise. The allowable number of figures in a shadow overlap can be increased if necessary for the model.

Zone Volume Capacitance Multiplier

```
! <Zone Volume Capacitance Multiplier>, Value
Zone Volume Capacitance Multiplier,   1.000
```

This shows the zone volume capacitance multiplier selected by the IDF value or defaulted.

Surface Geometry

```
! < Input Surface Geometry Information>,Starting Corner,Vertex Input Direction,Coordinate System
 SurfaceGeometry,UpperLeftCorner,CounterClockwise,RelativeCoordinateSystem
```

This shows the expected order of the vertices for each surface.

Climate Group Outputs

Climate related variables appear in two places for EnergyPlus outputs. Certain objects that are invariant throughout a simulation period have lines appear in the eplusout.eio file:

```
! <GroundTemperatures>, Months From Jan to Dec {Deg C}
 GroundTemperatures,  12.22,  12.78,  14.44,  16.67,  19.44,  23.33,  22.22,  20.00,  17.78,  16.67,
14.44,  12.78
! <Environment:Weather Station>,Wind Sensor Height Above Ground {m},Wind Speed Profile Exponent {},Wind
Speed Profile Boundary Layer Thickness {m},Air Temperature Sensor Height Above Ground {m},Wind Speed
Modifier Coefficient [Internal],Temperature Modifier Coefficient [Internal]
Environment:Weather Station,10.000,0.140,270.000,1.500,1.586,9.750E-003
! <Environment:Site Atmospheric Variation>,Wind Speed Profile Exponent {},Wind Speed Profile Boundary
Layer Thickness {m},Air Temperature Gradient Coefficient {K/m}
Environment:Site Atmospheric Variation,   0.220, 370.000, 0.006500
! <Location>, Location Name, Latitude, Longitude, Time Zone Number, Elevation {m}
 Location, DENVER COLORADO,   39.75, -104.87,    -7.00,      1610.26
! <GroundReflectances>, Months From Jan to Dec {dimensionless}
 GroundReflectances,  0.60,  0.60,  0.40,  0.30,  0.20,  0.20,  0.20,  0.20,  0.20,  0.20,  0.20,  0.40
! <Snow Ground Reflectance Modifiers>, Normal, Daylighting {dimensionless}
 Snow Ground Reflectance Modifiers,   1.000,   1.000
! <Snow GroundReflectances>, Months From Jan to Dec {dimensionless}
 Snow GroundReflectances,  0.60,  0.60,  0.40,  0.30,  0.20,  0.20,  0.20,  0.20,  0.20,  0.20,  0.20,
0.40
! <Snow GroundReflectances For Daylighting>, Months From Jan to Dec {dimensionless}
 Snow GroundReflectances For Daylighting,  0.60,  0.60,  0.40,  0.30,  0.20,  0.20,  0.20,  0.20,  0.20,
0.20,  0.20,  0.40
```

In addition for each “environment” simulated, information about the environment is shown:

```
! <Environment>,Environment Name,Environment Type, Start Date, End Date, Start DayOfWeek, Duration
{#days}, Source:Start DayOfWeek,  Use Daylight Savings, Use Holidays, Apply Weekend Holiday Rule
! <Environment:Special Days>, Special Day Name, Special Day Type, Source, Start Date, Duration {#days}
! <Environment:Daylight Saving>, Daylight Saving Indicator, Source, Start Date, End Date
! <Environment:Design_Day_Misc>,DayOfYear,ASHRAE A Coeff,ASHRAE B Coeff,ASHRAE C Coeff,Solar Constant-
Annual Variation,Eq of Time {minutes}, Solar Declination Angle {deg}, Solar Model
! <Environment:WarmupDays>, NumberofWarmupDays
```

For example, a DesignDay:

```
Environment,PHOENIX ARIZONA WINTER,DesignDay, 1/21, 1/21,MONDAY,  1,N/A,N/A,N/A,N/A
Environment:Daylight Saving,No,DesignDay
Environment:Design_Day_Misc, 21,1228.9,0.1414,5.7310E-002,1.0,-11.14,-20.0
```

A Design RunPeriod:

```
Environment,EXTREME SUMMER WEATHER PERIOD FOR DESIGN,User Selected WeatherFile Typical/Extreme Period
(Design)=Summer Extreme,07/13,07/19,SummerDesignDay,  7,Use RunPeriod Specified Day,No ,No ,No ,No ,No
Environment:Daylight Saving,No,RunPeriod Object
Environment:WarmupDays,  3
```

Or a RunPeriod:

```
Environment,CHICAGO IL TMY2-94846 WMO#=725300,WeatherRunPeriod, 1/
1,12/31,SUNDAY,365,UseWeatherFile,Yes,Yes,No
Environment:Daylight Saving,No,
Environment:Special Days,NEW YEARS DAY,Holiday,WeatherFile, 1/ 1,  1
Environment:Special Days,MEMORIAL DAY,Holiday,WeatherFile, 5/31,  1
Environment:Special Days,INDEPENDENCE DAY,Holiday,WeatherFile, 7/ 5,  1
Environment:Special Days,LABOR DAY,Holiday,WeatherFile, 9/ 6,  1
Environment:Special Days,THANKSGIVING,Holiday,WeatherFile,11/25,  1
Environment:Special Days,CHRISTMAS,Holiday,WeatherFile,12/25,  1
Environment:WarmupDays,  4
```

Note that in this display, using "weekend rule" and specific date holidays, the actual observed dates are shown in the output display – in the example above, Independence Day (July 4) is actually observed on July 5.

Climate Group – Simple Outputs

Some of the climate outputs are a "simple" group. The "header" line is followed immediately by the data line.

Location

This output represents the location data used for the simulation. Note that if a runperiod is used, the IDF "Location" is ignored and the location from the weather file is used instead.

Field: <Location>

This data field will contain the constant "Location".

Field: Location Name

This is the name given to the location whether from the IDF or the weather file.

Field: Latitude

This is the latitude of the site, expressed decimally. Convention uses positive (+) values for North of the Equator and negative (-) values for South of the Equator. For example, S 30° 15' is expressed as –30.25.

Field: Longitude

This is the longitude of the site, expressed decimally. Convention uses positive (+) values for East of the Greenwich meridian and negative (-) values for West of the Greenwich meridian. For example, E 130° 45' is expressed as +130.75.

Field: Time Zone Number

This is the time zone of the site, expressed decimally. Convention uses positive (+) values for GMT+ (Longitude East of the Greenwich meridian) and negative (-) values for GMT- (Longitude West of the Greenwich meridian). For example, the time zone for Central US time is –6. The time zone for parts of Newfoundland is –3.5 (-3 hours, 30 minutes from GMT).

Field: Elevation {m}

This is the elevation of the site. Units are m.

Weather Station

Field: Wind Sensor Height Above Ground {m}

This is the wind sensor height above ground for weather data measurements.

Field: Wind Speed Profile Exponent {}

The wind speed profile exponent for the terrain surrounding the weather station.

Field: Wind Speed Profile Boundary Layer Thickness {m}

The wind speed profile boundary layer thickness [m] for the terrain surrounding the weather station.

Field: Air Temperature Sensor Height Above Ground {m}

The height [m] above ground for the air temperature sensor.

Field: Wind Speed Modifier Coefficient [Internal]

This field is intended to provide a slight help for the user to determine the calculations that will be used to calculate the Wind Speed at a specific height at the site.

The full calculation for Local Wind Speed is:

$$Local\ Wind\ Speed = Windspeed_{met}\left(\frac{Wind\ Boundary\ Layer\ Thickness_{met}}{Air\ Sensor\ Height_{met}}\right)^{Wind\ Exponent_{met}} * \left(\frac{Height\ above\ ground_{site/component}}{Wind\ Boundary\ Layer\ Thickness_{site}}\right)^{site\ wind\ exponent}$$

The Wind Speed Modifier Coefficient [Internal] simplifies the equation to:

$$Local\ Wind\ Speed = Windspeed_{met} * Wind\ Speed\ Modifier * \left(\frac{Height\ above\ ground_{site/component}}{Wind\ Boundary\ Layer\ Thickness_{site}}\right)^{site\ wind\ exponent}$$

Where the Wind Speed Modifier encapsulates:

$$\left(\frac{Wind\ Boundary\ Layer\ Thickness_{met}}{Air\ Sensor\ Height_{met}}\right)^{Wind\ Exponent_{met}}$$

Where

met = meteorological station

site = location of the building

Field:Temperature Modifier Coefficient [Internal]

This field is intended to provide a slight help for the user to determine the calculations that will be used to calculate the air (dry-bulb) or wet-bulb temperature at a specific height at the site.

The site temperature modifier coefficient (TMC) is defined as:

$$TMC = \left(\frac{Atmospheric\ Temperature\ Gradient * EarthRadius * Temperature\ Sensor\ Height_{met}}{EarthRadius + Temperature\ Sensor\ Height_{met}}\right)$$

Then, the temperature at a height above ground is calculated as:

$$Actual\ Temperature = Temperature_{met} + TMC - \left(\frac{Temperature\ Gradient_{site} * EarthRadius * Height_{site/component}}{EarthRadius + Height_{site/component}}\right)$$

Where

met = meteorological station

site = location of the building

Site Atmospheric Variation

Field: Wind Speed Profile Exponent {}

The wind speed profile exponent for the terrain surrounding the site.

Field: Wind Speed Profile Boundary Layer Thickness {m}

The wind speed profile boundary layer thickness [m] for the terrain surrounding the site.

Field: Air Temperature Gradient Coefficient {K/m}

The air temperature gradient coefficient [K/m] is a research option that allows the user to control the variation in outdoor air temperature as a function of height above ground. The real physical value is 0.0065 K/m.

Ground Temperatures and Ground Temperatures:Deep and Ground Temperatures: Surface

Field: <GroundTemperatures>

This data field will contain the constant “GroundTemperatures”.

Field Set (1-12) – Monthly Ground Temperatures

There will be a set of 12 numbers – the ground temperatures by month: January, February, March, April, May, June, July, August, September, October, November, December. Units are C.

Ground Reflectance

Field: <GroundReflectances>

This data field will contain the constant “GroundReflectances”.

Field Set (1-12) – Monthly Ground Reflectances

There will be a set of 12 numbers – the ground reflectances by month: January, February, March, April, May, June, July, August, September, October, November, December.

Snow Ground Reflectance Modifiers

It is generally accepted that snow resident on the ground increases the basic ground reflectance. EnergyPlus allows the user control over the snow ground reflectance for both “normal ground reflected solar” calculations (see above) and snow ground reflected solar modified for daylighting. This is the display of the user entered or defaulted values.

Field: <Snow Ground Reflectance Modifiers>

This data field will contain the constant “Snow Ground Reflectance Modifiers”.

Field: Normal

This field is the value between 0.0 and 1.0 which is used to modified the basic monthly ground reflectance when snow is on the ground (from design day input or weather data values).

$$\text{GroundReflectance}_{\text{used}} = \text{GroundReflectance} \bullet Modifier_{Snow}$$

Field: Daylighting

This field is the value between 0.0 and 1.0 which is used to modified the basic monthly ground reflectance when snow is on the ground (from design day input or weather data values).

$$\text{DaylightingGroundReflectance}_{\text{used}} = \text{GroundReflectance} \bullet Modifier_{Snow}$$

Snow Ground Reflectance

This data is the result of using the Snow Ground Reflectance modifier and the basic Ground Reflectance value.

Field: <GroundReflectances>

This data field will contain the constant “Snow GroundReflectances”.

Field Set (1-12) – Monthly Snow Ground Reflectances

There will be a set of 12 numbers – the snow ground reflectances by month: January, February, March, April, May, June, July, August, September, October, November, December.

Snow Ground Reflectance for Daylighting

This data is the result of using the Snow Ground Reflectance for Daylighting modifier and the basic Ground Reflectance value.

Field: < Snow GroundReflectances For Daylighting>

This data field will contain the constant “Snow GroundReflectances For Daylighting”.

Field Set (1-12) – Monthly Snow Ground Reflectances for Daylighting

There will be a set of 12 numbers – the ground reflectances by month: January, February, March, April, May, June, July, August, September, October, November, December.

Climate Group – Not so Simple Outputs

For each “environment” simulated, a set of outputs is produced. The header group is only produced once. (The Design Day Misc header is produced only when there is a design day.)

```
! <Environment>,Environment Name,Environment Type, Start Date, End Date, Start DayOfWeek, Duration
{#days}, Source:Start DayOfWeek,  Use Daylight Saving, Use Holidays, Apply Weekend Holiday Rule
! <Environment:Special Days>, Special Day Name, Special Day Type, Source, Start Date, Duration {#days}
! <Environment:Daylight Saving>, Daylight Saving Indicator, Source, Start Date, End Date
! <Environment:Design_Day_Misc>,DayOfYear,ASHRAE A Coeff,ASHRAE B Coeff,ASHRAE C Coeff,Solar Constant-
Annual Variation,Eq of Time {minutes}, Solar Declination Angle {deg}
! <Environment:WarmupDays>, NumberofWarmupDays
```

Environment Line

Each “environment” (i.e. each design day, each run period) will have this line shown.

Field: <Environment>

This field will have the constant “Environment” in each data line.

Field:Environment Name

This field will have the “name” of the environment. For example, the design day name (“DENVER COLORADO SUMMER”) or the weather file location name (“BOULDER CO TMY2-94018 WMO#=724699”).

Field:Environment Type

This will be “DesignDay” for design day simulations and “WeatherRunPeriod” for weather file run periods.

Field: Start Date

This will have the month/day that is the starting date for the simulation period. (7/21, for example).

Field: End Date

This will have the month/day that is the ending date for the simulation period. Note that Design Days are only one day and the end date will be the same as the start date.

Field: Start DayOfWeek

For weather periods, this will be the designated starting day of week. For design days, it will be the day type listed for the design day object (e.g. SummerDesignDay or Monday).

Field: Duration {#days}

Number of days in the simulation period will be displayed in this field. Design days are only 1 day.

Field: Source:Start DayOfWeek

This field will list the "source" of the Start Day of Week listed earlier. This could be the RunPeriod command from the input file or the Weather File if the UseWeatherFile option was chosen in the RunPeriod command. For design days, this will be "N/A".

Field: Use Daylight Saving

This field reflects the value of the Use Daylight Saving field of the RunPeriod object. For design days, this will be "N/A".

Field: Use Holidays

This field reflects the value of the Use Holidays field of the RunPeriod object. For design days, this will be "N/A".

Field: Apply Weekend Holiday Rule

For design days, this will show "N/A". For weather periods, this will show "Yes" if the Apply Weekend Holiday Rule is in effect or "No" if it isn't.

Design Day Misc Line

This line is shown for each design day simulated. It is not shown for sizing runs that do not subsequently use the design day as a simulation period.

Field: <Design Day Misc>

This is a constant that will display "Environment:Design_Day_Misc".

Field:DayOfYear

This is the Julian day of year for the design day (i.e. Jan 1 is 1, Jan 31 is 31).

Field:ASHRAE A Coeff

Reference ASHRAE HOF 30 – this is the A Coefficient in Wh/m^2 calculated from EnergyPlus.

Field:ASHRAE B Coeff

Likewise, this is the ASHRAE B Coefficient (dimensionless).

Field:ASHRAE C Coeff

This is the ASHRAE C Coefficient (dimensionless).

Field:Solar Constant-Annual Variation

This is the calculated solar constant using the given location and day of year.

Field:Eq of Time {minutes}

This is the calculated equation of time (minutes) using the given location and day of year.

Field: Solar Declination Angle {deg}

This is the solar declination angle for the day of year, degrees.

Special Day Line

Field: <Environment:Special Days>

This is a constant that will display “Environment:SpecialDays”.

Field: Special Day Name

This is the user designated name for the special day.

Field: Special Day Type

This shows the type for the special day (e.g. Holiday).

Field: Source

This will display “InputFile” if it was specified in the IDF or “WeatherFile” if it came from the weather file designation.

Field: Start Date

This shows the starting date as month/day (e.g. 7/4).

Field: Duration {#days}

This shows how many days the special day period continues. Usually, holidays are only 1 day duration.

Daylight Saving Line

Field: <Environment:Daylight Saving>

This is a constant that will display “Environment:DaylightSaving”.

Field: Daylight Saving Indicator

This will be Yes if daylight saving is to be observed for this simulation period and No if it is not observed.

Field: Source

This will show the source of this invocation (or non-invocation). Inputfile if DaylightSavingPeriod was entered (weather files only), WeatherFile if used in the Weather file and selected in the Run Period object and designday if that was the source.

Field: Start Date

If the indicator field is Yes, then this field will be displayed and the month/day (e.g. 4/1) that starts the daylight saving period observance will be shown.

Field: End Date

If the indicator field is Yes, then this field will be displayed and the month/day (e.g. 10/29) that ends the daylight saving period observance will be shown.

Warmup Days Line

As described elsewhere, EnergyPlus simulates the first day of each simulation period until it reaches “convergence”. This data line will show how many warm up days were required to reach that state.

Field: <Environment:WarmupDays>

This is a constant that will display “Environment:WarmupDays”.

Field: NumberofWarmupDays

This field will show the number of days required to reach the convergence state for the simulation.

Zone Outputs

Each zone is summarized in a simple set of statements as shown below:

```
! <Zone Information>,Zone Name,North Axis {deg},Origin X-Coordinate {m},Origin Y-Coordinate {m},Origin Z-Coordinate {m},Centroid X-Coordinate {m},Centroid Y-Coordinate {m},Centroid Z-Coordinate {m},Type,Zone Multiplier,Zone List Multiplier,Minimum X {m},Maximum X {m},Minimum Y {m},Maximum Y {m},Minimum Z {m},Maximum Z {m},Ceiling Height {m},Volume {m3},Zone Inside Convection Algorithm {Simple-Detailed-CeilingDiffuser-TrombeWall},Zone Outside Convection Algorithm {Simple-Detailed-Tarp-MoWitt-DOE-2-BLAST},Floor Area {m2},Exterior Gross Wall Area {m2},Exterior Net Wall Area {m2},Exterior Window Area {m2}, Number of Surfaces, Number of SubSurfaces, Number of Shading SubSurfaces,  Part of Total Building Area
 Zone Information, PSI FOYER,0.0,0.00,0.00,0.00,8.56,-1.80,2.27,1,1,1,0.00,16.34,-9.51,4.88,0.00,6.10,3.81,368.12,Detailed,DOE-2,96.62,70.61,70.61,106.84,6,1,0,Yes
 Zone Information, DORM ROOMS AND COMMON AREAS,0.0,0.00,6.10,0.00,18.35,11.26,3.05,1,1,1,3.57,31.70,-4.75,25.36,0.00,6.10,6.10,2723.33,Detailed,DOE-2,445.93,312.15,267.56,52.59,10,22,0,Yes
 Zone Information, LEFT FORK,-36.9,0.00,31.70,0.00,22.07,31.46,3.05,1,1,1,19.02,25.12,25.36,37.55,0.00,6.10,6.10,453.07,Detailed,DOE-2,74.32,185.81,135.64,50.17,6,10,0,Yes
 Zone Information, MIDDLE FORK,0.0,4.88,35.36,0.00,31.21,28.41,3.05,1,1,1,25.12,37.31,21.70,35.11,0.00,6.10,6.10,453.07,Detailed,DOE-2,74.32,185.81,155.71,30.10,6,1,0,Yes
 Zone Information, RIGHT FORK,36.9,10.97,35.36,0.00,36.70,20.48,3.05,1,1,1,29.99,43.40,15.85,25.12,0.00,6.10,6.10,453.07,Detailed,DOE-2,74.32,185.81,135.64,50.17,6,10,0,Yes
```

Field: <Zone Information>

This field contains the constant “Zone” for each line.

Field: Zone Name

This is the Zone Name entered from the IDF.

Field: North Axis {deg}

This is the North Axis entered from the IDF. Note that this is used primarily in the positioning of the building when “relative” coordinates are used – however, the Daylighting:Detailed object also uses this. Units are degrees, clockwise from North.

Fields: X Origin {m}, Y Origin {m}, Z Origin {m}

This is the origin vertex {X,Y,Z} entered from the IDF. Note that this is used primarily in the positioning of the building when “relative” coordinates are used – however, the Daylighting:Detailed object also uses this. Units are m.

Field: TypeField: Multiplier

This is the multiplier (must be integral) entered from the IDF.

Field: Ceiling Height {m}

This is the ceiling height entered, if any, in the IDF. Ceiling height is also heuristically calculated from the surfaces in the zone – however, not all surfaces need to be entered and sometimes the user would rather enter the ceiling height for the zone. If no ceiling height was entered (i.e. the default of 0), this field will be the calculated value. A minor warning message will be issued if the calculated value is significantly different than the entered value. Units are m.

Field: Volume {m3}

Like the ceiling height, this user can also enter this value in the IDF. Volume is also heuristically calculated using the ceiling height (entered or calculated) as well as the calculated floor area (see later field). If entered here, this value will be used rather than the calculated value. A minor warning message will be issued if the calculated value is significantly different than the entered value. Units are m^3.

Field: Zone Inside Convection Algorithm {Simple-Detailed-CeilingDiffuser-TrombeWall}

The interior convection algorithm shown earlier (entire building) can be overridden for each zone by an entry in the individual Zone object. This field will show which method is operational for the zone.

Field: Floor Area {m2}

This field is calculated from the floor surfaces entered for the zone. Units are m^2.

Field: Exterior Gross Wall Area {m2}

This field is calculated from the exterior wall surfaces entered for the zone. Units are m^2.

Field: Exterior Net Wall Area {m2}

This field is calculated from the exterior wall surfaces entered for the zone. Any sub-surface area is subtracted from the gross area to determine the net area. Units are m^2.

Field: Exterior Window Area {m2}

This field is calculated from the exterior window surfaces entered for the zone. Units are m^2.

Field: Number of Surfaces

This field is a count of the number of base surfaces in the zone.

Field: Number of SubSurfaces

This field is a count of the number of subsurfaces (windows, doors, glass doors and the list) in the zone.

Field: Number of Shading SubSurfaces

This field is a count of the number of shading surfaces (overhangs, fins) for the zone.

Field: Part of Total Building Area

This field displays "Yes" when the zone is to be considered part of the total building floor area or "No" when it's not to be considered. This consideration has no impact on simulation but on reporting. Namely, when the value is "no", the zone is not part of the Total Floor Area as shown in the Annual Building Utility Performance Summary tables. In addition, when "No" is specified, the area is excluded from both the conditioned floor area and the total floor area in the Building Area sub table and the Normalized Metrics sub tables.

Internal Gains Outputs

Zone Internal Gains

Nominal Zone Internal Gains (people, lights, electric equipment, etc.) are summarized:

```
! <Zone Internal Gains/Equipment Information - Nominal>,Zone Name, Floor Area {m2},# Occupants,Area per
Occupant {m2/person},Occupant per Area {person/m2},Interior Lighting {W/m2},Electric Load {W/m2},Gas Load
{W/m2},Other Load {W/m2},Hot Water Eq {W/m2},Steam Equipment {W/m2},Sum Loads per Area {W/m2},Outdoor
Controlled Baseboard Heat
 Zone Internal Gains, PLENUM-1,463.60,0.0,N/A,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,No
 Zone Internal Gains, SPACE1-1,99.16,11.0,9.015,0.111,15.974,10.649,0.000,0.000,0.000,0.000,26.624,No
 Zone Internal Gains, SPACE2-1,42.74,5.0,8.547,0.117,16.006,10.670,0.000,0.000,0.000,0.000,26.676,No
 Zone Internal Gains, SPACE3-1,96.48,11.0,8.771,0.114,16.418,10.945,0.000,0.000,0.000,0.000,27.363,No
 Zone Internal Gains, SPACE4-1,42.74,5.0,8.547,0.117,16.006,10.670,0.000,0.000,0.000,0.000,26.676,No
 Zone Internal Gains, SPACE5-1,182.49,20.0,9.125,0.110,16.242,10.828,0.000,0.000,0.000,0.000,27.070,No
```

Field: <Zone Internal Gains/Equipment Information - Nominal>

This field contains the constant "Zone Internal Gains" for each line.

Field: Zone Name

This is the Zone Name entered from the IDF.

Field: Floor Area {m2}

This is the floor area for the zone.

Field: # Occupants

This is the nominal number of occupants (from the PEOPLE statements).

Field: Area per Occupant {m2/person}

This is the Zone Floor Area per occupant (person).

Field: Occupant per Area {person/m2}

This is the number of occupants per area.

Field: Interior Lighting {W/m2}

This is the lighting (Lights) per floor area.

Field: Electric Load {W/m2}

This is the electric equipment load (**Electric Equipment**) per floor area.

Field: Gas Load {W/m2}

This is the gas equipment load (**Gas Equipment**) per floor area.

Field: Other Load {W/m2

This is the other equipment load (**Other Equipment**) per floor area.

Field: Hot Water Eq {W/m2}

This is the hot water equipment load (**Hot Water Equipment**) per floor area.

Field: Steam Equipment {W/m2}

This is the steam equipment load (**Steam Equipment**) per floor area.

Field: Sum Loads per Area {W/m2}

This is the nominal sum of loads per area (equipment). This metric can be useful for incorrect (too much) loads in a zone.

Field: Outdoor Controlled Baseboard Heat

This field is “yes” if there is outdoor controlled baseboard heat in a Zone.

People Gains

```
! <People Internal Gains - Nominal>,Name,Schedule Name,Zone Name,Zone Floor Area {m2},# Zone
Occupants,Number of People {},People/Floor Area {person/m2},Floor Area per person {m2/person},Fraction
Radiant,Fraction Convected,Sensible Fraction Calculation,Activity level,ASHRAE 55 Warnings,MRT Calculation
Type,Work Efficiency,Clothing,Air Velocity,Fanger Calculation,Pierce Calculation,KSU Calculation
 People Internal Gains, SPACE1-1 PEOPLE 1,OCCUPY-1,SPACE1-
1,99.16,11.0,11.0,0.111,9.015,0.300,0.700,AutoCalculate,ACTSCHD,No
 People Internal Gains, SPACE2-1 PEOPLE 1,OCCUPY-1,SPACE2-
1,42.74,5.0,5.0,0.117,8.547,0.300,0.700,AutoCalculate,ACTSCHD,No
 People Internal Gains, SPACE3-1 PEOPLE 1,OCCUPY-1,SPACE3-
1,96.48,11.0,11.0,0.114,8.771,0.300,0.700,AutoCalculate,ACTSCHD,No
 People Internal Gains, SPACE4-1 PEOPLE 1,OCCUPY-1,SPACE4-
1,42.74,5.0,5.0,0.117,8.547,0.300,0.700,AutoCalculate,ACTSCHD,No
 People Internal Gains, SPACE5-1 PEOPLE 1,OCCUPY-1,SPACE5-
1,182.49,20.0,20.0,0.110,9.125,0.300,0.700,AutoCalculate,ACTSCHD,No
```

Field: <People Internal Gains - Nominal>

This field contains the constant “People Internal Gains” for each line.

Field: Name

This field contains the name of the People statement from the IDF file.

Field: Schedule Name

This is the schedule of occupancy fraction – the fraction is applied to the number of occupants for the statement. Limits are [0,1].

Field: Zone Name

This is the name of the Zone for the people/occupants.

Field: Zone Floor Area {m2}

This is the floor area (m2) of the zone.

Field: # Zone Occupants

This is the total number of occupants for the zone.

Field: Number of People {}

This is the specific number of people for this statement (nominal).

Field: People/Floor Area {person/m2}

This value represents the number of people density (this statement) per area (zone floor area).

Field: Floor Area per person {m2/person}

This is the floor area per person (this statement)

Field: Fraction Radiant

This is the fraction radiant for each person (this statement).

Field: Fraction Convected

This is the fraction convected for each person (this statement).

Field: Sensible Fraction Calculation

This field will show “Autocalculate” if the default calculation for sensible fraction of load is to be used. Or a specific value can be entered. If so, that value will be displayed.

Field: Activity level

This field will show the activity level schedule name.

Field: ASHRAE 55 Warnings

If this field shows "yes", then ASHRAE 55 comfort warnings are enabled. If "no", then no ASHRAE 55 comfort warnings are calculated or issued.

The following fields are shown only when one of the Comfort calculations (Fanger, KSU, Pierce) is used.

Field: MRT Calculation Type

This field's value will be one of the valid MRT calculation types (Zone Averaged, Surface Weighted, Angle Factor).

Field: Work Efficiency

This field will be the work efficiency schedule name for this people statement.

Field: Clothing

This field will be the clothing schedule name for this people statement.

Field: Air Velocity

This field will be the air velocity schedule name for this people statement.

Field: Fanger Calculation

This field will be "yes" if Fanger calculations are enabled for this people statement; otherwise it will be "no".

Field: Pierce Calculation

This field will be "yes" if Pierce calculations are enabled for this people statement; otherwise it will be "no".

Field: KSU Calculation

This field will be "yes" if KSU calculations are enabled for this people statement; otherwise it will be "no".

Lights Gains

```
! <Lights Internal Gains - Nominal>,Name,Schedule Name,Zone Name,Zone Floor Area {m2},# Zone 
Occupants,Lighting Level {W},Lights/Floor Area {W/m2},Lights per person {W/person},Fraction Return 
Air,Fraction Radiant,Fraction Short Wave,Fraction Convected,Fraction Replaceable,EndUse Category
 Lights Internal Gains, SPACE1-1 LIGHTS 1,LIGHTS-1,SPACE1-
1,99.16,11.0,1584.000,15.974,144.000,0.200,0.590,0.200,1.000E-002,0.000,GeneralLights
 Lights Internal Gains, SPACE2-1 LIGHTS 1,LIGHTS-1,SPACE2-
1,42.74,5.0,684.000,16.006,136.800,0.200,0.590,0.200,1.000E-002,0.000,GeneralLights
 Lights Internal Gains, SPACE3-1 LIGHTS 1,LIGHTS-1,SPACE3-
1,96.48,11.0,1584.000,16.418,144.000,0.200,0.590,0.200,1.000E-002,0.000,GeneralLights
 Lights Internal Gains, SPACE4-1 LIGHTS 1,LIGHTS-1,SPACE4-
1,42.74,5.0,684.000,16.006,136.800,0.200,0.590,0.200,1.000E-002,0.000,GeneralLights
 Lights Internal Gains, SPACE5-1 LIGHTS 1,LIGHTS-1,SPACE5-
1,182.49,20.0,2964.000,16.242,148.200,0.200,0.590,0.200,1.000E-002,0.000,GeneralLights
```

Field: <Lights Internal Gains - Nominal>

This field contains the constant "Lights Internal Gains" for each line.

Field: Name

This field contains the name of the Lights statement from the IDF file.

Field: Schedule Name

This is the schedule of lights fraction – the fraction is applied to the nominal lighting level for the statement. Limits are [0,1].

Field: Zone Name

This is the name of the Zone for the lights.

Field: Zone Floor Area {m2}

This is the floor area (m2) of the zone.

Field: # Zone Occupants

This is the total number of occupants for the zone.

Field: Lighting Level {W}

This is the nominal lighting level (this statement) in Watts.

Field: Lights/Floor Area {W/m2}

This is the watts per floor area (this statement)

Field: Lights per person {W/person}

This is the watts per person that this statement represents.

Field: Fraction Return Air

This is the fraction return air for this statement.

Field: Fraction Radiant

This is the fraction radiant for this lighting level.

Field: Fraction Short Wave

This is the fraction short wave for this lighting level.

Field: Fraction Convected

This is the fraction convected for this lighting level.

Field: Fraction Replaceable

This is the fraction replaceable for this lighting level. For daylighting calculations, this value should either be 0 (no dimming control) or 1 (full dimming control).

Field: EndUse Category

This field shows the enduse category for this lights statement. Usage can be reported by enduse category.

Equipment (Electric, Gas, Other, Hot Water) Gains

These equipments are all reported similarly. Electric Equipment is used in the example below:

```
! <ElectricEquipment Internal Gains - Nominal>,Name,Schedule Name,Zone Name,Zone Floor Area {m2},# Zone Occupants,Equipment Level {W},Equipment/Floor Area {W/m2},Equipment per person {W/person},Fraction Latent,Fraction Radiant,Fraction Lost,Fraction Convected,EndUse SubCategory
 ElectricEquipment Internal Gains, SPACE1-1 ELECEQ 1,EQUIP-1,SPACE1-1,99.16,11.0,1056.000,10.649,96.000,0.000,0.300,0.000,0.700,General
 ElectricEquipment Internal Gains, SPACE2-1 ELECEQ 1,EQUIP-1,SPACE2-1,42.74,5.0,456.000,10.670,91.200,0.000,0.300,0.000,0.700,General
 ElectricEquipment Internal Gains, SPACE3-1 ELECEQ 1,EQUIP-1,SPACE3-1,96.48,11.0,1056.000,10.945,96.000,0.000,0.300,0.000,0.700,General
 ElectricEquipment Internal Gains, SPACE4-1 ELECEQ 1,EQUIP-1,SPACE4-1,42.74,5.0,456.000,10.670,91.200,0.000,0.300,0.000,0.700,General
 ElectricEquipment Internal Gains, SPACE5-1 ELECEQ 1,EQUIP-1,SPACE5-1,182.49,20.0,1976.000,10.828,98.800,0.000,0.300,0.000,0.700,General
```

Field: <[Specific] Equipment Internal Gains - Nominal>

This field will contain the type of equipment internal gain in each line (i.e. Electric Equipment Internal Gains, Gas Equipment Internal Gains, …).

Field: Name

This field contains the name of the equipment statement from the IDF file.

Field: Schedule Name

This is the schedule of equipment fraction – the fraction is applied to the nominal equipment level for the statement. Limits are [0,1].

Field: Zone Name

This is the name of the Zone for the equipment.

Field: Zone Floor Area {m2}

This is the floor area (m2) of the zone.

Field: # Zone Occupants

This is the total number of occupants for the zone.

Field: Equipment Level {W}

This is the nominal equipment level (in Watts) for the statement.

Field: Equipment/Floor Area {W/m2}

This is the watts per floor area (this statement)

Field: Equipment per person {W/person}

This is the watts per person that this statement represents.

Field: Fraction Latent

This is the fraction latent for this equipment.

Field: Fraction Radiant

This is the fraction radiant for this equipment.

Field: Fraction Lost

This is the fraction lost (not attributed to the zone) for this equipment.

Field: Fraction Convected

This is the fraction convected for this equipment.

Field: EndUse SubCategory

This field shows the enduse category for this statement. Usage can be reported by enduse category.

Outdoor Controlled Baseboard Heat

```
! <Outdoor Controlled Baseboard Heat Internal Gains - Nominal>,Name,Schedule Name,Zone Name,Zone Floor Area {m2},# Zone Occupants,Capacity at Low Temperature {W},Low Temperature {C},Capacity at High Temperature {W},High Temperature {C},Fraction Radiant,Fraction Convected,EndUse Subcategory
 Outdoor Controlled Baseboard Heat Internal Gains, SPACE4-1 BBHEAT 1,EQUIP-1,SPACE4-1,42.74,5.0,1500.000,0.000,500.000,10.000,0.500,0.500,Baseboard Heat
```

Field: <Outdoor Controlled Baseboard Heat Internal Gains - Nominal>

This field contains the constant "Outdoor Controlled Baseboard Heat Internal Gains" for each line.

Field: Name

This field contains the name of the baseboard heat statement from the IDF file.

Field: Schedule Name

This is the schedule of equipment fraction – the fraction is applied to the nominal equipment level for the statement. Limits are [0,1].

Field: Zone Name

This is the name of the Zone for the equipment.

Field: Zone Floor Area {m2}

This is the floor area (m2) of the zone.

Field: # Zone Occupants

This is the total number of occupants for the zone.

Field: Capacity at Low Temperature {W}

This is the capacity (in Watts) of the equipment at low outdoor temperature.

Field: Low Temperature {C}

This is the low outdoor temperature (dry-bulb) for the capacity in the previous field. If the outdoor dry-bulb temperature (degrees Celsius) is at or below the low temperature, the baseboard heater operates at the low temperature capacity.

Field: Capacity at High Temperature {W}

This is the capacity (in Watts) of the equipment at high outdoor temperature.

Field: High Temperature {C}

This is the high outdoor temperature (dry-bulb) for the capacity in the previous field. If the outdoor dry-bulb temperature (degrees Celsius) is exceeds the high temperature, the baseboard heater turns off.

Field: Fraction Radiant

This is the fraction radiant for this equipment.

Field: Fraction Convected

This is the fraction convected for this equipment.

Field: EndUse Subcategory

This field shows the enduse category for this statement. Usage can be reported by enduse category.

Simple Airflow Outputs

Infiltration, Ventilation, Mixing, Cross Mixing Statistics

Infiltration, Ventilation, Mixing, Cross Mixing are only specified when the Airflow Model is "Simple" (no Airflow Network).

Infiltration

```
! <Infiltration Airflow Stats - Nominal>,Name,Schedule Name,Zone Name, Zone Floor Area {m2}, # Zone Occupants,Design Volume Flow Rate {m3/s},Volume Flow Rate/Floor Area {m3/s/m2},Volume Flow Rate/Exterior Surface Area {m3/s/m2},ACH - Air Changes per Hour,Equation A - Constant Term Coefficient {},Equation B - Temperature Term Coefficient {1/C},Equation C - Velocity Term Coefficient {s/m}, Equation D - Velocity Squared Term Coefficient {s2/m2}
ZoneInfiltration Airflow Stats, SPACE1-1 INFIL 1,INFIL-SCH,SPACE1-1,99.16,11.0,3.200E-002,3.227E-004,4.372E-004,0.482,0.000,0.000,0.224,0.000
 ZoneInfiltration Airflow Stats, SPACE2-1 INFIL 1,INFIL-SCH,SPACE2-1,42.74,5.0,1.400E-002,3.276E-004,3.838E-004,0.488,0.000,0.000,0.224,0.000
 ZoneInfiltration Airflow Stats, SPACE3-1 INFIL 1,INFIL-SCH,SPACE3-1,96.48,11.0,3.200E-002,3.317E-004,4.372E-004,0.482,0.000,0.000,0.224,0.000
 ZoneInfiltration Airflow Stats, SPACE4-1 INFIL 1,INFIL-SCH,SPACE4-1,42.74,5.0,1.400E-002,3.276E-004,3.838E-004,0.488,0.000,0.000,0.224,0.000
 ZoneInfiltration Airflow Stats, SPACE5-1 INFIL 1,INFIL-SCH,SPACE5-1,182.49,20.0,6.200E-002,3.397E-004,N/A,0.499,0.000,0.000,0.224,0.000
```

Field: <Infiltration Airflow Stats - Nominal>

This field contains the constant "Infiltration Airflow Stats" for each line.

Field: Name

This field contains the name of the infiltration statement from the IDF file.

Field: Schedule Name

This is the schedule of use fraction – the fraction is applied to the nominal volume flow rate for the statement. Limits are [0,1].

Field: Zone Name

This is the name of the Zone for the infiltration.

Field: Zone Floor Area {m2}

This is the floor area (m2) of the zone.

Field: # Zone Occupants

This is the total number of occupants for the zone.

Field: Design Volume Flow Rate {m3/s}

This is the nominal flow rate for the infiltration in m3/s.

Field: Volume Flow Rate/Floor Area {m3/s/m2}

This field is the volume flow rate density per floor area (flow rate per floor area) for infiltration.

Field: Volume Flow Rate/Exterior Surface Area {m3/s/m2}

This field is the volume flow rate density per exterior surface area (flow rate per exterior area) for infiltration.

Field: ACH - Air Changes per Hour

This field is the air changes per hour for the given infiltration rate.

Field: Equation A - Constant Term Coefficient {}

Actual infiltration amount is an equation based value:

$$Infiltration = \left(I_{design}\right)\left(F_{schedule}\right)\left[A + B\left|\left(T_{zone} - T_{odb}\right)\right| + C\left(WindSpeed\right) + D\left(Windspeed^2\right)\right]$$

This field value is the A coefficient in the above equation.

Field: Equation B - Temperature Term Coefficient {1/C}

This field value is the B coefficient in the above equation.

Field: Equation C - Velocity Term Coefficient {s/m}

This field value is the C coefficient in the above equation.

Field: Equation D - Velocity Squared Term Coefficient {s2/m2}

This field value is the D coefficient in the above equation.

Ventilation

```
! <Ventilation Airflow Stats - Nominal>,Name,Schedule Name,Zone Name, Zone Floor Area {m2}, # Zone Occupants,Design Volume Flow Rate {m3/s},Volume Flow Rate/Floor Area {m3/s/m2},Volume Flow Rate/person Area {m3/s/person},ACH - Air Changes per Hour,Fan Type {Exhaust;Intake;Natural/None},Fan Pressure Rise {?},Fan Efficiency {},Equation A - Constant Term Coefficient {},Equation B - Temperature Term Coefficient {1/C},Equation C - Velocity Term Coefficient {s/m}, Equation D - Velocity Squared Term Coefficient {s2/m2},Minimum Indoor Temperature/Schedule,Maximum Indoor Temperature/Schedule,Delta Temperature/Schedule,Minimum Outdoor Temperature/Schedule,Maximum Outdoor Temperature/Schedule,Maximum WindSpeed
 Ventilation Airflow Stats, SPACE1-1 VENTL 1,NIGHTVENTSCHED,SPACE1-1,99.16,11.0,5.295E-002,5.340E-004,4.814E-003,0.797,Intake,67.000,0.7,1.000,0.000,0.000,0.000,MININDOORTEMP,MAXINDOORTEMP,DELTATEMP,MINOUTDOORTEMP,MAXOUTDOORTEMP,40.00
 Ventilation Airflow Stats, SPACE1-1 VENTL 2,NIGHTVENTSCHED,SPACE1-1,99.16,11.0,5.295E-002,5.340E-004,4.814E-003,0.797,Intake,67.000,0.7,1.000,0.000,0.000,0.000,MININDOORTEMP,MAXINDOORTEMP,DELTATEMP,MINOUTDOORTEMP,MAXOUTDOORTEMP,40.00
 Ventilation Airflow Stats, SPACE2-1 VENTL 1,NIGHTVENTSCHED,SPACE2-1,42.74,5.0,7.030E-002,1.645E-003,1.406E-002,2.450,Intake,67.000,0.7,1.000,0.000,0.000,0.000,18.00,100.00,2.00,-100.00,100.00,40.00
Ventilation Airflow Stats, RESISTIVE ZONE VENTL 1,INF-SCHED,RESISTIVE ZONE,37.16,3.0,2.000E-002,5.382E-004,6.667E-003,0.636,Natural,0.000,1.0,0.606,2.020E-002,5.980E-004,0.000,18.00,100.00,1.00,-100.00,100.00,40.00
 Ventilation Airflow Stats, EAST ZONE VENTL 1,INF-SCHED,EAST ZONE,37.16,3.0,2.000E-002,5.382E-004,6.667E-003,0.636,Natural,0.000,1.0,0.606,2.020E-002,5.980E-004,0.000,18.00,100.00,1.00,-100.00,100.00,40.00
 Ventilation Airflow Stats, NORTH ZONE VENTL 1,INF-SCHED,NORTH ZONE,55.74,4.0,2.000E-002,3.588E-004,5.000E-003,0.424,Natural,0.000,1.0,0.606,2.020E-002,5.980E-004,0.000,18.00,100.00,1.00,-100.00,100.00,40.00
```

Field: <Ventilation Airflow Stats - Nominal>

This field contains the constant "Ventilation Airflow Stats" for each line.

Field: Name

This field contains the name of the ventilation statement from the IDF file.

Field: Schedule Name

This is the schedule of use fraction – the fraction is applied to the nominal volume flow rate for the statement. Limits are [0,1].

Field: Zone Name

This is the name of the Zone for the ventilation.

Field: Zone Floor Area {m2}

This is the floor area (m2) of the zone.

Field: # Zone Occupants

This is the total number of occupants for the zone.

Field: Design Volume Flow Rate {m3/s}

This is the nominal flow rate for the ventilation in m3/s.

Field: Volume Flow Rate/Floor Area {m3/s/m2}

This field is the volume flow rate density per floor area (flow rate per floor area) for ventilation.

Field: Volume Flow Rate/person Area {m3/s/person}

This field is the volume flow rate density per person (flow rate per person) for ventilation.

Field: ACH - Air Changes per Hour

This field is the air changes per hour for the given ventilation rate.

Field: Fan Type {Exhaust;Intake;Natural}

This field shows the entered value for the type of ventilation [NATURAL, EXHAUST, or INTAKE]. Natural ventilation is the air movement/exchange a result of openings in the building façade and does not consume any fan energy. For either EXHAUST or INTAKE, values for fan pressure and efficiency define the fan electric consumption. For NATURAL and EXHAUST ventilation, the conditions of the air entering the space are assumed to be equivalent to outdoor air conditions. For INTAKE ventilation, an appropriate amount of fan heat is added to the air stream.

Field: Fan Pressure Rise {Pa}

Operational when Fan Type is INTAKE or EXHAUST, this is the pressure rise experienced across the fan in Pascals (N/m^2). This is a function of the fan and plays a role in determining the amount of energy consumed by the fan.

Field: Fan Efficiency {}

Operational when Fan Type is INTAKE or EXHAUST, this is the total fan efficiency (a decimal number between 0.0 and 1.0). This is a function of the fan and plays a role in determining the amount of energy consumed by the fan.

Field: Equation A - Constant Term Coefficient {}

Actual ventilation amount is an equation based value:

$$Ventilation = \left(V_{design}\right)\left(F_{schedule}\right)\left[A + B\left|T_{zone} - T_{odb}\right| + C\left(WindSpeed\right) + D\left(WindSpeed^{2}\right)\right]$$

This field value is the A coefficient in the above equation.

Field: Equation B - Temperature Term Coefficient {1/C}

This field value is the B coefficient in the above equation.

Field: Equation C - Velocity Term Coefficient {s/m}

This field value is the C coefficient in the above equation.

Field: Equation D - Velocity Squared Term Coefficient {s2/m2}

This field value is the D coefficient in the above equation.

Field: Minimum Indoor Temperature{C}/Schedule

This is the indoor temperature (in Celsius) below which ventilation is shutoff. As the values can also be entered as a schedule, the schedule name may be listed here rather than a temperature.

Field: Maximum Indoor Temperature{C}/Schedule

This is the indoor temperature (in Celsius) above which ventilation is shutoff. As the values can also be entered as a schedule, the schedule name may be listed here rather than a temperature.

Field: Delta Temperature{C}/Schedule

This is the temperature difference (in Celsius) between the indoor and outdoor air dry-bulb temperatures below which ventilation is shutoff. As the values can also be entered as a schedule, the schedule name may be listed here rather than a temperature.

Field: Minimum Outdoor Temperature{C}/Schedule

This is the outdoor temperature (in Celsius) below which ventilation is shut off. As the values can also be entered as a schedule, the schedule name may be listed here rather than a temperature.

Field: Maximum Outdoor Temperature{C}/Schedule

This is the outdoor temperature (in Celsius) above which ventilation is shut off. As the values can also be entered as a schedule, the schedule name may be listed here rather than a temperature.

Field: Maximum WindSpeed{m/s}

This is the wind speed (m/s) above which ventilation is shut off.

Mixing

```
! <Mixing Airflow Stats - Nominal>,Name,Schedule Name,Zone Name, Zone Floor Area {m2}, # Zone
Occupants,Design Volume Flow Rate {m3/s},Volume Flow Rate/Floor Area {m3/s/m2},Volume Flow Rate/person
Area {m3/s/person},ACH - Air Changes per Hour,From/Source Zone,Delta Temperature {C}
 Mixing Airflow Stats, RESISTIVE ZONE MIXNG 1,ZONE MIXING,RESISTIVE ZONE,37.16,3.0,5.000E-002,1.345E-
003,1.667E-002,1.589,EAST ZONE,0.00
```

Field: <Mixing Airflow Stats - Nominal>

This field contains the constant “Mixing Airflow Stats” for each line.

Field: Name

This field contains the name of the mixing statement from the IDF file.

Field: Schedule Name

This is the schedule of use fraction – the fraction is applied to the nominal volume flow rate for the statement. Limits are [0,1].

Field: Zone Name

This is the name of the Zone for the mixing.

Field: Zone Floor Area {m2}

This is the floor area (m2) of the zone.

Field: # Zone Occupants

This is the total number of occupants for the zone.

Field: Design Volume Flow Rate {m3/s}

This is the nominal flow rate for the mixing in m3/s.

Field: Volume Flow Rate/Floor Area {m3/s/m2}

This field is the volume flow rate density per floor area (flow rate per floor area) for mixing.

Field: Volume Flow Rate/person Area {m3/s/person}

This field is the volume flow rate density per person (flow rate per person) for mixing.

Field: ACH - Air Changes per Hour

This field is the air changes per hour for the given mixing rate.

Field: From/Source Zone

This is the source zone for the mixing rate.

Field: Delta Temperature {C}

This number controls when mixing air from the source zone is sent to the receiving zone. This parameter is a temperature {units Celsius}. If this field is positive, the temperature of the zone from which the air is being drawn (source zone) must be “Delta Temperature” warmer than the receiving zone air or else no mixing occurs. If this field is negative, the temperature of the source zone must be “Delta Temperature” cooler than the receiving zone air or else no mixing occurs. If this parameter is zero, mixing occurs regardless of the relative zone temperatures.

Cross Mixing

```
! <CrossMixing Airflow Stats - Nominal>,Name,Schedule Name,Zone Name, Zone Floor Area {m2}, # Zone
Occupants,Design Volume Flow Rate {m3/s},Volume Flow Rate/Floor Area {m3/s/m2},Volume Flow Rate/person
Area {m3/s/person},ACH - Air Changes per Hour,From/Source Zone,Delta Temperature {C}
 CrossMixing Airflow Stats, EAST ZONE XMIXNG 1,ZONE MIXING,EAST ZONE,37.16,3.0,0.100,2.691E-003,3.333E-
002,3.178,NORTH ZONE,1.00
 CrossMixing Airflow Stats, NORTH ZONE XMIXNG 1,ZONE MIXING,NORTH ZONE,55.74,4.0,0.100,1.794E-003,2.500E-
002,2.119,EAST ZONE,1.00
```

Field: <CrossMixing Airflow Stats - Nominal>

This field contains the constant “CrossMixing Airflow Stats” for each line.

Field: Name

This field contains the name of the mixing statement from the IDF file.

Field: Schedule Name

This is the schedule of use fraction – the fraction is applied to the nominal volume flow rate for the statement. Limits are [0,1].

Field: Zone Name

This is the name of the Zone for the mixing.

Field: Zone Floor Area {m2}

This is the floor area (m2) of the zone.

Field: # Zone Occupants

This is the total number of occupants for the zone.

Field: Design Volume Flow Rate {m3/s}

This is the nominal flow rate for the mixing in m3/s.

Field: Volume Flow Rate/Floor Area {m3/s/m2}

This field is the volume flow rate density per floor area (flow rate per floor area) for mixing.

Field: Volume Flow Rate/person Area {m3/s/person}

This field is the volume flow rate density per person (flow rate per person) for mixing.

Field: ACH - Air Changes per Hour

This field is the air changes per hour for the given mixing rate.

Field: From/Source Zone

This is the source zone for the mixing – air is exchanged equally between the two zones.

Field: Delta Temperature {C}

This number controls when mixing air from the source zone is sent to the receiving zone. This parameter is a temperature {units Celsius}. If this field is positive, the temperature of the zone from which air is being drawn ("source zone") must be "Delta Temperature" warmer than the zone air or no mixing occurs. If this field is zero, mixing occurs regardless of the relative air temperatures. Negative values for "Delta Temperature" are not permitted.

Surface Details Report

A good example of this is the surface details report (**Report, Surfaces, Details;**, **Report, Surfaces, Vertices;**, **Report, Surfaces, DetailsWithVertices;**). Excerpt from the file:

```
Line 1: ! <Zone/Shading Surfaces>,<Zone Name>/#Shading Surfaces,# Surfaces, Vertices are shown starting at Upper-Left-Corner => Counter-Clockwise => World Coordinates
Line 2: ! <HeatTransfer/Shading/Frame/Divider_Surface>,Surface Name,Surface Class, Base Surface,Construction,Nominal U (w/o film coefs),Nominal U (with film coefs),Area (Net), Area (Gross), Area (Sunlit Calc), Aimuth, Tilt, ~Width, ~Height, Reveal, <ExtBoundCondition>, <ExtConvCoeffCalc>, <IntConvCoeffCalc>,<SunExposure>,<WindExposure>,ViewFactorToGround,ViewFactorToSky,ViewFactorToGround-IR,ViewFactorToSky-IR,#Sides, {Vertex 1},,, {Vertex 2},,, {Vertex 3},,, {Vertex 4}, ,,{etc}
Line 3: ! <Units>,,,,,{W/m2-K},{W/m2-K},{m2},{m2},{m2},{deg},{deg},{m},{m},{m},,,,,,,,,,X {m},Y {m},Z {m},X {m},Y {m},Z {m},X {m},Y {m},Z {m},X {m},Y {m},Z {m}
Ex Line 1: Shading_Surfaces,Number of Shading Surfaces,   10
Ex Line 2: Shading_Surface,WEST SIDE BUSHES,Detached Shading:Building,,,,, 180.0, 180.0, 180.0, 90.0, 90.0, 60.00, 3.00,,,,,,,,,,, 4, -5.00, 0.00, 3.00, -5.00, 0.00, 0.00, -5.00, 60.00, 0.00, -5.00, 60.00, 3.00
Ex Line 2: Shading_Surface,EAST SIDE TREE1,Detached Shading:Building,,,,, 500.0, 500.0, 500.0, 270.0, 90.0, 20.00, 50.99,,,,,,,,,,, 3, 70.00, 30.00, 50.00, 70.00, 40.00, 0.00, 70.00, 20.00, 0.00
Ex Line 2: Shading_Surface,EAST SIDE TREE2,Detached Shading:Building,,,,, 500.0, 500.0, 500.0, 0.0, 90.0, 20.00, 50.99,,,,,,,,,,, 3, 70.00, 30.00, 50.00, 80.00, 30.00, 0.00, 60.00, 30.00, 0.00
Ex Line 1: Zone_Surfaces,HEARTLAND AREA,   35
Ex Line 2: HeatTransfer_Surface,ZN001:WALL001,Wall,,EXTERIOR,0.644, 0.588, 136.0, 200.0, 136.0, 180.0, 90.0, 20.0, 10.0, 0.00,ExternalEnvironment,ASHRAEDetailed,ASHRAEDetailed,SunExposed,WindExposed, 0.50, 0.50, 0.67,  0.33, 4, 20.00, 10.00, 10.00, 20.00, 10.00, 0.00, 40.00, 10.00, 0.00, 40.00, 10.00, 10.00
Ex Line 2: HeatTransfer_Surface,ZN001:WALL001:WIN001,Window,ZN001:WALL001,SINGLE PANE HW WINDOW,N/A,6.121, 64.00000, 64.00000, 64.00000,180.0, 90.0, 8.00, 8.00, 0.00, ExternalEnvironment, ASHRAEDetailed, ASHRAEDetailed, SunExposed, WindExposed,  0.50,  0.50,  0.71,  0.29, 4, 26.00, 10.00, 8.10, 26.00, 10.00, 0.10, 34.00, 10.00, 0.10, 34.00, 10.00, 8.10
Ex Line 2: HeatTransfer_Surface,ZN001:WALL002,Wall,,EXTERIOR,0.644,0.588, 155.0, 200.0, 155.0, 90.0, 90.0, 20.00, 10.00, 0.00,ExternalEnvironment, ASHRAEDetailed, ASHRAEDetailed, SunExposed, WindExposed, 0.50, 0.50,  0.73,  0.27, 4, 50.00, 20.00, 10.00, 50.00, 20.00, 0.00, 50.00, 40.00, 0.00, 50.00, 40.00, 10.00
Ex Line 2: HeatTransfer_Surface,ZN001:WALL002:WIN001,Window,ZN001:WALL002,SINGLE PANE HW WINDOW,N/A,6.121, 15.0, 15.0, 15.0, 90.0, 90.0, 3.00, 5.00,  0.00, ExternalEnvironment, ASHRAEDetailed, ASHRAEDetailed, SunExposed, WindExposed,  0.50,  0.50,  0.76,  0.24, 4, 50.00, 22.20, 7.30, 50.00, 22.20, 2.30, 50.00, 25.20, 2.30, 50.00, 25.20, 7.30
```

```
Ex Line 2: HeatTransfer_Surface,ZN001:WALL002:WIN002,Window,ZN001:WALL002,SINGLE PANE HW WINDOW, N/A,
6.121, 15.00, 15.00, 15.00, 90.00, 90.00, 3.00, 5.00, 0.00, ExternalEnvironment, ASHRAEDetailed,
ASHRAEDetailed, SunExposed, WindExposed, 0.50, 0.50, 0.71, 0.29, 4, 50.00, 28.50, 7.30, 50.00, 28.50,
2.30, 50.00, 31.50, 2.30, 50.00, 31.50, 7.30
Ex Line 2: HeatTransfer_Surface, ZN001:WALL002:WIN003, Window, ZN001:WALL002, SINGLE PANE HW WINDOW, N/A,
6.121, 15.00, 15.00, 15.00, 90.00, 90.00, 3.00, 5.00, 0.00, ExternalEnvironment, ASHRAEDetailed,
ASHRAEDetailed, SunExposed, WindExposed, 0.50, 0.50, 0.77, 0.23, 4, 50.00, 35.30, 7.30, 50.00, 35.30,
2.30, 50.00, 38.30, 2.30, 50.00, 38.30, 7.30
<reduced for brevity>
```

```
Ex Line 1: Zone_Surfaces,MAINE WING,   12
Ex Line 2: HeatTransfer_Surface, ZN005:WALL001, Wall, , EXTERIOR, 0.644, 0.588, 100.00, 100.00, 100.00,
180.00, 90.00, 10.00, 10.00, 0.00, ExternalEnvironment, ASHRAEDetailed, ASHRAEDetailed, SunExposed,
WindExposed, 0.50, 0.50, 0.74, 0.26, 4, 50.00, 40.00, 10.00, 50.00, 40.00, 0.00, 60.00, 40.00, 0.00,
60.00, 40.00, 10.00
Ex Line 2: HeatTransfer_Surface, ZN005:FLR001, Floor, , SLAB FLOOR, 17.040, 3.314, 400.00, 400.00, 400.00,
90.00, 180.00, 20.00, 20.00, 0.00, Ground, N/A-Ground, ASHRAEDetailed, NoSun, NoWind, 1.00, 0.00, 1.00,
0.00, 4, 60.00, 40.00, 0.00, 40.00, 40.00, 0.00, 40.00, 60.00, 0.00, 60.00, 60.00, 0.00
Ex Line 2: HeatTransfer_Surface, ZN005:ROOF001, Roof, , ROOF31, 0.790, 0.688, 400.00, 400.00, 400.00,
180.00, 0.00, 20.00, 20.00, 0.00, ExternalEnvironment, ASHRAEDetailed, ASHRAEDetailed, SunExposed,
WindExposed, 0.00, 1.00, 2.41E-002, 0.98, 4, 40.00, 60.00, 10.00, 40.00, 40.00, 10.00, 60.00, 40.00,
10.00, 60.00, 60.00, 10.00
```

Description of the Detailed Surfaces Report(s)

The preceding excerpt includes the surface details *and* vertices. You can also obtain the report with *just* the details or *just* the vertices.

```
Line 1: ! <Zone/Shading Surfaces>,<Zone Name>/#Shading Surfaces,# Surfaces, Vertices are shown starting at
Upper-Left-Corner => Counter-Clockwise => World Coordinates
```

When a line is shown with the comment character (!) in the first position, it signifies a informational “header” record for the report. In addition, “Line 1” is also a header for the subsequent “real” surface lines.

Field: <Zone/Shading Surfaces>

This field is a dual purpose field. For beginning of the Shading Surfaces, it will show “Shading_Surfaces”. At each Zone, it will show “Zone_Surfaces”.

Field: <Zone Name>/#Shading Surfaces

This field is a dual purpose field. It will either show the Zone Name of the subsequent surfaces or the “Number of Shading Surfaces” for the entire building.

Field: # Surfaces

This field, then, specifies the number of surfaces of the type (zone or shading) that will follow.

The example lines illustrate:

```
Shading_Surfaces,Number of Shading Surfaces,   10
Zone_Surfaces,HEARTLAND AREA,   35
Zone_Surfaces,MAINE WING,   12
```

```
Line 2: ! <HeatTransfer/Shading/Frame/Divider_Surface>, Surface Name, Surface Class, Base Surface,
Construction, Nominal U (w/o film coefs), Nominal U (with film coefs), Area (Net), Area (Gross), Area
(Sunlit Calc), Azimuth, Tilt, ~Width, ~Height, Reveal, <ExtBoundCondition>, <ExtConvCoeffCalc>,
<IntConvCoeffCalc>, <SunExposure>, <WindExposure>, ViewFactorToGround, ViewFactorToSky,
ViewFactorToGround-IR, ViewFactorToSky-IR, #Sides, {Vertex 1},,, {Vertex 2},,, {Vertex 3},,, {Vertex 4},
,,{etc}
Line 3: ! <Units>,,,,,{W/m2-K},{W/m2-K},{m2},{m2},{m2},{deg},{deg},{m},{m},{m},,,,,,,,,,X {m},Y {m},Z
{m},X {m},Y {m},Z {m},X {m},Y {m},Z {m},X {m},Y {m},Z {m}
```

Line 2 shows the full detail of each surface record with Line 3 used for illustrating the units of individual fields (as appropriate).

The first four fields (<HeatTransfer/ShadingSurface>,Surface Name, Surface Class, Base Surface) are included in all the Surface reports (Details, Vertices, Details with Vertices).

Field: <HeatTransfer/Shading/Frame/Divider_Surface>

For shading surfaces, this will be a constant "Shading_Surface". For heat transfer surfaces, this will be a constant "HeatTransfer_Surface". For Frame and Divider Surfaces, it will be a constant "Frame/Divider_Surface" with the proper type showing in the Surface Class.

Field: Surface Name

This field will contain the actual surface name as entered in the IDF.

Field: Surface Class

This field contains the surface class (e.g. Window, Door, Wall, Roof) as entered in the IDF.

Field: Base Surface

This field contains the base surface name if this surface is a sub-surface (i.e. Window, Door).

Fields in Details and Details with Vertices report.

Field: Construction

This field will contain the name of the construction used for the surface. (Will be empty for shading surfaces).

Field: Nominal U (w/o film coefs)

A nominal thermal conductance for the surface is calculated for the surface. It does not include interior or exterior film coefficients as this is calculated during the simulation and is dependent on several factors that may change during the simulation time period. Units for this field are W/m^2-K.

For windows, no value is reported because the film coefficients cannot be removed from the U-value.

Field: Nominal U (with film coefs)

A nominal thermal conductance for the surface is calculated for the surface, including film coefficients. Units for this field are W/m^2-K.

For opaque surfaces, interior and exterior film coefficients are added to the surface construction based on the prescribed R-values for interior and exterior film coefficients as found in ASHRAE 90.1-2004, Appendix A, and shown below: The SI values are the exact values used inside EnergyPlus.

Surface Class	***Interior Film Coefficient***		***Exterior Film Coefficient***	
	(ft^2-F-hr/BTU)	***(m^2-K/W)***	***(ft^2-F-hr/BTU)***	***(m^2-K/W)***
WALL	0.68	0.1197548	0.17	0.0299387
FLOOR	0.92	0.1620212	0.46	0.0810106
CEILING/ROOF	0.61	0.1074271	0.46	0.0810106

NOTE: The resulting "Nominal U with film coefs" is only for comparison purposes with the ASHRAE 90.1 requirements. Actual film coefficients are calculated during the simulation and are dependent on several factors that may change during the simulation time period.

For windows, the "Nominal U with film coefs" is calculated using the following assumptions from the WINDOW 5 program (also NFRC winter conditions):

- Indoor air temperature = 21 C (69.8 F)
- Outdoor air temperature = -18 C (-.4 F)

- Exterior film coefficient = 26 W/m^2 (4.58 ft^2-F-hr/BTU)
- Interior film coefficient = Calculated by EnergyPlus convection algorithm
- No incident solar beam radiation

Field: Area (Net)

When surfaces are entered, the gross area of the surface is calculated from the vertices (except for Internal Mass where it is entered directly). As net area is needed in the calculations, any sub-surfaces to the primary surface are subtracted from the original gross area. This field will show the final "net" area for the surface. For example, walls with windows will have the multiplier (of the window) * window area subtracted from the gross amount. Likewise, any divider area (including multipliers) for the window will be subtracted. Units for this field are m^2.

Field: Area (Gross)

This field shows the gross area of the surface. Units for this field are m^2.

Field: Area (Sunlit Calc)

This field shows the net area for the purposes of sunlit/shading calculations. For these, only 1 unit of a multiplied window/door is subtracted from the gross area of a wall that the window/door is on. This net area includes the *frame area* (if any) for the windows on the wall. For windows, this value includes the divider area of the window. Thus for both frames and dividers, there will be a * in this field – since the areas are included in the wall/window areas. Units for this field are m^2.

Field: Azimuth

Using the specified vertices for the surface (and order of entry), EnergyPlus can determine the outward facing normal angle for the surface. That angle is displayed in this field. Units for this field are degrees.

Field: Tilt

Using the specified vertices for the surface (and order of entry), EnergyPlus can determine the tilt of the surface with respect to "horizontal". That angle is displayed in this field. Units for this field are degrees.

Field: ~Width

This field (approximate width of the surface) is calculated and filled by EnergyPlus from the entered vertices. Some parts of EnergyPlus use a width and height rather than the more detailed vertex/area calculations. Units for this field are m.

Field: ~Height

This field (approximate height of the surface) is calculated and filled by EnergyPlus from the entered vertices. Some parts of EnergyPlus use a width and height rather than the more detailed vertex/area calculations. Units for this field are m.

Field: Reveal

This field is calculated for sub-surfaces with respect to their base surfaces using the entered vertices, plane of the two surfaces, and distance between the planes. Reveal may be important in shading of windows, in particular. Units for this field are m.

Field: <ExtBoundCondition>

This field shows the exterior boundary condition for the surface. If this is a surface that is "external" the values will be **ExternalEnvironment** or **Ground**. If this surface is an interzone surface, this value will be the surface name in the "other" zone. If this surface is an internal surface, this value will be the same as the surface name. If this is a special surface with

"Other Side Coefficients", the value will be the OtherSideCoefficient name (see description of OtherSideCoefficient reporting later in this document). If this is a special surface with "Other Side Condition Model", the value will be the OtherSideConditionModel name.

Field: <ExtConvCoeffCalc>

The value for this field will be a descriptor of the External Convection Coefficient calculation. If this surface uses Other Side Coefficients, this field will display **N/A-OSC**. If this surface uses Other Side Condition Model, this field will display **N/A-OSCM**. Ground surfaces will display **N/A-Ground**. If this is an interior or inter-zone surface, it will display **Other/Same Surface Int Conv**. If a schedule is used, it will display **User Supplied Schedule.** If a constant value is supplied by the user, it will display **User Supplied Value**. The standard values may also be displayed here (e.g. **ASHRAEDetailed**).

Field: <IntConvCoeffCalc>

The value for this field will be a descriptor of the Internal Convection Coefficient calculation. If a schedule is used, it will display **User Supplied Schedule.** If a constant value is supplied by the user, it will display **User Supplied Value**. The standard values may also be displayed here (e.g. **ASHRAEDetailed**).

Field: <SunExposure>

The value for this field will be **SunExposed** or **NoSun**. Internal surfaces should have NoSun exposure.

Field: <WindExposure>

The value for this field will be **WindExposed** or **NoWind**. Internal surfaces should have NoWind exposure.

Field: ViewFactorToGround

This value has been entered as part of the surface description. View factor to ground is described in the Input Output Reference document during the Surface:HeatTransfer description.

Field: ViewFactorToSky

This value is calculated by EnergyPlus based on surface tilt and shadowing surfaces.

Field: ViewFactorToGround-IR

This value is calculated by EnergyPlus based on surface tilt and shadowing surfaces. Shadowing surfaces are considered to have the same emissivity and temperature as the ground, so they are lumped together with the ground in calculating the ground IR view factor.

Field: ViewFactorToSky-IR

This value is calculated by EnergyPlus based on surface tilt and shadowing surfaces.

Field: #Sides

This value is the number of sides / vertices the surface has.

Fields in Vertices Reports

Field Set: Vertex x [X {m}, Y {m}, Z {m}]

For each side of the surface, the vertices are shown in three separate fields (comma separated) in the EnergyPlus "standard" coordinate order (Upper Left Corner first, Counter-Clockwise, World Coordinates). Units for each vertex is m.

Calculating with Surface Details Report

It is reasonably easy to import this data into a spreadsheet and then calculate glazing area percentage based on wall facing direction:

<Zone Name>	# Surfaces			
<Surface Name>	<Surface Class>	Nominal U (w/o film coef)	Area (Net)	Azimuth
		{W/m2-K}	{m2}	{deg}
HEARTLAND AREA	**35**			
ZN001:WALL001	WALL	0.64	136	180
ZN001:WALL001:WIN001	WINDOW	6.12	64	180
South Window/Wall			**32%**	
ZN001:WALL002	WALL	0.64	155	90
ZN001:WALL002:WIN001	WINDOW	6.12	15	90
ZN001:WALL002:WIN002	WINDOW	6.12	15	90
ZN001:WALL002:WIN003	WINDOW	6.12	15	90
East Window/Wall			**23%**	
ZN001:WALL003	WALL	0.64	155	0
ZN001:WALL003:WIN001	WINDOW	6.12	15	0
ZN001:WALL003:WIN002	WINDOW	6.12	15	0
ZN001:WALL003:WIN003	WINDOW	6.12	15	0
North Window/Wall			**23%**	
ZN001:WALL004	WALL	0.64	155	270
ZN001:WALL004:WIN001	WINDOW	6.12	15	270
ZN001:WALL004:WIN002	WINDOW	6.12	15	270
ZN001:WALL004:WIN003	WINDOW	6.12	15	270
West Window/Wall			**23%**	

Figure 3. Surface Details with Window/Wall % calculated

OtherSideCoefficient Outputs

For the most part, the output for the Other Side Coefficients represents the input as entered. The header record for the Other Side Coefficients output is shown below:

```
Line 1: ! Other Side Coefficients,Name,Combined convective/radiative film coefficient,User selected Constant Temperature,Coefficient modifying the constant temperature term,Coefficient modifying the external dry bulb temperature term,Coefficient modifying the ground temperature term,Coefficient modifying the wind speed term {s/m},Coefficient modifying the zone air temperature term,Constant Temperature Schedule Name
```

Field: Other Side Coefficients

This field will be filled with the text **OtherSideCoefficients**.

The report describes the actions for the following equation:

The coefficients listed above are used in the following equation:

$$T = C2 * Tzone + C3 * Toadb + C4 * C5 + C6 * Tgrnd + C7 * Wspd * Toadb$$

where:

T = Outdoor air Temperature when Combined convective/radiative film Coeff > 0

T = Exterior Surface Temperatre when Combined convective/radiative film Coeff <= 0

Tzone = Temperature of the zone being simulated (°C)

Toadb = Dry-bulb temperature of the outdoor air (°C)

Tgrnd = Temperature of the ground (°C)

Wspd = Outdoor wind speed (m/sec)

Field: Name

This is the unique name entered for the OtherSideCoefficient. Note that the surface it applies to will have this name in the <ExtBoundCondition> field.

Field: Combined convective/radiative film coefficient

This field is a trigger value. When entered as >0, it is used as the combined convective/radiative film coefficient. The other fields in the OtherSideCoefficient object are used then as well: the remaining fields are used first to calculate the outdoor air temperature for the surface and then to calculate the outside surface temperature based on the outdoor air temperature and the film coefficient. If this field contains **N/A**, then the remaining fields are used to calculate the surface temperature (not the outdoor air temperature).

Field: User selected Constant Temperature

This field is a temperature that remains a constant part of the calculation either of the surface or outdoor air temperature. When the schedule option is used, this field will show **N/A**. The parameter in the equation for this or the schedule value is ***C5***.

Field: Coefficient modifying the constant temperature term

This field is multiplied to the previous field when a simple number is entered. This parameter is shown as ***C4*** in the equation. This parameter is dimensionless. The value of this parameter should be 1.0 if a schedule is used to set ***C5***.

Field: Coefficient modifying the external dry bulb temperature term

This field defines a constant coefficient that is applied to the outdoor air dry-bulb temperature. This parameter is shown as ***C3*** in the equation. This parameter is dimensionless.

Field: Coefficient modifying the ground temperature term

This field defines a constant coefficient that is applied to the ground temperature. This parameter is shown as ***C6*** in the equation. This parameter is dimensionless.

Field: Coefficient modifying the wind speed term {s/m}

This field defines a constant coefficient that is applied to the product of the outdoor air dry-bulb temperature and the wind speed. This parameter is shown as ***C7*** in the equation. This parameter has dimensions of inverse velocity or s/m.

Field: Coefficient modifying the zone air temperature term

This field defines a constant coefficient that is applied to the temperature of the zone to which this surface belongs. This parameter is shown as ***C2*** in the equation. This parameter is dimensionless.

Field: Constant Temperature Schedule Name

This field is used to supply a schedule name. That schedule supplies the “constant” temperature value ***C5***. Note that the value of the ***C4*** field should normally be 1.0 if a schedule is used for ***C5***. If this field contains a value, then constant temperature field will be **N/A** in this report.

Construction Element Outputs

An optional report (contained in **eplusout.eio**) gives calculated elements for the materials and constructions used in the input. One report is specific to opaque constructions (note that nominal thermal conductance is calculated).

The report is invoked by including the following in the IDF:

```
Report,Construction;
```

```
Line 1: ! <Construction>,Construction Name,#Layers,#CTFs,Time Step {hours},ThermalConductance {w/m2-K},OuterThermalAbsorptance,InnerThermalAbsorptance,OuterSolarAbsorptance,InnerSolarAbsorptance,Roughness
Line 2: ! <Material>,Material Name,Thickness {m},Conductivity {w/m-K},Density {kg/m3},Specific Heat {J/kg-K},ThermalResistance {m2-K/w}
Line 3: ! <Material:Air>,Material Name,ThermalResistance {m2-K/w}
Line 4: ! <CTF>,Time,Outside,Cross,Inside,Flux (except final one)
Ex Line 1: Construction,EXTWALL09, 4,10, 0.250,2.545    ,   0.900,   0.900,   0.930,   0.920,Rough
Ex Line 2: Material,A2 - 4 IN DENSE FACE BRICK,  0.1015, 1.245, 2082.400, 920.480,  0.8151E-01
Ex Line 2: Material:Air,B1 - AIRSPACE RESISTANCE,  0.1604
Ex Line 2: Material,C3 - 4 IN HW CONCRETE BLOCK,  0.1015, 0.813,  977.126,  836.800,  0.1249
Ex Line 2: Material,E1 - 3 / 4 IN PLASTER OR GYP BOARD,0.0191,0.726, 1601.846,  836.800,  0.2622E-01
Ex Line 3: CTF,  10,      0.13890138E-11,      0.95367648E-14,      0.62566281E-10,     -0.39500133E-14
Ex Line 3: CTF,   9,     -0.32803336E-08,      0.29933755E-10,     -0.60855613E-07,      0.10196216E-10
Ex Line 3: CTF,   8,      0.23798948E-05,      0.21201413E-07,      0.21649376E-04,     -0.88463084E-08
Ex Line 3: CTF,   7,     -0.58681847E-03,      0.38118098E-05,     -0.26539198E-02,      0.25879187E-05
Ex Line 3: CTF,   6,      0.46201324E-01,      0.18871269E-03,      0.12095720    ,     -0.26290432E-03
Ex Line 3: CTF,   5,      -1.2828328    ,      0.27337395E-02,      -2.1646103    ,      0.91268499E-02
Ex Line 3: CTF,   4,       13.603723    ,      0.11920108E-01,       17.065325    ,     -0.12663354
Ex Line 3: CTF,   3,      -62.546625    ,      0.15112689E-01,      -64.276824    ,      0.73877389
Ex Line 3: CTF,   2,       133.27916    ,      0.47414487E-02,       120.00640    ,      -1.9706501
Ex Line 3: CTF,   1,      -130.02410    ,      0.22383019E-03,      -106.88260    ,       2.3359193
Ex Line 3: CTF,   0,       46.959981    ,      0.53137072E-06,       36.168919
```

Description of the Opaque Construction Report

The Opaque Construction report has 3 parts for each construction.

Part 1 is the construction name along with some derived values for the entire construction (i.e. Thermal Conductance) as well as noting other details about the surface (# CTFs, # Layers).

Part 2 shows the material layers for the construction. This is essentially just an echo of the entered properties of the materials from the IDF.

Part 3 shows the CTFs as calculated for the Construction. CTFs are described more completely in the Engineering Reference document.

Fields in Part 1 – Opaque Construction Report

Field: <Construction>

This will be filled with the constant “Construction” for each Construction line.

Field: Construction Name

This is the name of the construction as entered in the IDF.

Field: #Layers

This is the number of material layers inferred from the construction entry in the IDF. Material layers are listed “outside” to “inside” of the construction. This, of course, depends on the placement of the surface in the building – the “outside” of an internal surface is the layer that is closest to whatever the surface touches whereas the “inside” of an internal surface is the layer that shows in the surface’s “zone”. The outside of an external surface is the layer that faces the outside environment and, again, the inside is the layer that shows in the zone.

Field: #CTFs

This is the calculated number of CTFs (Conduction Transfer Functions). The conduction transfer functions are temperature and flux coefficients that characterize the thermal properties of the wall.

Field: Time Step

The "timestep" in the construction line is the timestep at which the CTFs are valid. Because CTFs for certain constructions might not be stable at the user specified timestep (might be too "heavy" from a thermal mass standpoint), this may be different from the zone timestep (specified in “TimeStep in Hour”). In all cases though, this will be greater than or equal to the zone timestep. If the timestep for the construction is greater than the zone timestep, E+ will use interpolated histories to solve for the surface heat balances for this surface (see discussion on interpolated histories in the Engineering Reference document).

Field: Thermal Conductance

This is the nominal thermal conductance of the construction calculated without film coefficients. Units are w/m^2-K.

Field: Outer Thermal Absorptance

This will be the thermal absorptance of the outer material layer.

Field: Inner Thermal Absorptance

This will be the thermal absorptance of the inner material layer.

Field: Outer Solar Absorptance

This will be the solar absorptance of the outer material layer.

Field: Inner Solar Absorptance

This will be the solar absorptance of the inner material layer.

Field: Roughness

The construction takes on the roughness from the outer material layer. Roughness is used in several parts of external environment calculations.

Fields in Part 2 – Opaque Construction Report

```
Line 2: ! <Material>,Material Name,Thickness {m},Conductivity {w/m-K},Density {kg/m3},Specific Heat {J/kg-K},ThermalResistance {m2-K/w}
```

In this version of part 2, the full material properties are entered by the user and displayed in the report.

Field: <Material>

This will be filled with the constant “Material” for each material layer line.

Field: Material Name

This is the name of the material as entered in the IDF.

Field: Thickness

This is the entered thickness of the material. Units are m.

Field: Conductivity

For Material:Regular materials, this will be the entered conductivity in w/m-K. For Material:Regular-R materials, this will be shown as 0.0.

Field: Density

For Material:Regular materials, this will be the entered density in kg/m^3. For Material:Regular-R materials, this will be shown as 0.0.

Field: Specific Heat

For Material:Regular materials, this will be the entered specific heat in J/kg-K. For Material:Regular-R materials, this will be shown as 0.0.

Field: Thermal Resistance

For Material:Regular-R materials, this is the entered thermal resistance in m^2-K/w. For Material:Regular materials, this is the calculated thermal resistance based on the other properties.

```
Line 3: ! <Material:Air>,Material Name,ThermalResistance {m2-K/w}
```

In this version of part 2, only the thermal resistance of the air layer is entered by the user and displayed in the report.

Field: <Material:Air>

This will be filled with the constant “Material:Air” for each material layer line.

Field: Material Name

This is the name of the material as entered in the IDF.

Field: Thermal Resistance

This is the entered thermal resistance in m^2-K/w.

Fields in Part 3 – Opaque Construction Report

```
Line 4: ! <CTF>,Time,Outside,Cross,Inside,Flux (except final one)
```

In part 3, the CTF calculations are shown. It is necessary to use the conduction transfer functions labeled "Inside" and "Cross" to calculate the heat flux at the inside surface and the conduction transfer functions labeled "Outside" and "Cross" to calculate the heat flux at the outside surface. Inside and outside coefficients will be identical for symmetric walls.

Conduction through constructions such as walls, roofs, floors, etc. is generally characterized as one-dimensional and transient within EnergyPlus. The solution to this partial differential equation results in "conduction transfer functions" or CTFs. In a CTF equation, the current heat transfer flux due to conduction through a construction is a function of the current temperature at either face of the surface as well as the history of temperatures at either face and the history of conductive fluxes at this face. CTFs are a simplification of response factors which are based solely on temperature histories and require an "infinite" history. The inclusion of heat flux history terms reduces the overall number of terms in the equation for conductive flux significantly, resulting in a more efficient solution.

For each unique combination of materials, there are a unique set of CTFs. While there are other procedures to determine the CTFs for a particular construction, EnergyPlus uses a state-space method (see conduction transfer function documentation) to obtain the CTF coefficients. These coefficients are calculated once at the beginning of the simulation and are constant for a particular construction. The CTF equation itself is a linear equation with these constant coefficients.

Conduction heat transfer flux at the outside face of a particular surface is a function of the construction of the surface (which leads to the CTF coefficients), the current and previous temperatures at both the inside and outside face of the surface, and the previous conduction heat transfer fluxes at the outside surface. The CTF coefficients that would be used in this equation would be the "Outside" (multiplied by the temperature history at the outside face) terms, the "Cross" (multiplied by the temperature history at the inside face) terms, and the "Flux" (multiplied by the flux history at the outside face) terms. Solving for the conductive flux at the inside surface would require the use of the "Inside" (multiplied by the temperature history at the inside face) terms, the "Cross" (multiplied by the temperature history at the outside face) terms, and the "Flux" (multiplied by the flux history at the inside face) terms. A textual example is given below for illustration purposes:

Current Outside Conductive Flux = (Outside Term 0) * (Current Outside Face Temperature)

+(Outside Term 1) * (Previous Outside Face Temperature)
+(Outside Term 2) * (Outside Face Temperature 2 Time Steps Ago)
+(Outside Term 3) * (Outside Face Temperature 3 Time Steps Ago)
+ ...
+(Cross Term 0) * (Current Inside Face Temperature)
+(Cross Term 1) * (Previous Inside Face Temperature)
+(Cross Term 2) * (Inside Face Temperature 2 Time Steps Ago)
+(Cross Term 3) * (Inside Face Temperature 3 Time Steps Ago)

+ ...
+(Flux Term 1) * (Previous Outside Face Flux)
+(Flux Term 2) * (Outside Face Flux 2 Time Steps Ago)
+(Flux Term 3) * (Outside Face Flux 3 Time Steps Ago)
+ ...

The number of terms is based on the CTF coefficient calculation routine and is related to the amount of thermal mass contained within a particular construction. Actual signs (positive or negative) of various terms in the preceding equation will vary based on their definition and use within the equation. Those interested in more details on the use and calculation of CTFs are encouraged to read the Engineering Documentation.

Field: <CTF>

This will be filled with the constant "CTF" for each CTF coefficient line.

Field: Time

This field "time" refers to the history term to which the coefficients are applied. The last line is the "zero" term that gets applied to the current values of temperatures. The line with a "1" refers to the temperatures and fluxes from the previous timestep--previous as in time minus one timestep. Timestep, in this case, is defined by the construction timestep (see description on "Fields in Part 1 – Opaque Construction Report") *not* the zone timestep. Lines with other values are for previous timesteps at t-n(timestep). These are the terms that are used to model conduction through a construction.

Field: Outside

Field: Cross

Field: Inside

Field: Flux (except final one)

Description of the Windows Construction Report

A separate report is available for windows (note that both nominal conductance and Solar Heat Gain Coefficient are calculated for windows). Like the opaque construction, the window construction report has multiple parts – in this case, 2.

```
Line 1: ! <WindowConstruction>,Construction Name,#Layers,Roughness,Conductance {w/m2-K},SHGC,SolarTransmittanceNormalIncid,VisibleTransmittanceNormalIncid
Line 2: ! <Material:WindowGlass>,Material Name,Thickness {m},Conductivity {w/m-K},SolarTransmittance,VisibleTransmittance,ThermalFrontAbsorptance,ThermalBackAbsorptance,SolarFrontReflectance,SolarBackReflectance,VisibleFrontReflectance,VisibleBackReflectance,GlassTransDirtFactor,SolarDiffusing
Line 3: ! <Material:WindowGas>,Material Name,GasType,Thickness {m}
Line 4: ! <Material:WindowShade>,Material Name,Thickness {m},Conductivity {w/m-K},ThermalAbsorptance,Transmittance,VisibleTransmittance,ShadeReflectance
Line 5: ! <Material:WindowScreen>,Material Name,Thickness {m},Conductivity {w/m-K},ThermalAbsorptance,Transmittance,Reflectance,VisibleReflectance,DiffuseReflectance,DiffuseVisibleReflectance,ScreenMaterialDiameterToSpacingRatio,ScreenToGlassDistance {m}
Line 6: ! <Material:WindowBlind>,Material Name,SlatWidth {m},SlatSeparation {m},SlatThickness {m},SlatAngle {deg},SlatBeamSolarTransmittance,SlatBeamSolarFrontReflectance,BlindToGlassDistance {m}
Construction,DOUBLE PANE WITH SCREEN,   4,MediumRough,   2.555,   0.555,   0.511,   0.589
 Material:WindowScreen,BRIGHT ALUMINUM SCREEN 1,0.00025,   2.210E+02,   0.272,   0.697,   0.172,   0.172,
0.218,   0.218,   0.165,   0.025
 Material:WindowGlass,GLASS - CLEAR SHEET 1 / 8 IN,   0.003,   0.900,   0.837,   0.898,   0.840,   0.840,
0.075,   0.075,   0.081,   0.081,   1.000,NO
 Material:WindowGas,WINAIRB1 - AIRSPACE RESISTANCE,Air,   1.300E-02,
 Material:WindowGlass,GLASS - CLEAR SHEET 1 / 8 IN,   0.003,   0.900,   0.837,   0.898,   0.840,   0.840,
0.075,   0.075,   0.081,   0.081,   1.000,NO
Construction,DOUBLE PANE WITH SHADE,   4,VerySmooth,   2.761,   0.627,   0.267,   0.310
 Material:WindowGlass,GLASS - CLEAR SHEET 1 / 8 IN,   0.003,   0.900,   0.837,   0.898,   0.840,   0.840,
0.075,   0.075,   0.081,   0.081,   1.000,NO
 Material:WindowGas,WINAIRB1 - AIRSPACE RESISTANCE,Air,   1.300E-02,
 Material:WindowGlass,GLASS - CLEAR SHEET 1 / 8 IN,   0.003,   0.900,   0.837,   0.898,   0.840,   0.840,
0.075,   0.075,   0.081,   0.081,   1.000,NO
 Material:WindowShade,INTERIOR SHADE,   0.003,   1.000E-01,   0.900,   0.360,   0.360,   0.250
Construction,DOUBLE PANE WITH BLIND,   4,VerySmooth,   2.761,   0.714,   0.395,   0.456
 Material:WindowGlass,GLASS - CLEAR SHEET 1 / 8 IN,   0.003,   0.900,   0.837,   0.898,   0.840,   0.840,
0.075,   0.075,   0.081,   0.081,   1.000,NO
 Material:WindowGas,WINAIRB1 - AIRSPACE RESISTANCE,Air,   1.300E-02,
 Material:WindowGlass,GLASS - CLEAR SHEET 1 / 8 IN,   0.003,   0.900,   0.837,   0.898,   0.840,   0.840,
0.075,   0.075,   0.081,   0.081,   1.000,NO
 Material:WindowBlind,INTERIOR BLIND, 0.0010, 0.0022, 0.0010,  0.000,   0.000,   0.200,   0.025
```

Fields in Part 1 – Window Construction Report

```
Line 1: ! <WindowConstruction>,Construction Name,#Layers,Roughness,Conductance {w/m2-K},SHGC,SolarTransmittanceNormalIncid,VisibleTransmittanceNormalIncid
```

Field: <WindowConstruction>

This will be filled with the constant "Construction" for each Window Construction line.

Field: Construction Name

This is the name of the window as entered in the IDF.

Field: #Layers

This is the number of material layers inferred from the windows construction entry in the IDF. Material layers are listed "outside" to "inside" of the construction. This, of course, depends on the placement of the surface in the building – the "outside" of an internal surface is the layer that is closest to whatever the surface touches whereas the "inside" of an internal surface is the layer that shows in the surface's "zone". The outside of an external surface is the layer that faces the outside environment and, again, the inside is the layer that shows in the zone.

Field: Roughness

The window construction takes on the roughness from the outer material layer. Roughness is used in several parts of external environment calculations.

Field: Conductance

This is the center-of-glass conductance of the construction calculated with film coefficients, for winter conditions (indoor air temperature = 21C (69.8F), outdoor air temperature = -18C (-.4F), windspeed = 5.5 m/s (12.3 mph), no solar radiation). Units are W/m^2-K.

Field: SHGC

This is the center-of-glass Solar Heat Gain Coefficient for summer conditions (indoor air temperature = 24C (75.2F), outdoor air temperature = 32C (89.6F), windspeed = 2.8 m/s (6.2 mph), 783 W/m2 (248 Btu/h-ft2) incident beam solar radiation normal to glazing.

The following transmittance and reflectance values are for the window glazing (plus shade, screen or blind, if present in the construction). For exterior windows, "front" means the side of the window facing the exterior environment and "back" means the side facing the zone. For interior windows, "front" means the side to window facing the zone and "back" means the side facing the adjacent zone.

Field: Solar Transmittance at Normal Incidence (SolarTransmittanceNormalIncid)

Transmittance at normal incidence averaged over the solar spectrum.

Field: Visible Transmittance at Normal Incidence (VisibleTransmittanceNormalIncid)

Transmittance normal incidence averaged over the solar spectrum and weighted by the response of the human eye.

Fields in Part 2 – Window Construction Report

Part 2 of the Window Construction Report encompasses several "lines".

```
Line 2: ! <Material:WindowGlass>,Material Name,Thickness {m},Conductivity {w/m-K},SolarTransmittance,VisibleTransmittance,ThermalFrontAbsorptance,ThermalBackAbsorptance,SolarFrontReflectance,SolarBackReflectance,VisibleFrontReflectance,VisibleBackReflectance,GlassTransDirtFactor,SolarDiffusing
Line 3: ! <Material:WindowGas>,Material Name,GasType,Thickness {m}
Line 4: ! <Material:WindowShade>,Material Name,Thickness {m},Conductivity {w/m-K},ThermalAbsorptance,Transmittance,VisibleTransmittance,ShadeReflectance
Line 5: ! <Material:WindowScreen>,Material Name,Thickness {m},Conductivity {w/m-K},ThermalAbsorptance,Transmittance,Reflectance,VisibleReflectance,DiffuseReflectance,DiffuseVisibleReflectance,ScreenMaterialDiameterToSpacingRatio,ScreenToGlassDistance {m}
Line 6: ! <Material:WindowBlind>,Material Name,SlatWidth {m},SlatSeparation {m},SlatThickness {m},SlatAngle {deg},SlatBeamSolarTransmittance,SlatBeamSolarFrontReflectance,BlindToGlassDistance {m}
```

Material:WindowGlass

Field: <Material:WindowGlass>

This will be filled with the constant "Material:WindowGlass" for each material of this type in the construction.

Field: Material Name

Name of the glass layer.

Field: Thickness {m}

Thickness of the glass layer.

Field: Conductivity {w/m-K}

Conductivity of the glass layer.

Field: SolarTransmittance

Transmittance of the glass layer at normal incidence averaged over the solar spectrum.

Field: VisibleTransmittance

Transmittance normal incidence of the glass layer averaged over the solar spectrum and weighted by the response of the human eye.

Field: ThermalFrontAbsorptance

Thermal emissivity of the front face of the glass layer.

Field: ThermalBackAbsorptance

Thermal emissivity of the back face of the glass layer.

Field: SolarFrontReflectance

Reflectance of the front face of the glass layer at normal incidence averaged over the solar spectrum.

Field: SolarBackReflectance

Reflectance of the back face of the glass layer at normal incidence averaged over the solar spectrum.

Field: VisibleFrontReflectance

Reflectance of the front face of the glass layer at normal incidence averaged over the solar spectrum.

Field: VisibleBackReflectance

Reflectance of the back face of the glass layer at normal incidence averaged over the solar spectrum.

Field: GlassTransDirtFactor

Glass transmittance dirt factor (1.0 is clear, no dirt factor).

Field: SolarDiffusing

Solar Diffusing value – Yes if solar diffusing glass, No if not.

Material:WindowGas

Field: <Material:WindowGas>

This will be filled with the constant “Material:WindowGas” for each material of this type in the construction.

Field: Material Name

Name of the gas layer.

Field: GasType

Type of the gas layer. Possibilities are Air, Argon, Krypton, Xenon, and Custom.

Field: Thickness {m}

Thickness of the gas layer.

Material:WindowShade

Field: <Material:WindowShade>

This will be filled with the constant “Material:WindowShade” for each material of this type in the construction.

Field: Material Name

Name of the window shade layer.

Field: Thickness {m}

Thickness of the window shade layer.

Field: Conductivity {w/m-K}

Thermal conductivity of the window shade layer.

Field: ThermalAbsorptance

Emissivity of the window shade layer (assumed same for front and back faces).

Field: SolarTransmittance

Transmittance of the window shade layer averaged over the solar spectrum. Assumed same for beam solar radiation and diffuse solar radiation. Transmittance of beam solar radiation is assumed to be independent of angle of incidence.

Field: VisibleTransmittance

Transmittance of the window shade layer averaged over the solar spectrum and weighted by the response of the human eye. Assumed same for beam visible radiation and diffuse visible radiation. Transmittance of beam visible radiation is assumed to be independent of angle of incidence.

Field: ShadeReflectance

Reflectance of the window shade layer averaged over the solar spectrum. Assumed same for beam solar radiation and diffuse solar radiation. Reflectance of beam solar radiation is assumed to be independent of angle of incidence. Reflectance is assumed to be the same for the front and back faces of the shade layer.

Material:WindowBlind

This will be filled with the constant “Material:WindowBlind” for each material of this type in the construction.

Field: <Material:WindowBlind>

Field: Material Name

Name of the blind layer.

Field: SlatWidth {m}

Width of the slats in the blind.

Field: SlatSeparation {m}

Distance between the centerline of adjacent slats.

Field: SlatThickness {m}

Distance between front and back faces of a slat.

Field: SlatAngle {deg}

This is the angle between the glazing outward normal and the slat outward normal, where the outward normal points away from the front face of the slat.

Field: SlatBeamSolarTransmittance

The beam solar transmittance of the slat at normal incidence. Any transmitted beam radiation is assumed to be 100% diffuse (i.e., slats are translucent). Transmittance is assumed to have the same value at other angles of incidence.

Field: SlatBeamSolarFrontReflectance

The beam solar reflectance at normal incidence on the front side of the slat. Assumed to have the same value at other angles of incidence (matte finish).

Field: BlindToGlassDistance {m}

Distance from the mid-plane of the blind to the adjacent glass (m).

Material:WindowScreen

Field: <Material:WindowScreen>

This will be filled with the constant "Material:WindowScreen" for each material of this type in the construction.

Field: Material Name

Name of the window screen layer.

Field: Thickness {m}

Thickness of the window screen layer (screen material diameter).

Field: Conductivity {w/m-K}

Thermal conductivity of the window screen layer. This is the effective value for the overall screen "assembly" including open spaces between the screen material.

Field: ThermalAbsorptance

Emissivity of the window screen layer (assumed same for front and back faces). This is the effective value for the overall screen "assembly" including open spaces between the screen material.

Field: Transmittance

Beam transmittance of the window screen layer including any inward reflections from the material surface if specified (i.e., Material: WindowScreen, field Reflected Beam Transmittance Accounting Method). This is the effective value for the overall screen "assembly" including open spaces between the screen material. The value reported here is for direct normal incidence.

Field: Reflectance

Solar reflectance (beam-to-diffuse) of the window screen layer accounting for inward-reflected beam solar radiation as specified (i.e., Material: WindowScreen, field Reflected Beam Transmittance Accounting Method). This is the effective value for the overall screen "assembly" including open spaces between the screen material averaged over the solar spectrum. The value reported here is for direct normal incidence.

Field: VisibleReflectance

Visible reflectance (beam-to-diffuse) of the window screen layer accounting for inward-reflected beam solar radiation as specified (i.e., Material: WindowScreen, field Reflected Beam Transmittance Accounting Method). This is the effective value for the overall screen "assembly" including open spaces between the screen material averaged over the solar spectrum and weighted by the response of the human eye. The value reported here is for direct normal incidence.

Field: DiffuseReflectance

Solar reflectance (diffuse-to-diffuse) of the window screen layer accounting for inward-reflected beam solar radiation as specified (i.e., Material: WindowScreen, field Reflected Beam Transmittance Accounting Method). Reflectance of diffuse solar radiation is considered constant and applies to both the front and back surfaces of the screen. Diffuse reflectance is calculated by the model as an average value by integrating the screen's solar reflectance (beam-to-diffuse) over a quarter hemisphere of incident radiation.

Field: DiffuseVisibleReflectance

Visible reflectance (diffuse-to-diffuse) of the window screen layer accounting for inward-reflected beam solar radiation as specified (i.e., Material: WindowScreen, field Reflected Beam Transmittance Accounting Method). Visible reflectance of diffuse solar radiation is considered constant and applies to both the front and back surfaces of the screen. Diffuse visible reflectance is calculated by the model as an average value by integrating the screen's visible beam reflectance (beam-to-diffuse) over a quarter hemisphere of incident radiation.

Field: ScreenMaterialDiameterToSpacingRatio

The aspect ratio of the screen material. The aspect ratio is calculated as the ratio of the screen material diameter to screen material spacing.

Field: ScreenToGlassDistance {m}

Distance from the mid-plane of the screen to the adjacent glass (m).

HAMT Cell Data

This gives the surface name, the construction name, the origins and cell numbers of the cells used within the HAMT solutions algorithm. The cell numbering starts from the external surface to the internal surface.

```
! <HAMT origins>, Surface Name, Construction Name, Cell origins (m)
! <HAMT cells>, Surface Name, Construction Name, Cell Numbers
HAMT origins,SOUTH WALL,EXTERIOR WALL, 0.0000000, 0.0005729,
0.0026459, 0.0060000, 0.0093541, 0.0114271, 0.0128076, 0.0159588,
0.0219528, 0.0302028, 0.0399012, 0.0500988, 0.0597972, 0.0680472,
0.0740412, 0.0771924, 0.0785729, 0.0806459, 0.0840000, 0.0873541,
0.0894271, 0.0900000
HAMT cells, SOUTH WALL,EXTERIOR
WALL,    1,    2,    3,    4,    5,    6,    7,    8,    9,   10,   11,   12,
13,   14,   15,   16,   17,   18,   19,   20,   21,   22
```

Field: Surface Name

Name of the Surface.

Field: Construction Name

Name of the construction.

Field: Cell origins

Origins of the Cells.

Field: Cell Numbers

Numbers for the Cells.

Sizing Information

The sizing information in the .eio file reflects the inputs and results for the zone, system and plant (component). Actual fields/details included depend on the "autosize" inputs.

Timesteps in Zone Design Calculation

```
! <Load Timesteps in Zone Design Calculation Averaging Window>, Value
 Load Timesteps in Zone Design Calculation Averaging Window,     1
```

Field: Load Timesteps in Zone Design Calculation Averaging Window

The number of load timesteps in the zone design flow sequence averaging window. The default is 1, in which case the calculated zone design flow rates are averaged over the load timestep.

The zone design air flow rate calculation is performed assuming a potentially infinite supply of heating or cooling air at a fixed temperature. Thus, the calculated design air flow rate will always be able to meet any load or change in load no matter how large or abrupt. In reality air flow rates are limited by duct sizes and fan capacities. The idealized zone design flow calculation may result in unrealistically large flow rates, especially if the user is performing the sizing calculations using thermostat schedules with night setup or setback. The calculated zone design flow rates are always averaged over the load timestep. The user may want to perform a broader average to mitigate the effect of thermostat setup and setback and prevent the warm up or cool down flow rates from dominating the design flow rate calculation. Specifying the width of the averaging window allows the user to do this.

For example, if the load calculation timestep is 15 minutes and the user specifies the *timesteps in averaging window* to be 4, the zone design air flows will be averaged over a time period of 1 hour. Specifying 8 would result in averaging over a 2 hour period.

Sizing Factor Information

```
! <Sizing Factor Information>, Sizing Factor ID, Value
Sizing Factor Information, Global,   1.3000
 Sizing Factor Information, Zone SPACE1-1,   1.3000
 Sizing Factor Information, Zone SPACE2-1,   1.3000
 Sizing Factor Information, Zone SPACE3-1,   1.3000
 Sizing Factor Information, Zone SPACE4-1,   1.3000
 Sizing Factor Information, Zone SPACE5-1,   1.3000
```

Field: Sizing Factor ID

Sizing factors can be entered in two places: Sizing Parameters, Zone Sizing. If entered in the Sizing Parameters statement, the Sizing Factor ID is "Global" (applied to all if not specified). If entered in the Zone Sizing statement, the Zone and Zone Name designation are shown.

This sizing factor ratio is applied at the zone level to all of the zone heating and cooling loads and air flow rates. These new loads and air flow rates are then used to calculate the system level flow rates and capacities and are used in all of the component sizing calculations.

Field: Value

This is the sizing factor ratio to be applied as described previously.

Zone Sizing Information

```
! <Zone Sizing Information>, Zone Name, Load Type, DesLoad {W}, Calc Des Air Flow Rate {m3/s}, UserDes Air
Flow Rate {m3/s}, Design Day Name, Date/Time of Peak, Temperature at Peak {C}, Humidity Ratio at Peak
{kgWater/kgAir}, Floor Area {m2}, # Occupants, Calc Outdoor Air Flow Rate {m3/s}
 Zone Sizing Information, SPACE1-1, Cooling, 2698.90215, 0.22672, 0.22672, CHICAGO_IL_USA ANNUAL COOLING
1% DESIGN CONDITIONS DB/MCWB, 7/21 16:00:00, 31.17900, 1.45947E-002, 99.16000, 11.00000, 5.62038E-002
 Zone Sizing Information, SPACE1-1, Heating, 3947.71021, 0.11914, 0.11914, CHICAGO_IL_USA ANNUAL HEATING
99% DESIGN CONDITIONS DB, 1/21 24:00:00, -17.30000, 8.38927E-004, 99.16000, 11.00000, 5.62038E-002
 Zone Sizing Information, SPACE2-1, Cooling, 2103.11548, 0.17666, 0.17666, CHICAGO_IL_USA ANNUAL COOLING
1% DESIGN CONDITIONS DB/MCWB, 7/21 09:45:00, 25.10675, 1.45947E-002, 42.73500, 5.00000, 2.48342E-002
 Zone Sizing Information, SPACE2-1, Heating, 1626.05728, 4.90731E-002, 4.90731E-002, CHICAGO_IL_USA ANNUAL
HEATING 99% DESIGN CONDITIONS DB, 1/21 24:00:00, -17.30000, 8.38927E-004, 42.73500, 5.00000, 2.48342E-002
 Zone Sizing Information, SPACE3-1, Cooling, 2493.27800, 0.20944, 0.20944, CHICAGO_IL_USA ANNUAL COOLING
1% DESIGN CONDITIONS DB/MCWB, 7/21 15:00:00, 31.50000, 1.45947E-002, 96.48000, 11.00000, 5.53864E-002
 Zone Sizing Information, SPACE3-1, Heating, 3753.70268, 0.11328, 0.11328, CHICAGO_IL_USA ANNUAL HEATING
99% DESIGN CONDITIONS DB, 1/21 24:00:00, -17.30000, 8.38927E-004, 96.48000, 11.00000, 5.53864E-002
 Zone Sizing Information, SPACE4-1, Cooling, 2649.62711, 0.22257, 0.22257, CHICAGO_IL_USA ANNUAL COOLING
1% DESIGN CONDITIONS DB/MCWB, 7/21 17:30:00, 29.84150, 1.45947E-002, 42.73500, 5.00000, 2.48342E-002
 Zone Sizing Information, SPACE4-1, Heating, 1626.05728, 4.90731E-002, 4.90731E-002, CHICAGO_IL_USA ANNUAL
HEATING 99% DESIGN CONDITIONS DB, 1/21 24:00:00, -17.30000, 8.38927E-004, 42.73500, 5.00000, 2.48342E-002
 Zone Sizing Information, SPACE5-1, Cooling, 2641.08224, 0.22187, 0.22187, CHICAGO_IL_USA ANNUAL COOLING
1% DESIGN CONDITIONS DB/MCWB, 7/21 15:00:00, 31.50000, 1.45947E-002, 182.49000, 20.00000, 0.10286
 Zone Sizing Information, SPACE5-1, Heating, 2985.27300, 9.00926E-002, 0.10286, CHICAGO_IL_USA ANNUAL
HEATING 99% DESIGN CONDITIONS DB, 1/21 24:00:00, -17.30000, 8.38927E-004, 182.49000, 20.00000, 0.10286
```

Field: <Zone Sizing Information>

This field just contains "Zone Sizing".

Field: Zone Name

This field contains the Zone Name.

Field: Load Type

This field specifies which kind of load is being sized – Heating or Cooling.

Field: DesLoad {W}

This is the Design Load in Watts.

Field: Calc Des Air Flow Rate {m3/s}

This is the calculated design air flow rate in m3/s. The calculated design air flow rate is the "nonadjusted" air flow rate. It is the air flow rate sufficient to meet the zone loads from the design day simultion.

Field: UserDes Air Flow Rate {m3/s}

User Des Air Flow rate is the flow rate after user specified adjustments and is the flow rate actually used for sizing components. Following the calculations (as in the previous field) various adjustments can be made based on user input - the most obvious is a sizing factor; but it could also be something like cooling min air flow per zone area or just a user input design flow rate.

Field: Design Day Name

This is the name of the design day or design run period that triggered the sizing calculations.

Field: Date/Time of Peak

This is the date and time of the peak load (used for the sizing calculations).

Field: Temperature at Peak {C}

This is the temperature (outdoor dry-bulb) at the time of the peak load.

Field: Humidity Ratio at Peak {kgWater/kgAir}

This is the humidity ratio (outdoor) at the time of the peak load.

Field: Floor Area {m2}

This is the floor area of the zone.

Field: # Occupants

This is the number of occupants in the zone.

Field: Calc Outdoor air Flow Rate {m3/s}

This is the calculated outdoor air flow rate.

System Sizing Information

```
! <System Sizing Information>, System Name, Field Description, Value
 System Sizing Information, VAV SYS 1, Calculated Cooling Design Air Flow Rate [m3/s], 1.05725
 System Sizing Information, VAV SYS 1, User Cooling Design Air Flow Rate [m3/s], 1.05725
 System Sizing Information, VAV SYS 1, Calculated Heating Design Air Flow Rate [m3/s], 0.43343
 System Sizing Information, VAV SYS 1, User Heating Design Air Flow Rate [m3/s], 0.43343
```

Field: <System Sizing Information>

This field just contains “System Sizing”.

Field: System Name

This field contains the system (Air Loop) name.

Field: Field Description

This contains the field description and units.

Field: Value

This contains the value of the field.

Component Sizing Information

Component sizing is applicable to all manners of autosized components and equipments (coils, boilers, chillers, towers, etc.)

```
! <Component Sizing Information>, Component Type, Component Name, Input Field Description, Value
Component Sizing Information, AirTerminal:SingleDuct:VAV:Reheat, SPACE1-1 VAV REHEAT, Maximum Air Flow
Rate [m3/s], 0.22672
 Component Sizing Information, AirTerminal:SingleDuct:VAV:Reheat, SPACE1-1 VAV REHEAT, Maximum Reheat
Water Flow Rate [m3/s], 5.87104E-005
 Component Sizing Information, Coil:Heating:Water, SPACE1-1 ZONE COIL, Maximum Water Flow Rate [m3/s],
5.87104E-005
 Component Sizing Information, Coil:Heating:Water, SPACE1-1 ZONE COIL, Design Coil Load [W], 2699.50304
 Component Sizing Information, Coil:Heating:Water, SPACE1-1 ZONE COIL, U-Factor Times Area Value [W/K],
66.15122
 Component Sizing Information, AirTerminal:SingleDuct:VAV:Reheat, SPACE2-1 VAV REHEAT, Maximum Air Flow
Rate [m3/s], 0.17666
 Component Sizing Information, AirTerminal:SingleDuct:VAV:Reheat, SPACE2-1 VAV REHEAT, Maximum Reheat
Water Flow Rate [m3/s], 4.57480E-005
 Component Sizing Information, Coil:Heating:Water, SPACE2-1 ZONE COIL, Maximum Water Flow Rate [m3/s],
4.57480E-005
 Component Sizing Information, Coil:Heating:Water, SPACE2-1 ZONE COIL, Design Coil Load [W], 2103.49527
 Component Sizing Information, Coil:Heating:Water, SPACE2-1 ZONE COIL, U-Factor Times Area Value [W/K],
51.54607
 Component Sizing Information, AirTerminal:SingleDuct:VAV:Reheat, SPACE3-1 VAV REHEAT, Maximum Air Flow
Rate [m3/s], 0.20944
 Component Sizing Information, AirTerminal:SingleDuct:VAV:Reheat, SPACE3-1 VAV REHEAT, Maximum Reheat
Water Flow Rate [m3/s], 5.42362E-005
 Component Sizing Information, Coil:Heating:Water, SPACE3-1 ZONE COIL, Maximum Water Flow Rate [m3/s],
5.42362E-005
 Component Sizing Information, Coil:Heating:Water, SPACE3-1 ZONE COIL, Design Coil Load [W], 2493.78307
 Component Sizing Information, Coil:Heating:Water, SPACE3-1 ZONE COIL, U-Factor Times Area Value [W/K],
61.11006
 Component Sizing Information, AirTerminal:SingleDuct:VAV:Reheat, SPACE4-1 VAV REHEAT, Maximum Air Flow
Rate [m3/s], 0.22257
 Component Sizing Information, AirTerminal:SingleDuct:VAV:Reheat, SPACE4-1 VAV REHEAT, Maximum Reheat
Water Flow Rate [m3/s], 5.76351E-005
 Component Sizing Information, Coil:Heating:Water, SPACE4-1 ZONE COIL, Maximum Water Flow Rate [m3/s],
5.76351E-005
 Component Sizing Information, Coil:Heating:Water, SPACE4-1 ZONE COIL, Design Coil Load [W], 2650.06093
 Component Sizing Information, Coil:Heating:Water, SPACE4-1 ZONE COIL, U-Factor Times Area Value [W/K],
64.93964
 Component Sizing Information, AirTerminal:SingleDuct:VAV:Reheat, SPACE5-1 VAV REHEAT, Maximum Air Flow
Rate [m3/s], 0.22187
 Component Sizing Information, AirTerminal:SingleDuct:VAV:Reheat, SPACE5-1 VAV REHEAT, Maximum Reheat
Water Flow Rate [m3/s], 5.74541E-005
 Component Sizing Information, Coil:Heating:Water, SPACE5-1 ZONE COIL, Maximum Water Flow Rate [m3/s],
5.74541E-005
 Component Sizing Information, Coil:Heating:Water, SPACE5-1 ZONE COIL, Design Coil Load [W], 2641.74210
 Component Sizing Information, Coil:Heating:Water, SPACE5-1 ZONE COIL, U-Factor Times Area Value [W/K],
64.73579
 Component Sizing Information, Branch, VAV SYS 1 MAIN BRANCH, Maximum Flow Rate [m3/s], 1.05725
 Component Sizing Information, AirLoopHVAC, VAV SYS 1, Design Supply Air Flow Rate [m3/s], 1.05725
 Component Sizing Information, Controller:OutdoorAir, OA CONTROLLER 1, Maximum Outdoor Air Flow Rate
[m3/s], 1.05725
 Component Sizing Information, Controller:OutdoorAir, OA CONTROLLER 1, Minimum Outdoor Air Flow Rate
[m3/s], 0.26412
```

```
 Component Sizing Information, Coil:Heating:Water, OA HEATING COIL 1, Maximum Water Flow Rate [m3/s], 
1.48158E-004
 Component Sizing Information, Coil:Heating:Water, OA HEATING COIL 1, Design Coil Load [W], 6812.28921
 Component Sizing Information, Coil:Heating:Water, OA HEATING COIL 1, U-Factor Times Area Value [W/K], 
84.72044
 Component Sizing Information, Coil:Cooling:Water, OA COOLING COIL 1, Design Water Flow Rate [m3/s], 
1.14523E-003
 Component Sizing Information, Coil:Cooling:Water, OA COOLING COIL 1, Design Air Flow Rate [m3/s], 0.26412
 Component Sizing Information, Coil:Cooling:Water, OA COOLING COIL 1, Design Inlet Air Temperature [C], 
30.01375
 Component Sizing Information, Coil:Cooling:Water, OA COOLING COIL 1, Design Outlet Air Temperature [C], 
11.00000
 Component Sizing Information, Coil:Cooling:Water, OA COOLING COIL 1, Design Inlet Water Temperature [C], 
7.00000
 Component Sizing Information, Coil:Cooling:Water, OA COOLING COIL 1, Design Inlet Air Humidity Ratio, 
1.45947E-002
 Component Sizing Information, Coil:Cooling:Water, OA COOLING COIL 1, Design Outlet Air Humidity Ratio, 
8.00000E-003
 Component Sizing Information, Coil:Cooling:Water, MAIN COOLING COIL 1, Design Water Flow Rate [m3/s], 
9.16309E-004
 Component Sizing Information, Coil:Cooling:Water, MAIN COOLING COIL 1, Design Air Flow Rate [m3/s], 
1.05725
 Component Sizing Information, Coil:Cooling:Water, MAIN COOLING COIL 1, Design Inlet Air Temperature [C], 
21.55448
 Component Sizing Information, Coil:Cooling:Water, MAIN COOLING COIL 1, Design Outlet Air Temperature [C], 
12.80000
 Component Sizing Information, Coil:Cooling:Water, MAIN COOLING COIL 1, Design Inlet Water Temperature 
[C], 7.00000
 Component Sizing Information, Coil:Cooling:Water, MAIN COOLING COIL 1, Design Inlet Air Humidity Ratio, 
9.33031E-003
 Component Sizing Information, Coil:Cooling:Water, MAIN COOLING COIL 1, Design Outlet Air Humidity Ratio, 
8.00000E-003
 Component Sizing Information, Coil:Heating:Water, MAIN HEATING COIL 1, Maximum Water Flow Rate [m3/s], 
7.51969E-005
 Component Sizing Information, Coil:Heating:Water, MAIN HEATING COIL 1, Design Coil Load [W], 3457.55329
 Component Sizing Information, Coil:Heating:Water, MAIN HEATING COIL 1, U-Factor Times Area Value [W/K], 
55.78870
 Component Sizing Information, Fan:VariableVolume, SUPPLY FAN 1, Maximum Flow Rate [m3/s], 1.05725
 Component Sizing Information, Fan:VariableVolume, SUPPLY FAN 1, Minimum Flow Rate [m3/s], 0.35326
 Component Sizing Information, Controller:WaterCoil, OA CC CONTROLLER 1, Maximum Actuated Flow [m3/s], 
1.14523E-003
 Component Sizing Information, Controller:WaterCoil, OA HC CONTROLLER 1, Maximum Actuated Flow [m3/s], 
1.48158E-004
 Component Sizing Information, Controller:WaterCoil, CENTRAL COOLING COIL CONTROLLER 1, Maximum Actuated 
Flow [m3/s], 9.16309E-004
 Component Sizing Information, Controller:WaterCoil, CENTRAL HEATING COIL CONTROLLER 1, Maximum Actuated 
Flow [m3/s], 7.51969E-005
 Component Sizing Information, PlantLoop, HOT WATER LOOP, Maximum Loop Flow Rate [m3/s], 4.97138E-004
 Component Sizing Information, PlantLoop, HOT WATER LOOP, Plant Loop Volume [m3], 0.55928
 Component Sizing Information, PlantLoop, CHILLED WATER LOOP, Maximum Loop Flow Rate [m3/s], 2.06154E-003
 Component Sizing Information, PlantLoop, CHILLED WATER LOOP, Plant Loop Volume [m3], 2.31923
 Component Sizing Information, Chiller:Electric, CENTRAL CHILLER, Nominal Capacity [W], 34468.93699
 Component Sizing Information, Chiller:Electric, CENTRAL CHILLER, Design Chilled Water Flow Rate [m3/s], 
2.06154E-003
 Component Sizing Information, Boiler:HotWater, CENTRAL BOILER, Nominal Capacity [W], 22858.42690
 Component Sizing Information, Boiler:HotWater, CENTRAL BOILER, Design Water Flow Rate [m3/s], 4.97138E-
004
 Component Sizing Information, Pump:VariableSpeed, HW CIRC PUMP, Rated Flow Rate [m3/s], 4.97138E-004
 Component Sizing Information, Pump:VariableSpeed, HW CIRC PUMP, Rated Power Consumption [W], 127.01247
 Component Sizing Information, Pump:VariableSpeed, CW CIRC PUMP, Rated Flow Rate [m3/s], 2.06154E-003
 Component Sizing Information, Pump:VariableSpeed, CW CIRC PUMP, Rated Power Consumption [W], 526.69672
```

Field: <Component Sizing Information>

This field simply contains the words “Component Sizing”.

Field: Component Type

This field shows the component type (e.g. Pump:Variable Speed, Plant Loop, Fan:Simple:VariableVolume) being sized.

Field: Component Name

This field shows the name of the component.

Field: Input Field Description

This field shows the field description/variable with units.

Field: Value

This field shows the value of the sized component.

Refrigerated Case Output

```
! <#Refrigerated Case Racks>,Number of Refrigerated Case Racks
 #Refrigerated Case Racks,3
! <Refrigerated Case Compressor Rack>,Compressor Rack Name,# Refrigerated Cases Connected,Heat
Rejection Location,COP
!  <Refrigerated Case>,Refrigerated Case Number,Refrigerated Case Name,Zone Name,Zone Node
#,Zone Node Name,Capacity {W/m},LHR,Temperature {C},Length {m},Fan {W/m},Lighting {W/m},Anti-
Sweat {W/m},Defrost {W/m}
 Refrigerated Case Compressor Rack,SELFCONTAINEDDISPLAY,1,Zone,  2.000
  Refrigerated Case,1,SELFCONTAINEDDISPLAYCASE,SALESFLOOR,9,SALESFLOOR NODE,  1000.0,  0.080,
13.0,   10.0,   40.0,   75.0,    0.0,    0.0
 Refrigerated Case Compressor Rack,MEDIUMTEMPRACK,3,Outdoors,  1.700
  Refrigerated Case,2,FISHDISPLAYCASE,SALESFLOOR,9,SALESFLOOR NODE,   288.4,  0.100,    1.1,
15.0,    0.0,   41.6,    0.0,    0.0
  Refrigerated Case,3,MEATDISPLAYCASE,SALESFLOOR,9,SALESFLOOR NODE,   456.6,  0.100,   -4.4,
26.0,   47.2,   86.8,   13.2,  585.8
  Refrigerated Case,4,MULTIDECKDAIRYANDDELICASE,SALESFLOOR,9,SALESFLOOR NODE,  1890.0,  0.300,
-1.1,   12.0,   78.7,  307.3,    0.0,    0.0
 Refrigerated Case Compressor Rack,LOWTEMPRACK,3,Outdoors,  1.500
  Refrigerated Case,5,OPENWELLICECREAMDISPLAYCASE,SALESFLOOR,9,SALESFLOOR NODE,   441.6,
0.080,  -34.4,   14.6,   28.7,   42.7,   70.0,   76.5
  Refrigerated Case,6,GLASSDOORFROZENFOOD,SALESFLOOR,9,SALESFLOOR NODE,   615.8,  0.130,  -
23.3,   11.7,   57.9,   99.8,  218.7, 1106.5
  Refrigerated Case,7,WALKINFREEZER,BACKROOM,11,BACKROOM NODE,  2835.7,  0.100,   -2.2,
4.3,  172.2,   28.1,    0.0, 1291.7

! !<#Detailed Refrigeration Systems>,Number of Detailed Refrigeration Systems
 #Detailed Refrigeration Systems,2
! <Detailed Refrigeration System>,Refrigeration System Name,Refrigerant Used, # Refrigerated
Cases Connected, # Compressors Connected
!  <Refrigerated Case>,Refrigerated Case Number,Refrigerated Case Name,Zone Name,Zone Node
#,Zone Node Name,Capacity {W/m},LHR,Temperature {C},Length {m},Fan {W/m},Lighting {W/m},Anti-
Sweat {W/m},Defrost {W/m}
!  <Refrigeration Compressor>,Compressor Number,Compressor Name,Nominal Capacity (W)
!  <Refrigeration Condenser>,Condenser Number,Condenser Name,Rated Condensing Temperature
(C),Rated Capacity (W)
 Detailed Refrigeration System,MEDIUMTEMPSYSTEM,R22,3,3
  Refrigerated Case,2,FISHDISPLAYCASE,SALESFLOOR,9,SALESFLOOR NODE,   288.4,  0.100,    1.1,
15.0,    0.0,   41.6,    0.0,    0.0
  Refrigerated Case,3,MEATDISPLAYCASE,SALESFLOOR,9,SALESFLOOR NODE,   456.6,  0.100,   -4.4,
26.0,   47.2,   86.8,   13.2,  585.8
  Refrigerated Case,4,MULTIDECKDAIRYANDDELICASE,SALESFLOOR,9,SALESFLOOR NODE,  1890.0,  0.300,
-1.1,   12.0,   78.7,  307.3,    0.0,    0.0
  Refrigeration Compressor,1,MEDTEMP001CARLYLE_R-22_MED_06DR820, Nominal Capacity, W,
15535.
  Refrigeration Compressor,2,MEDTEMP002CARLYLE_R-22_MED_06DR820, Nominal Capacity, W,
15535.
  Refrigeration Compressor,3,MEDTEMP003CARLYLE_R-22_MED_06DR820, Nominal Capacity, W,
15535.
  Refrigeration Condenser,1,MEDIUMTEMPCONDENSER,    51.7,          51888.4
 Detailed Refrigeration System,LOWTEMPSYSTEM,R22,3,3
  Refrigerated Case,5,OPENWELLICECREAMDISPLAYCASE,SALESFLOOR,9,SALESFLOOR NODE,   441.6,
0.080,  -34.4,   14.6,   28.7,   42.7,   70.0,   76.5
  Refrigerated Case,6,GLASSDOORFROZENFOOD,SALESFLOOR,9,SALESFLOOR NODE,   615.8,  0.130,  -
23.3,   11.7,   57.9,   99.8,  218.7, 1106.5
  Refrigerated Case,7,WALKINFREEZER,BACKROOM,11,BACKROOM NODE,  2835.7,  0.100,   -2.2,
4.3,  172.2,   28.1,    0.0, 1291.7
  Refrigeration Compressor,5,LOWTEMP001CARLYLE_R-22_LOW_06CC665, Nominal Capacity, W,
15952.
  Refrigeration Compressor,6,LOWTEMP002CARLYLE_R-22_LOW_06DR718, Nominal Capacity, W,
2940.
```

```
  Refrigeration Compressor,7,LOWTEMP003CARLYLE_R-22_LOW_06DR718, Nominal Capacity, W,
2940.
  Refrigeration Condenser,2,LOWTEMPCONDENSER,    51.7,          34427.5


! <#Orphaned Refrigerated Cases>,<Number of Orphaned Refrigerated Cases>,<Message>
 #Orphaned Refrigerated Cases,1,  NOTE: These cases were not simulated...
! <Orphaned Refrigerated Case>,<Refrigerated Case Number>,<Refrigerated Case Name>,<Zone Node
#>,<Zone Node Name>
 Orphaned Refrigerated Case,4,MULTIDECKSODACASE,9,SALESFLOOR NODE
```

The refrigerated case output in the **eplusout.eio** file shows the number of refrigerated case compressor racks found in the input data file (IDF). Additional information is shown for each refrigerated case compressor rack and the refrigerated case(s) connected to each compressor rack.

The first “header” record (lines starting with an “!”) is followed immediately by a single line of data showing the number of refrigerated case compressor racks specified in the input data file. The second and third “header” lines reflect the information for each refrigerated case compressor rack followed by the information for each refrigerated case connected to this rack. The fourth “header” record shows the units of measurement associated with the information for each refrigerated case.

This output reflects information for the specified refrigerated case equipment along with entries from the IDF (or default data for blank fields). The data are preceded by a description (i.e. #Refrigerated Case Racks, Refrigerated Case Compressor Rack, Refrigerated Case, #Orphaned Refrigerated Cases, and Orphaned Refrigerated Case) followed by the information associated with each description. The descriptions are output in the order of occurrence in the IDF and are “grouped” by refrigerated case compressor rack.

A final set of “header” records and descriptions are output only when a refrigerated case object is found in the IDF but is not connected to a compressor rack object (i.e., orphaned).

The following fields define each description and associated information.

Header Record: #Refrigerated Case Racks

This field simply says “#Refrigerated Case Racks” .

Field: Number of Refrigerated Case Racks

The total number of refrigerated case compressor racks simulated. This is the number of Compressor Rack:Refrigerated Case objects found in the IDF.

Header Record: Refrigerated Case Compressor Rack

Field: Compressor Rack Name

The name of the compressor rack simulated. Echoes the field Refrigerated Case Compressor Rack Name in object Compressor Rack:Refrigerated Case from the IDF.

Field: # Refrigerated Cases Connected

The total number of refrigerated cases connected to the compressor rack.

Field: Heat Rejection Location

The location of the compressor rack’s air-cooled condenser. Echoes the field Heat Rejection Location in object Compressor Rack:Refrigerated Case from the IDF.

Field: COP

The Coefficient of Performance (W/W) of the compressor rack. Echoes the field Design Compressor Rack COP in object Compressor Rack:Refrigerated Case from the IDF.

Header Record: Refrigerated Case

Field: Refrigerated Case Number

The number of the refrigerated case, assigned sequentially according to the order in which these objects are defined in the IDF.

Field: Refrigerated Case Name

The name of the refrigerated case simulated. Echoes the field Refrigerated Case Name in object Case:Refrigerated from the IDF.

Field: Zone Name

The name of the zone where the refrigerated case is located. Echoes the field Zone Name in object Case:Refrigerated from the IDF.

Field: Zone Node #

The number of the zone node (connection to the air loop) where the refrigerated case is located. This is the number of the zone node as found in the **eplusout.bnd** file.

Field: Zone Node Name

The name of the zone node where the refrigerated case is located. The refrigerated case will impact the air heat balance in this zone.

Field: Capacity

The total cooling capacity (W/m) of the refrigerated case. Echoes the field Rated Total Cooling Capacity per Unit Length in object Case:Refrigerated from the IDF.

Field: LHR

The design latent heat ratio (latent capacity divided by total cooling capacity) of the refrigerated case. Echoes the field Rated LHR in object Case:Refrigerated from the IDF.

Field: Temperature {C}

The average temperature (C) of the air and products within the refrigerated case. Echoes the field Case Operating Temperature in object Case:Refrigerated from the IDF.

Field: Length {m}

The length (m) of the refrigerated case. Echoes the field Case Length in object Case:Refrigerated from the IDF.

Field: Fan {W/m}

The total operating fan power (W/m) in the refrigerated case. Echoes the field Operating Case Fan Power per Unit Length in object Case:Refrigerated from the IDF.

Field: Lighting {W/m}

The total lighting power (W/m) in the refrigerated case. Echoes the field Standard Case Lighting Power per Unit Length in object Case:Refrigerated from the IDF.

Field: Anti-Sweat {W/m}

The electric anti-sweat heater power (W/m) in the refrigerated case. Echoes the field Case Anti-Sweat Heater Power per Unit Length in object Case:Refrigerated from the IDF.

Field: Defrost {W/m}

The defrost power (W/m) in the refrigerated case. Echoes the field Case Defrost Power per Unit Length in object Case:Refrigerated from the IDF.

Header Record: #Detailed Refrigeration Systems

Field: Number of Detailed Refrigeration Systems

The total number of detailed refrigeration systems found in the IDF.

Header Record: Detailed Refrigeration System

Field: Refrigeration System Name

The name of theRefrigeration System simulated. Echoes the field Refrigeration System Name in object Refrigeration:System from the IDF.

Field: Refrigerant Used

The name of the refrigerant used in the system. Echoes the field Working Fluid ID in object Refrigeration:System from the IDF.

Field: # Refrigerated Cases Connected

The total number of refrigerated cases connected to the refrigeration system.

Field: # Compressors Connected

The total number of compressors connected to the refrigeration system.

Header Record: Refrigeration Compressor

Field: Compressor Number

The number of the refrigeration compressor, assigned sequentially according to the order in which these objects are defined in the IDF.

Field: Compressor Name

The name of the compressor simulated. Echoes the field Name of Compressor in object List:Refrigeration:Compressors from the IDF.

Field: Nominal Capacity, W

The nominal capacity of the compressor based on the capacity curve (identified by the field Unique Name of Capacity Curve in the object Refrigeration:Compressor in the IDF) evaluated at the lowest design evaporating temperature of all the cases attached to the system and at the design condensing temperature of the condenser attached to the system.

Header Record: Refrigeration Condenser

Field: Condenser Number

The number of the refrigeration condenser, assigned sequentially according to the order in which these objects are defined in the IDF.

Field: Condenserr Name

The name of the compressor simulated. Echoes the field Name of Condenser for the System in object Refrigeration:System from the IDF.

Field: Rated Condensing Temperature, C

The rated condensing temperature of the condenser, set by standard ARI 460 for air-cooled condensers, by standard ARI 490 for evaporative condensers, and input by the user in the field Rated Condensing Temperature in the object Refrigeration:Condenser:WaterCooled for water-cooled condensers..

Field: Rated Capacity, W

The rated capacity of the condenser. For air-cooled condensers, this value is taken from the capacity curve (identified by the field Name of Condenser Heat of Rejection Curve, Linear, in the object Refrigeration:Condenser:AirCooled in the IDF) evaluated at the temperature difference specified in standard ARI 460. For evaporative-cooled and water-cooled condensers, this value is input in the field Rated Total Heat Rejection Effect in the object Refrigeration:Condenser:EvaporativeCooled or Refrigeration:Condenser:WaterCooled in the IDF.

Header Record: #Orphaned Refrigerated Cases

Field: Number of Orphaned Refrigerated Cases

The total number of orphaned refrigerated cases found in the IDF.

Field: Message

A message stating "NOTE: These cases were not simulated...".

Header Record: Orphaned Refrigerated Case

Field: Refrigerated Case Number

The number of the orphaned refrigerated case found in the IDF. The refrigerated case numbers are assigned sequentially according to the order in which these objects are defined in the IDF.

Field: Refrigerated Case Name

The name of the orphaned refrigerated case which is **not** connected to a compressor rack. Echoes the field Refrigerated Case Name in object Case:Refrigerated from the IDF.

Field: Zone Name

The name of the zone where the refrigerated case is located. Echoes the field Zone Name in object Case:Refrigerated from the IDF.

Field: Zone Node #

The number of the zone node (connection to the air loop) where the refrigerated case is located. This is the number of the zone node as found in the **eplusout.bnd** file.

Field: Zone Node Name

The name of the zone node where the orphaned refrigerated case is located. This orphaned refrigerated case will **not** impact the air heat balance in this zone.

UserViewFactor Info

Note: the following report does not currently (V1.4.0) follow the prescribed format for the eplusout.eio file – this will be corrected in a future release.

In order to get user view factors ready for inclusion in an input file, several steps much be taken. First, because EnergyPlus has a data structure for zones that only is defined at initialization, it is necessary to use EnergyPlus to determine the surface numbers (i,j) before a UserViewFactors object can be constructed. This is done by making a run with a special object. This takes the form:

```
Output:Reports,Surfaces,ViewFactorInfo;
```

This triggers EnergyPlus to produce a special output section in the file eplusout.eio. This file, which is csv format, can be opened in Excel, and will show detailed information about the surfaces in all the zones. An example for the core zone is shown in the following table format.

Table 3. Report of Surface View Factors

ZoneNum	9
Zone Name	CORE
Number of Surfaces	6

Number of Sides	4	4	0	0	0	0
Surface Type	FLOOR	ROOF	INTMASS	INTMASS	INTMASS	INTMASS
XVertex 1	3.048	0	0	0	0	0
YVertex 1	0	3.048	0	0	0	0
ZVertex 1	0	2.743	0	0	0	0
XVertex 2	3.048	0	0	0	0	0
YVertex 2	0	3.048	0	0	0	0
ZVertex 2	0	2.743	0	0	0	0
XVertex 3	3.048	0	0	0	0	0
YVertex 3	0	3.048	0	0	0	0
ZVertex 3	0	2.743	0	0	0	0
XVertex 4	3.048	0	0	0	0	0
YVertex 4	0	3.048	0	0	0	0
ZVertex 4	0	2.743	0	0	0	0
Area	9.29	9.29	11.61	11.61	11.61	11.61
Azimuth	90	180	0	0	0	0
Tilt	180	0	90	90	90	90
ThermalEmissivity	0.9	0.9	0.9	0.9	0.9	0.9
Surface Type	FLOOR	ROOF	INTMASS	INTMASS	INTMASS	INTMASS
Approximate or User Input ViewFactors						
Surface Number	1	2	3	4	5	6
1	0.11	0.12	0	0	0.15	0
2	0	0.22	0.23	0	0	0
3	0	0	0	0	0	0.36
4	0	0.42	0	0	0.45	0.46
5	0.51	0	0	0	0	0.56
6	0	0	0	0.64	0.65	0
Surface Type	FLOOR	ROOF	INTMASS	INTMASS	INTMASS	INTMASS
Fixed ViewFactors						
Surface Number	1	2	3	4	5	6
1	0.349	5.63E-02	0	0	0.5946	0
2	5.63E-02	5.68E-02	0.5633	0.3243	0	0
3	0	0.4506	0	0	0	0.5486
4	0	0.2595	0	0	0.4063	0.3337
5	0.4757	0	0	0.4063	0	0.1183
6	0	0	0.5486	0.3337	0.1183	0
Surface Type	FLOOR	ROOF	INTMASS	INTMASS	INTMASS	INTMASS
Script F Factors						
Surface Number	1	2	3	4	5	6
1	0.3179	4.84E-02	3.10E-03	2.22E-02	0.5015	6.84E-03
2	4.84E-02	7.44E-02	0.4623	0.2668	1.41E-02	3.44E-02
3	2.48E-03	0.3699	4.54E-02	2.72E-02	6.55E-03	0.4479

4	1.77E-02	0.2135	2.72E-02	2.98E-02	0.3346	0.2767
5	0.4012	1.13E-02	6.55E-03	0.3346	3.87E-02	0.1078
6	5.48E-03	2.76E-02	0.4479	0.2767	0.1078	3.51E-02

The information given for each zone includes the number of surfaces in the zone, and the number of sides on each surface along with the surface type. Note in this example that there are only two enclosing surfaces and four thermal mass surfaces. Then, for each surface, the x,y, and z coordinates of each of the vertices are given. This is necessary if the auxiliary program for calculating view factors is going to be used since that requires the vertex information.

Following this information, the surface area, azimuth, tilt and thermal emissivity are given. Then, either the approximate view factors calculated as described above or the user input view factors are given. Note that in this example the unrealistic view factors from the idf example are shown. It can be seen that they were inserted into the correct row and column locations because their values correspond to the row and column. If the output had been triggered by the report object, the view factors shown for this zone would have been those from the approximate view factor calculation.

The information following shows view factors after they have been corrected for reciprocity and completeness. This is necessary to make sure any two surfaces exchange radiation reciprocally, that is, the radiation leaving one surface directed at another surface is the same as the amount of radiation arriving at the other surface, and that the sum of all the radiant energy exchanges in the zone is zero. If the user input view factors are perfect in these characteristics, the correction will not change them.

Finally, grey interchange coefficients are presented. These are the coefficients that are used to calculate the radiant energy exchange between the surfaces in the zone. They are calculated to include reflection from intervening surfaces in the zone.

eplusout.end

This is a simple one line synopsis of the simulation. Successful or Not Successful, including number of errors/warnings:

```
EnergyPlus Completed Successfully-- 8 Warning; 0 Severe Errors
```

If no file is produced, it is really *not* successful and EnergyPlus has probably crashed during the run. This file and its contents are intended for interfaces that will put friendly front-ends onto EnergyPlus. This file is also used by the EP-Launch program so that it can determine if the run was successful or not – if not, the user should review the eplusout.err file. (Actually, the eplusout.err file should always be reviewed but often is ignored in haste to view the results.)

eplusout.epmidf

If you use an EPMacro file (usual extension is .imf) as your basis for input, then this file is the “idf” that the EPMacro program produces.

eplusout.epmdet

If you use an EPMacro file (usual extension is .imf) as your basis for input, then this file is the details of the EPMacro run (including any error messages).

eplusout.err

This file is *very important* to every simulation run. All of the warnings, errors, etc that occur during the run will show up in this file. They may show up in other files as well. The first line of the error file is also significant:

```
Program Version,EnergyPlus, <version>,IDD_Version <version>
```

This shows not only the current version of the program but the "version" of the Energy+.idd file that was used.

Table 4. EnergyPlus Errors

Error Level	Action
Warning	Take note
Severe	Should Fix
Fatal	Program will abort

The previous table illustrates the three levels of errors that occur in the eplusout.err file. Several other message lines may be shown as well. For example:

```
   ** Warning ** World Coordinate System selected.  Some Zone Origins are non-zero.
   **   ~~~   ** These will be used in Daylighting:Detailed calculations but not in normal geometry
inputs.
```

The line that includes the "~~~" is a "continue" error line. It continues from the previous line to help describe the context of the error.

Some common errors, their consequences, and what to do about them follows:

```
   ** Severe  ** Possible incorrect IDD File
   ** Severe  ** Possible Invalid Numerics
   **  Fatal  ** Errors occurred on processing IDF file. Preceding condition(s) cause termination.
```

The previous errors cause program termination. The most likely cause is that you have an "old" IDF and have not converted it to work with the current version of the program. In this case, you will likely has some other hints such as alphas in numeric fields or too many fields in an object. Energyplus also has built in range checking:

```
   ** Severe  ** Out of range value numeric Field#7 (Sky Clearness),
value=100.00000, range=>=0.0 and <=1.2, in DESIGNDAY=FALL
```

The error message should supply you with enough information to find the line with the error.

Error – <schedule not found>

All, or virtually all, objects that have schedules in their fields must have a schedule actually input into this field. To leave it blank will result in a severe error that will later terminate the run.

Schedule <schedule name> has missing days

Schedule periods in EnergyPlus must fill a full year.

Zone Name in <internal gain> statement not found

If a statement specifies a zone name as part of its fields, it cannot be left blank.

eplusout.eso

The standard output file from EnergyPlus. It includes all the applicable variables selected with the "Report Variable" commands as well as those with the "Report Meter" commands. All levels of frequency of reporting are included intermingled as occurs in the running of the program. The form of the file is a data dictionary, followed by the data.

In this case, the dictionary portion of the file comes first followed by an “end of data dictionary line” and then the data makes up the rest of the file.

```
Program Version,EnergyPlus, <version>
     1,5,Environment Title[],Latitude[degrees],Longitude[degrees],Time Zone[],Elevation[m]
     2,6,Day of Simulation[],Month[],Day of Month[],DST Indicator[1=yes 0=no],Hour[],StartMinute[],EndMinute[],DayType
     3,3,Cumulative Day of Simulation[],Month[],Day of Month[],DST Indicator[1=yes 0=no],DayType  ! When Daily Report Variables Requested
     4,2,Cumulative Days of Simulation[],Month[]  ! When Monthly Report Variables Requested
     5,1,Cumulative Days of Simulation[] ! When Run Period Report Variables Requested
6,2,Environment,Outdoor Dry Bulb [C] !Hourly
429,2,RESISTIVE ZONE,Zone/Sys Sensible Heating Energy[J] !Hourly
450,2,RESISTIVE ZONE,Zone/Sys Sensible Cooling Energy[J] !Hourly
458,2,RESISTIVE ZONE,Zone/Sys Air Temp[C] !Hourly
463,2,EAST ZONE,Zone/Sys Sensible Heating Energy[J] !Hourly
469,2,EAST ZONE,Zone/Sys Sensible Cooling Energy[J] !Hourly
472,2,EAST ZONE,Zone/Sys Air Temp[C] !Hourly
477,2,NORTH ZONE,Zone/Sys Sensible Heating Energy[J] !Hourly
483,2,NORTH ZONE,Zone/Sys Sensible Cooling Energy[J] !Hourly
486,2,NORTH ZONE,Zone/Sys Air Temp[C] !Hourly
491,2,SimHVAC,HVACManage Iterations !Hourly
521,2,SimAir,Max SimAir Iterations !Hourly
<reduced for brevity>
```

```
End of Data Dictionary
  1,CHANUTE AFB ILLINOIS SUMMER,  40.30, -88.13,  -6.00, 229.51
  2,   1, 7,21, 0, 1, 0.00,60.00,Monday
6,21.2884261500000
429,0.000000000000000E+000
450,0.000000000000000E+000
458,31.1054947436037
463,0.000000000000000E+000
469,0.000000000000000E+000
472,31.2222148107451
477,0.000000000000000E+000
483,0.000000000000000E+000
486,31.5855358697037
```

Each report variable (ref: eplusout.rdd) is assigned an identification number, as in the line:

```
486,2,NORTH ZONE,Zone/Sys Air Temp[C] !Hourly
```

#486 is the id number of the Zone/Sys Air Temp value for the North Zone.

2 – is the number of parameters on the line

North Zone – the identifying “key name” for the line

Zone/Sys Air Temp [C] – the actual report variable name along with units [C]

! Hourly – the ! is the standard comment character, information following this character reminds the user how frequently this data will appear in the following.

More details on this file format can be found in the Interface Developer’s Guide.

eplusout.log

When EnergyPlus is running, it is usually running from a “command” window (unless inside another interface program) and some items may appear in the command window. These messages are preserved in the “log” output file. For example:

```
 EnergyPlus Starting
 EnergyPlus, Version <version>
 Processing Data Dictionary
 Processing Input File
 Warming up
 Initializing Response Factors
 Calculating CTFs for "ROOF-1", Construction #1
 Calculating CTFs for "WALL-1", Construction #2
 Calculating CTFs for "FLOOR-SLAB-1", Construction #6
 Calculating CTFs for "INT-WALL-1", Construction #7
 Initializing Window Optical Properties
 Initializing Solar Calculations
 Initializing HVAC
 Warming up
 Warming up
 Performing Zone Sizing Simulation
 Warming up
 Warming up
 Performing Zone Sizing Simulation
 Calculating System sizing
 Calculating System sizing
```

```
 Initializing New Environment Parameters
 Warming up {1}
 Warming up {2}
 Warming up {3}
 Starting Simulation at 01/01 for CHICAGO IL USA TMY2-94846 WMO#=725300
 Updating Shadowing Calculations, Start Date=01/21
 Continuing Simulation at 01/21 for CHICAGO IL USA TMY2-94846 WMO#=725300
 Updating Shadowing Calculations, Start Date=02/10
 Continuing Simulation at 02/10 for CHICAGO IL USA TMY2-94846 WMO#=725300
 Updating Shadowing Calculations, Start Date=03/02
 Continuing Simulation at 03/02 for CHICAGO IL USA TMY2-94846 WMO#=725300
 Updating Shadowing Calculations, Start Date=03/22
 Continuing Simulation at 03/22 for CHICAGO IL USA TMY2-94846 WMO#=725300
<reduced>
Updating Shadowing Calculations, Start Date=12/07
 Continuing Simulation at 12/07 for CHICAGO IL USA TMY2-94846 WMO#=725300
 Updating Shadowing Calculations, Start Date=12/27
 Continuing Simulation at 12/27 for CHICAGO IL USA TMY2-94846 WMO#=725300
 EnergyPlus Run Time=00hr 00min 46.00sec
ReadVarsESO program starting.
ReadVars Run Time=00hr 00min  1.11sec
ReadVarsESO program completed successfully.
ReadVarsESO program starting.
ReadVars Run Time=00hr 00min  0.00sec
ReadVarsESO program completed successfully.
  Started HVAC Diagram
  Complete
```

eplusout.mtd

This file contains the “meter details” for the run. This shows what report variables are on which meters and vice versa – which meters contain what report variables.

An abbreviated example shows:

```
Meters for 356,EAST ZONE:Lights-Electric Consumption[J]
  OnMeter=Electricity:Facility [J]
  OnMeter=Electricity:Building [J]
  OnMeter=Electricity:Zone:EAST ZONE [J]
  OnMeter=GeneralLights:Electricity [J]
  OnMeter=GeneralLights:Electricity:Zone:EAST ZONE [J]

 For Meter=Electricity:Facility [J], contents are:
  EAST ZONE:Lights-Electric Consumption[J]
  NORTH ZONE:Lights-Electric Consumption[J]
```

```
RESISTIVE ZONE:Electric Eq-Consumption[J]
EAST ZONE:Electric Eq-Consumption[J]
NORTH ZONE:Electric Eq-Consumption[J]
SUPPLY FAN 1:Fan Electric Consumption[J]
LITTLE CHILLER:Chiller Electric Consumption [J]
BIG CHILLER:Chiller Electric Consumption [J]
CIRC PUMP:Pump Electric Consumption [J]
COND CIRC PUMP:Pump Electric Consumption [J]
HW CIRC PUMP:Pump Electric Consumption [J]
BIG TOWER:Tower Fan Electric Consumption [J]
```

This shows the meters on which the Zone:Lights – Electric Consumption appear as well as the contents of the Electricity:Facility meter.

eplusout.mtr

This is the equivalent file to the eplusout.eso file but contains only the Report Meter requests. The format and style of the file is identical to the eplusout.eso file.

eplusout.rdd

This file (invoked by the Report,Variable Dictionary; command) shows all the report variables along with their "availability" for the current input file.

"**Zone**" variables are calculated and can be reported after each Zone/Heat Balance timestep (ref: TimeSteps in Hour command). "**HVAC**" variables are calculated and can be reported with each variable HVAC timestep. "Average" variables will be averaged over the time interval being reported whereas "sum" variables are summed over that time interval.

A typical rdd file might be:

```
Program Version,EnergyPlus, <version>, <date and time of run>, IDD_Version <version>
Var Type (reported time step),Var Report Type,Variable Name [Units]
Zone,Average,Outdoor Dry Bulb [C]
Zone,Average,Outdoor Dew Point [C]
Zone,Average,Outdoor Wet Bulb [C]
Zone,Average,Outdoor Humidity Ratio [kgWater/kgAir]
Zone,Average,Outdoor Relative Humidity [%]
Zone,Average,Outdoor Barometric Pressure [Pa]
Zone,Average,Wind Speed [m/s]
Zone,Average,Wind Direction [deg]
Zone,Average,Sky Temperature [C]
Zone,Average,Diffuse Solar [W/m2]
Zone,Average,Direct Solar [W/m2]
Zone,Average,Ground Reflected Solar [W/m2]
Zone,Average,Ground Temperature [C]
Zone,Average,Surface Ground Temperature [C]
Zone,Average,Deep Ground Temperature [C]
Zone,Average,Outdoor Enthalpy [J/kg]
Zone,Average,Outdoor Air Density [kg/m3]
Zone,Average,Solar Azimuth Angle [deg]
Zone,Average,Solar Altitude Angle [deg]
Zone,Average,Solar Hour Angle [deg]
Zone,Average,Fraction of Time Raining[]
Zone,Average,Fraction of Time Snow On Ground[]
Zone,Average,Exterior Horizontal Illuminance From Sky [lux]
Zone,Average,Exterior Horizontal Beam Illuminance [lux]
Zone,Average,Exterior Beam Normal Illuminance [lux]
Zone,Average,Luminous Efficacy of Sky Diffuse Solar Radiation [lum/W]
Zone,Average,Luminous Efficacy of Beam Solar Radiation [lum/W]
Zone,Average,Sky Clearness for Daylighting Calculation []
Zone,Average,Sky Brightness for Daylighting Calculation []
Zone,Average,Daylight Saving Time Indicator []
Zone,Average,DayType Index []
Zone,Average,Water Mains Temperature [C]
Zone,Average,Zone Outdoor Dry Bulb [C]
Zone,Average,Zone Outdoor Wet Bulb [C]
Zone,Average,Zone Outdoor Wind Speed [m/s]
Zone,Average,Zone Transmitted Solar[W]
Zone,Average,Zone Beam Solar from Exterior Windows[W]
Zone,Average,Zone Beam Solar from Interior Windows[W]
Zone,Average,Zone Diff Solar from Exterior Windows[W]
Zone,Average,Zone Diff Solar from Interior Windows[W]
```

```
Zone,Average,Zone Window Heat Gain[W]
Zone,Average,Zone Window Heat Loss[W]
Zone,Sum,Zone Transmitted Solar Energy[J]
Zone,Sum,Zone Beam Solar from Exterior Windows Energy[J]
Zone,Sum,Zone Beam Solar from Interior Windows Energy[J]
Zone,Sum,Zone Diff Solar from Exterior Windows Energy[J]
Zone,Sum,Zone Diff Solar from Interior Windows Energy[J]
Zone,Sum,Zone Window Heat Gain Energy[J]
Zone,Sum,Zone Window Heat Loss Energy[J]
Zone,Average,Surface Ext Sunlit Area [m2]
Zone,Average,Surface Ext Sunlit Fraction []
Zone,Average,Surface Ext Solar Incident[W/m2]
Zone,Average,Surface Ext Solar Beam Incident[W/m2]
Zone,Average,Surface Ext Solar Sky Diffuse Incident[W/m2]
Zone,Average,Surface Ext Solar Ground Diffuse Incident[W/m2]
Zone,Average,Surface Ext Solar Beam Cosine Of Incidence Angle[]
Zone,Average,Surface Ext Solar From Sky Diffuse Refl From Ground[W/m2]
Zone,Average,Surface Ext Solar From Sky Diffuse Refl From Obstructions[W/m2]
Zone,Average,Surface Ext Beam Sol From Bm-To-Bm Refl From Obstructions[W/m2]
Zone,Average,Surface Ext Diff Sol From Bm-To-Diff Refl From Obstructions[W/m2]
Zone,Average,Surface Ext Solar From Bm-To-Diff Refl From Ground[W/m2]
Zone,Average,Window Solar Absorbed:All Glass Layers[W]
Zone,Average,Window Transmitted Solar[W]
Zone,Average,Window Transmitted Beam Solar[W]
Zone,Average,Window Transmitted Diffuse Solar[W]
Zone,Average,Window Heat Gain[W]
Zone,Average,Window Heat Loss[W]
Zone,Average,Window Gap Convective Heat Flow[W]
Zone,Average,Window Solar Absorbed:Shading Device[W]
Zone,Sum,Window Solar Absorbed:All Glass Layers Energy[J]
Zone,Sum,Window Transmitted Solar Energy[J]
Zone,Sum,Window Transmitted Beam Solar Energy[J]
Zone,Sum,Window Transmitted Diffuse Solar Energy[J]
Zone,Sum,Window Heat Gain Energy[J]
Zone,Sum,Window Heat Loss Energy[J]
Zone,Sum,Window Gap Convective Heat Flow Energy[J]
Zone,Sum,Window Solar Absorbed:Shading Device Energy[J]
Zone,Average,Window System Solar Transmittance[]
Zone,Average,Window System Solar Reflectance[]
Zone,Average,Window System Solar Absorptance[]
Zone,Average,Inside Glass Condensation Flag[]
Zone,Average,Inside Frame Condensation Flag[]
Zone,Average,Inside Divider Condensation Flag[]
Zone,Average,Beam Solar Reflected by Outside Reveal Surfaces[W]
Zone,Average,Beam Solar Reflected by Inside Reveal Surfaces[W]
Zone,Sum,Beam Solar Reflected by Outside Reveal Surfaces Energy[J]
Zone,Sum,Beam Solar Reflected by Inside Reveal Surfaces Energy[J]
Zone,Average,Solar Horizontal Profile Angle[deg]
Zone,Average,Solar Vertical Profile Angle[deg]
Zone,Average,Glass Beam-Beam Solar Transmittance[]
Zone,Average,Glass Beam-Diffuse Solar Transmittance[]
Zone,Average,Glass Diffuse-Diffuse Solar Transmittance[]
Zone,Average,Window Calculation Iterations[]
Zone,Average,Beam Sol Intensity from Ext Windows on Inside of Surface[W/m2]
Zone,Average,Beam Sol Amount from Ext Windows on Inside of Surface[W]
Zone,Average,Diff Sol Intensity from Ext Windows on Inside of Surface[W/m2]
Zone,Average,Diff Sol Amount from Ext Windows on Inside of Surface[W]
Zone,Average,Beam Sol Intensity from Int Windows on Inside of Surface[W/m2]
Zone,Average,Beam Sol Amount from Int Windows on Inside of Surface[W]
Zone,Average,Diff Sol Intensity from Int Windows on Inside of Surface[W/m2]
Zone,Average,Diff Sol Amount from Int Windows on Inside of Surface[W]
Zone,Sum,Beam Sol Amount from Ext Windows on Inside of Surface Energy[J]
Zone,Sum,Diff Sol Amount from Ext Windows on Inside of Surface Energy[J]
Zone,Sum,Beam Sol Amount from Int Windows on Inside of Surface Energy[J]
Zone,Sum,Diff Sol Amount from Int Windows on Inside of Surface Energy[J]
Zone,Average,Surface Inside Temperature[C]
Zone,Average,Surface Outside Temperature[C]
Zone,Average,Surface Int Adjacent Air Temperature [C]
Zone,Average,Surface Int Convection Coeff[W/m2-K]
Zone,Average,Surface Int Convection Heat Rate [W]
Zone,Average,Surface Int Convection Heat Rate per Area [W/m2]
```

```
Zone,Sum,Surface Int Convection Heat Gain to Air [J]
Zone,Average,Surface Ext Outdoor Dry Bulb [C]
Zone,Average,Surface Ext Outdoor Wet Bulb [C]
Zone,Average,Surface Ext Wind Speed [m/s]
Zone,Average,Surface Ext Convection Coeff[W/m2-K]
Zone,Average,Surface Ext Rad to Air Coeff[W/m2-K]
Zone,Average,Surface Ext Rad to Sky Coeff[W/m2-K]
Zone,Average,Surface Ext Rad to Ground Coeff[W/m2-K]
Zone,Average,Opaque Surface Inside Face Beam Solar Absorbed[W]
Zone,Average,Fraction of Time Shading Device Is On []
Zone,Average,Storm Window On/Off Flag []
Zone,Average,Window Blind Slat Angle [deg]
Zone,Average,Zone Mean Radiant Temperature [C]
Zone,Sum,Zone Total Internal Radiant Heat Gain [J]
Zone,Sum,Zone Total Internal Visible Heat Gain [J]
Zone,Sum,Zone Total Internal Convective Heat Gain [J]
Zone,Sum,Zone Total Internal Latent Gain [J]
Zone,Sum,Zone Total Internal Total Heat Gain [J]
Zone,Average,People Number Of Occupants []
Zone,Sum,People Radiant Heat Gain [J]
Zone,Sum,People Convective Heat Gain [J]
Zone,Sum,People Sensible Heat Gain [J]
Zone,Sum,People Latent Heat Gain [J]
Zone,Sum,People Total Heat Gain [J]
Zone,Average,Zone People Number Of Occupants []
Zone,Sum,Zone People Radiant Heat Gain [J]
Zone,Sum,Zone People Convective Heat Gain [J]
Zone,Sum,Zone People Sensible Heat Gain [J]
Zone,Sum,Zone People Latent Heat Gain [J]
Zone,Sum,Zone People Total Heat Gain [J]
Zone,Average,Lights Electric Power [W]
Zone,Sum,Lights Radiant Heat Gain [J]
Zone,Sum,Lights Visible Heat Gain [J]
Zone,Sum,Lights Convective Heat Gain [J]
Zone,Sum,Lights Return Air Heat Gain [J]
Zone,Sum,Lights Total Heat Gain [J]
Zone,Sum,Lights Electric Consumption [J]
Zone,Average,Zone Lights Electric Power [W]
Zone,Sum,Zone Lights Radiant Heat Gain [J]
Zone,Sum,Zone Lights Visible Heat Gain [J]
Zone,Sum,Zone Lights Convective Heat Gain [J]
Zone,Sum,Zone Lights Return Air Heat Gain [J]
Zone,Sum,Zone Lights Total Heat Gain [J]
Zone,Sum,Zone Lights Electric Consumption [J]
Zone,Average,Electric Equipment Electric Power [W]
Zone,Sum,Electric Equipment Radiant Heat Gain [J]
Zone,Sum,Electric Equipment Convective Heat Gain [J]
Zone,Sum,Electric Equipment Latent Heat Gain [J]
Zone,Sum,Electric Equipment Lost Heat Gain [J]
Zone,Sum,Electric Equipment Total Heat Gain [J]
Zone,Sum,Electric Equipment Electric Consumption [J]
Zone,Average,Zone Electric Equipment Electric Power [W]
Zone,Sum,Zone Electric Equipment Radiant Heat Gain [J]
Zone,Sum,Zone Electric Equipment Convective Heat Gain [J]
Zone,Sum,Zone Electric Equipment Latent Heat Gain [J]
Zone,Sum,Zone Electric Equipment Lost Heat Gain [J]
Zone,Sum,Zone Electric Equipment Total Heat Gain [J]
Zone,Sum,Zone Electric Equipment Electric Consumption [J]
Zone,Average,Zone Mean Air Temperature [C]
Zone,Average,Zone Operative Temperature [C]
HVAC,Sum,Zone Infiltration Sensible Heat Loss [J]
HVAC,Sum,Zone Infiltration Sensible Heat Gain [J]
HVAC,Sum,Zone Infiltration Volume [m3]
HVAC,Sum,Zone Infiltration Mass [kg]
HVAC,Average,Zone Infiltration Air Change Rate [ach]
HVAC,Sum,Zone/Sys Sensible Heating Energy[J]
HVAC,Sum,Zone/Sys Sensible Cooling Energy[J]
HVAC,Average,Zone/Sys Sensible Heating Rate[W]
HVAC,Average,Zone/Sys Sensible Cooling Rate[W]
HVAC,Average,Zone/Sys Air Temperature[C]
HVAC,Average,Zone Air Humidity Ratio[]
```

```
HVAC,Average,Zone Air Relative Humidity[%]
HVAC,Average,Zone/Sys Sensible Load Predicted[W]
HVAC,Average,Zone/Sys Sensible Load to Heating Setpoint Predicted[W]
HVAC,Average,Zone/Sys Sensible Load to Cooling Setpoint Predicted[W]
HVAC,Average,Zone/Sys Moisture Load Rate Predicted[kgWater/sec]
Zone,Average,Zone/Sys Thermostat Control Type
Zone,Average,Zone/Sys Thermostat Heating Setpoint [C]
Zone,Average,Zone/Sys Thermostat Cooling Setpoint [C]
HVAC,Sum,HVACManage Iterations
HVAC,Sum,Time Zone Temperature Oscillating[hr]
HVAC,Sum,Time Any Zone Temperature Oscillating[hr]
Zone,Sum,Time Not Comfortable Summer Clothes[hr]
Zone,Sum,Time Not Comfortable Winter Clothes[hr]
Zone,Sum,Time Not Comfortable Summer Or Winter Clothes[hr]
Zone,Sum,Time Not Comfortable Summer Clothes Any Zone[hr]
Zone,Sum,Time Not Comfortable Winter Clothes Any Zone[hr]
Zone,Sum,Time Not Comfortable Summer Or Winter Clothes Any Zone[hr]
Zone,Sum,Time Heating Setpoint Not Met[hr]
Zone,Sum,Time Heating Setpoint Not Met While Occupied[hr]
Zone,Sum,Time Cooling Setpoint Not Met[hr]
Zone,Sum,Time Cooling Setpoint Not Met While Occupied[hr]
Zone,Average,Schedule Value []
HVAC,Average,Damper Position
HVAC,Sum,Total Water Heating Coil Energy[J]
HVAC,Sum,Water Heating Coil Hot Water Consumption[J]
HVAC,Average,Total Water Heating Coil Rate[W]
HVAC,Sum,Total Water Cooling Coil Energy[J]
HVAC,Sum,Water Cooling Coil Chilled Water Consumption[J]
HVAC,Sum,Sensible Water Cooling Coil Energy[J]
HVAC,Average,Total Water Cooling Coil Rate[W]
HVAC,Average,Sensible Water Cooling Coil Rate[W]
HVAC,Average,Cooling Coil Area Wet Fraction
HVAC,Average,System Cycle On/Off Status
HVAC,Sum,Max SimAir Iterations
HVAC,Sum,Tot SimAir Iterations
HVAC,Sum,Tot SimAirLoopComponents Calls
HVAC,Average,Fan Electric Power[W]
HVAC,Average,Fan Delta Temp[C]
HVAC,Sum,Fan Electric Consumption[J]
HVAC,Average,Plant Loop Cooling Demand[W]
HVAC,Average,Plant Loop Heating Demand[W]
HVAC,Average,Plant Loop InletNode Flowrate[kg/s]
HVAC,Average,Plant Loop InletNode Temperature[C]
HVAC,Average,Plant Loop OutletNode Temperature[C]
HVAC,Average,Plant Loop Unmet Demand[W]
HVAC,Average,Debug Plant Loop Bypass Fraction
HVAC,Average,Debug SSOutletNode Flowrate[kg/s]
HVAC,Average,Boiler Heating Output Rate [W]
HVAC,Sum,Boiler Heating Output Energy [J]
HVAC,Average,Boiler Gas Consumption Rate [W]
HVAC,Sum,Boiler Gas Consumption [J]
HVAC,Average,Boiler Water Inlet Temp [C]
HVAC,Average,Boiler Water Outlet Temp [C]
HVAC,Average,Boiler Water Mass Flow Rate [kg/s]
HVAC,Average,Boiler Parasitic Electric Consumption Rate [W]
HVAC,Sum,Boiler Parasitic Electric Consumption [J]
HVAC,Average,Chiller Electric Power [W]
HVAC,Sum,Chiller Electric Consumption [J]
HVAC,Average,Chiller Evap Heat Trans Rate [W]
HVAC,Sum,Chiller Evap Heat Trans [J]
HVAC,Average,Chiller Evap Water Inlet Temp [C]
HVAC,Average,Chiller Evap Water Outlet Temp [C]
HVAC,Average,Chiller Evap Water Mass Flow Rate [kg/s]
HVAC,Average,Chiller Cond Heat Trans Rate [W]
HVAC,Sum,Chiller Cond Heat Trans [J]
HVAC,Average,Chiller COP [W/W]
HVAC,Average,Chiller Cond Air Inlet Temp [C]
HVAC,Sum,Pump Electric Consumption [J]
HVAC,Average,Pump Electric Power [W]
HVAC,Average,Pump Shaft Power[W]
HVAC,Average,Pump Heat To Fluid[W]
```

```
HVAC,Sum,Pump Heat To Fluid Energy[J]
HVAC,Average,Pump Outlet Temp[C]
HVAC,Average,Pump Mass Flow Rate[kg/s]
HVAC,Average,Total Electric Power Purchased [W]
HVAC,Sum,Total Electric Energy Purchased [J]
HVAC,Sum,Total Electric Energy Surplus [J]
HVAC,Average,Net Electric Power Purchased [W]
HVAC,Sum,Net Electric Energy Purchased [J]
HVAC,Average,Total Building Electric Demand [W]
HVAC,Average,Total HVAC Electric Demand [W]
HVAC,Average,Total Electric Demand [W]
HVAC,Average,System Node Temp[C]
HVAC,Average,System Node MassFlowRate[kg/s]
HVAC,Average,System Node Humidity Ratio[]
HVAC,Average,System Node Setpoint Temp[C]
HVAC,Average,System Node Setpoint Temp Hi[C]
HVAC,Average,System Node Setpoint Temp Lo[C]
HVAC,Average,System Node Setpoint Humidity Ratio[]
HVAC,Average,System Node Setpoint Humidity Ratio Min[]
HVAC,Average,System Node Setpoint Humidity Ratio Max[]
HVAC,Average,System Node Relative Humidity[%]
HVAC,Average,System Node Pressure[Pa]
HVAC,Average,System Node VolFlowRate[m3/s]
HVAC,Average,System Node Enthalpy[J/kg]
HVAC,Average,System Node Wetbulb Temp[C]
HVAC,Average,System Node Quality[]
HVAC,Average,System Node Height[m]
HVAC,Sum,Carbon Equivalent Pollution From NOx[kg]
HVAC,Sum,Carbon Equivalent Pollution From CH4[kg]
HVAC,Sum,Carbon Equivalent Pollution From CO2[kg]
HVAC,Sum,Air Loop Total Heating Energy[J]
HVAC,Sum,Air Loop Total Cooling Energy[J]
HVAC,Sum,Air Loop Hot Water Consumption[J]
HVAC,Sum,Air Loop Steam Consumption[J]
HVAC,Sum,Air Loop Chilled Water Consumption[J]
HVAC,Sum,Air Loop Electric Consumption[J]
HVAC,Sum,Air Loop Gas Consumption[J]
HVAC,Sum,Air Loop Water Consumption[m3]
HVAC,Sum,Air Loop Fan Heating Energy[J]
HVAC,Sum,Air Loop Total Cooling Coil Energy[J]
HVAC,Sum,Air Loop Total Heating Coil Energy[J]
HVAC,Sum,Air Loop Total Heat Exchanger Heating Energy[J]
HVAC,Sum,Air Loop Total Heat Exchanger Cooling Energy[J]
HVAC,Sum,Air Loop Total Humidifier Heating Energy[J]
HVAC,Sum,Air Loop Total Evap Cooler Cooling Energy[J]
HVAC,Sum,Air Loop Total Desiccant Dehumidifier Cooling Energy[J]
HVAC,Sum,Air Loop Fan Electric Consumption[J]
HVAC,Sum,Air Loop Heating Coil Hot Water Consumption[J]
HVAC,Sum,Air Loop Cooling Coil Chilled Water Consumption[J]
HVAC,Sum,Air Loop DX Heating Coil Electric Consumption[J]
HVAC,Sum,Air Loop DX Cooling Coil Electric Consumption[J]
HVAC,Sum,Air Loop Heating Coil Electric Consumption[J]
HVAC,Sum,Air Loop Heating Coil Gas Consumption[J]
HVAC,Sum,Air Loop Heating Coil Steam Consumption[J]
HVAC,Sum,Air Loop Humidifier Electric Consumption[J]
HVAC,Sum,Air Loop Evap Cooler Electric Consumption[J]
HVAC,Sum,Air Loop Desiccant Dehumidifier Electric Consumption[J]
HVAC,Sum,Zone Mechanical Ventilation No Load Heat Removal [J]
HVAC,Sum,Zone Mechanical Ventilation Cooling Load Increase [J]
HVAC,Sum,Zone Mech Ventilation Cooling Load Increase: OverHeating [J]
HVAC,Sum,Zone Mechanical Ventilation Cooling Load Decrease [J]
HVAC,Sum,Zone Mechanical Ventilation No Load Heat Addition [J]
HVAC,Sum,Zone Mechanical Ventilation Heating Load Increase [J]
HVAC,Sum,Zone Mech Ventilation Heating Load Increase: OverCooling[J]
HVAC,Sum,Zone Mechanical Ventilation Heating Load Decrease [J]
HVAC,Average,Zone Mechanical Ventilation Mass Flow Rate [kg/s]
HVAC,Average,Zone Mechanical Ventilation Volume Flow Rate [m3/s]
HVAC,Sum,Zone Mechanical Ventilation Total Volume of Outside Air [m3]
HVAC,Sum,Zone Mechanical Ventilation Total Mass of Outside Air [kg]
HVAC,Average,Zone Mechanical Ventilation Air Change Rate [ach]
```

eplusout.mdd

This file (invoked by the Report,Variable Dictionary; command) shows all the report meters along with their “availability” for the current input file. Note that meters are always accumulated to the Zone timestep. They are always “summed” variables.

```
Program Version,EnergyPlus, <version>, <date and time of run>, IDD_Version <version>
Var Type (reported time step),Var Report Type,Variable Name [Units]
Zone,Meter,Electricity:Facility [J]
Zone,Meter,Electricity:Building [J]
Zone,Meter,Electricity:Zone:SPACE1-1 [J]
Zone,Meter,InteriorLights:Electricity [J]
Zone,Meter,InteriorLights:Electricity:Zone:SPACE1-1 [J]
Zone,Meter,GeneralLights:InteriorLights:Electricity [J]
Zone,Meter,Electricity:Zone:SPACE2-1 [J]
Zone,Meter,InteriorLights:Electricity:Zone:SPACE2-1 [J]
Zone,Meter,Electricity:Zone:SPACE3-1 [J]
Zone,Meter,InteriorLights:Electricity:Zone:SPACE3-1 [J]
Zone,Meter,Electricity:Zone:SPACE4-1 [J]
Zone,Meter,InteriorLights:Electricity:Zone:SPACE4-1 [J]
Zone,Meter,Electricity:Zone:SPACE5-1 [J]
Zone,Meter,InteriorLights:Electricity:Zone:SPACE5-1 [J]
Zone,Meter,InteriorEquipment:Electricity [J]
Zone,Meter,InteriorEquipment:Electricity:Zone:SPACE1-1 [J]
Zone,Meter,General:InteriorEquipment:Electricity [J]
Zone,Meter,InteriorEquipment:Electricity:Zone:SPACE2-1 [J]
Zone,Meter,InteriorEquipment:Electricity:Zone:SPACE3-1 [J]
Zone,Meter,InteriorEquipment:Electricity:Zone:SPACE4-1 [J]
Zone,Meter,InteriorEquipment:Electricity:Zone:SPACE5-1 [J]
Zone,Meter,EnergyTransfer:Facility [J]
Zone,Meter,EnergyTransfer:Building [J]
Zone,Meter,EnergyTransfer:Zone:PLENUM-1 [J]
Zone,Meter,Heating:EnergyTransfer [J]
Zone,Meter,Heating:EnergyTransfer:Zone:PLENUM-1 [J]
Zone,Meter,Cooling:EnergyTransfer [J]
Zone,Meter,Cooling:EnergyTransfer:Zone:PLENUM-1 [J]
Zone,Meter,EnergyTransfer:Zone:SPACE1-1 [J]
Zone,Meter,Heating:EnergyTransfer:Zone:SPACE1-1 [J]
Zone,Meter,Cooling:EnergyTransfer:Zone:SPACE1-1 [J]
Zone,Meter,EnergyTransfer:Zone:SPACE2-1 [J]
Zone,Meter,Heating:EnergyTransfer:Zone:SPACE2-1 [J]
Zone,Meter,Cooling:EnergyTransfer:Zone:SPACE2-1 [J]
Zone,Meter,EnergyTransfer:Zone:SPACE3-1 [J]
Zone,Meter,Heating:EnergyTransfer:Zone:SPACE3-1 [J]
Zone,Meter,Cooling:EnergyTransfer:Zone:SPACE3-1 [J]
Zone,Meter,EnergyTransfer:Zone:SPACE4-1 [J]
Zone,Meter,Heating:EnergyTransfer:Zone:SPACE4-1 [J]
Zone,Meter,Cooling:EnergyTransfer:Zone:SPACE4-1 [J]
Zone,Meter,EnergyTransfer:Zone:SPACE5-1 [J]
Zone,Meter,Heating:EnergyTransfer:Zone:SPACE5-1 [J]
Zone,Meter,Cooling:EnergyTransfer:Zone:SPACE5-1 [J]
Zone,Meter,EnergyTransfer:HVAC [J]
Zone,Meter,HeatingCoils:EnergyTransfer [J]
Zone,Meter,PlantLoopHeatingDemand:Facility [J]
Zone,Meter,PlantLoopHeatingDemand:HVAC [J]
Zone,Meter,HeatingCoils:PlantLoopHeatingDemand [J]
Zone,Meter,CoolingCoils:EnergyTransfer [J]
Zone,Meter,PlantLoopCoolingDemand:Facility [J]
Zone,Meter,PlantLoopCoolingDemand:HVAC [J]
Zone,Meter,CoolingCoils:PlantLoopCoolingDemand [J]
```

```
Zone,Meter,Electricity:HVAC [J]
Zone,Meter,Fans:Electricity [J]
Zone,Meter,General:Fans:Electricity [J]
Zone,Meter,EnergyTransfer:Plant [J]
Zone,Meter,Boilers:EnergyTransfer [J]
Zone,Meter,Gas:Facility [J]
Zone,Meter,Gas:Plant [J]
Zone,Meter,Heating:Gas [J]
Zone,Meter,Boiler:Heating:Gas [J]
Zone,Meter,Electricity:Plant [J]
Zone,Meter,Heating:Electricity [J]
Zone,Meter,Boiler Parasitic:Heating:Electricity [J]
Zone,Meter,Cooling:Electricity [J]
Zone,Meter,Chillers:EnergyTransfer [J]
Zone,Meter,HeatRejection:EnergyTransfer [J]
Zone,Meter,Pumps:Electricity [J]
Zone,Meter,ElectricityPurchased:Facility [J]
Zone,Meter,ElectricityPurchased:Plant [J]
Zone,Meter,Cogeneration:ElectricityPurchased [J]
Zone,Meter,ElectricitySurplusSold:Facility [J]
Zone,Meter,ElectricitySurplusSold:Plant [J]
Zone,Meter,Cogeneration:ElectricitySurplusSold [J]
Zone,Meter,ElectricityNet:Facility [J]
Zone,Meter,ElectricityNet:Plant [J]
Zone,Meter,Cogeneration:ElectricityNet [J]
Zone,Meter,Carbon Equivalent:Facility [kg]
Zone,Meter,CarbonEquivalentEmissions:Carbon Equivalent [kg]
Zone,Meter,MYGENERALLIGHTS [J]
Zone,Meter,MYBUILDINGELECTRIC [J]
Zone,Meter,MYBUILDINGOTHER [J]
```

eplusout.shd

This file contains details of the shadow casting, back and receiving surfaces for the building. The Engineering Reference explains the shadowing calculations in more detail; this report file merely shows the level of interactions that the calculations will use. The report shows the Solar Distribution algorithm (in the example Full Interior and Exterior) and then proceeds to illustrate which surfaces shade (possibly) which other surfaces.

An example follows:

```
Shadowing Combinations
..Solar Distribution=FullInteriorAndExterior
 ==================================
 Surface=ZN001:WALL001 is used as Shadow Casting Surface in calculations.
 Number of general receiving surfaces=           0
 Number of back surfaces=           5
 ...Surface=ZN001:WALL002
 ...Surface=ZN001:WALL003
 ...Surface=ZN001:WALL004
 ...Surface=ZN001:FLR001
 ...Surface=ZN001:ROOF001
 Number of receiving sub surfaces=           1
 ....Surface=ZN001:WALL001:WIN001
 ==================================
 Surface=ZN001:WALL001:WIN001 is not used as Shadow Casting Surface in calculations.
 Number of general receiving surfaces=           0
 Number of back surfaces=           0
 Number of receiving sub surfaces=           0
 ==================================
```

```
Surface=ZN001:WALL002 is used as Shadow Casting Surface in calculations.
Number of general receiving surfaces=           0
Number of back surfaces=          0
Number of receiving sub surfaces=          0
==================================
Surface=ZN001:WALL003 is not used as Shadow Casting Surface in calculations.
Number of general receiving surfaces=           0
Number of back surfaces=          0
Number of receiving sub surfaces=          0
==================================
Surface=ZN001:WALL004 is not used as Shadow Casting Surface in calculations.
Number of general receiving surfaces=           0
Number of back surfaces=          0
Number of receiving sub surfaces=          0
==================================
Surface=ZN001:FLR001 is not used as Shadow Casting Surface in calculations.
Number of general receiving surfaces=           0
Number of back surfaces=          0
Number of receiving sub surfaces=          0
==================================
Surface=ZN001:ROOF001 is used as Shadow Casting Surface in calculations.
Number of general receiving surfaces=           0
Number of back surfaces=          0
Number of receiving sub surfaces=          0
```

eplusout.sln

The following shows an excerpt of "lines" report (**eplusout.sln**) for a single surface. It gives the surface name and then the coordinates in the "standard" EnergyPlus fashion (that is, UpperLeftCorner first and proceeding around, in this case, the four vertices in the surface.

```
SPACE1-1:MAIN SOUTH OVERHANG
     -0.65,     -1.13,      2.20,      0.00,      0.00,      2.20
      0.00,      0.00,      2.20,     17.15,     -9.90,      2.20
     17.15,     -9.90,      2.20,     16.50,    -11.03,      2.20
     16.50,    -11.03,      2.20,     -0.65,     -1.13,      2.20
```

The following shows an excerpt of "lines, IDF" report (**eplusout.sln**) for a single surface. It gives the coordinates in the "standard" EnergyPlus fashion (that is, UpperLeftCorner first and proceeding around, in this case, the four vertices in the surface. Note that this is NOT a complete description of the surface but enough to change your IDF file, if you want to.

```
Surface=WALL, Name=ROOMNORTH SURF6-1
  4,  !- Number of (X,Y,Z) groups in this surface
      -22.65,     -5.34,      3.00,  !- X,Y,Z ==> Vertex 1
      -22.65,     -5.34,      0.00,  !- X,Y,Z ==> Vertex 2
      -23.07,     -5.34,      0.00,  !- X,Y,Z ==> Vertex 3
      -23.07,     -5.34,      3.00;  !- X,Y,Z ==> Vertex 4
```

eplusout.sql

eplusout.sql is an optional output format for EnergyPlus. The eplusout.sql output file is an sqlite3 database file (see http://www.sqlite.org) and includes all of the data found in EnergyPlus' eplusout.eso and eplusout.mtr output files (i.e., EnergyPlus' standard variable and meter output files) plus a number of reports that are found in the eplusout.eio output file.

A discussion of the individual data tables is presented below followed by a discussion about how to access data within the SQL file.

List of Available SQLite Tables

This initial release of the SQL database output option includes a variety of data in the following tables:

- Component Sizing Table
- Construction Layers Table
- Constructions Table
- Materials Table
- Nominal Baseboard Heat Table
- Nominal Electric Equipment Table
- Nominal Gas Equipment Table
- Nominal Hot Water Equipment Table
- Nominal Infiltration Table
- Nominal Lighting Table
- Nominal Other Equipment Table
- Nominal People Table
- Nominal Steam Equipment Table
- Nominal Ventilation Table
- Report Meter Data Table
- Report Meter Data Dictionary Table
- Report Meter Extended Data Table
- Report Variable Data Table
- Report Variable Data Dictionary Table
- Report Variable Extended Data Table
- Room Air Model Table
- Schedules Table
- Surfaces Table
- System Sizing Table
- Time Indices Table
- Zone Group Table
- Zone Info Table
- Zone List Table
- Zone Sizing Table

A short discussion of contents of each of the above SQL tables is given in the sections that follow.

Report Variable Data

Data in the following four tables is also found in EnergyPlus' standard output file (i.e., eplusout.eso – see that section for more information). As with the standard output file, the "Report Variable" and "Report Meter" commands control the data in these tables.

Report Variable Data Dictionary Table

The ReportVariableDataDictionary table provides the equivalent of the dictionary portion of the ESO file (i.e., the first section of the .eso file). Please see the Report Variable section of the Input-Output Reference for more information.

Table 5. SQL ReportVariableDataDictionary Contents

Field Name	Field Type	Description
recordIndex	INTEGER PRIMARY KEY	The recordIndex links the dictionary data to the variable data (see ReportVariableData table)

indexType	INTEGER	The type of variable
keyValue	TEXT	The identifying "key name" for the data
variableName	TEXT	The actual report variable name
reportingFrequency	INTEGER	The reporting frequency of the variable
scheduleName	TEXT	The name of the schedule that controls reporting frequency
variableUnits	TEXT	The variable's units

Report Variable Data Table

The ReportVariableData table contains the report variable data (e.g., the hourly, daily, and monthly report variable data). Please see the Report Variable section of the Input-Output Reference for more information.

Table 6. SQL Report Variable Data Table Contents

Field Name	Field Type	Description
timeIndex	INTEGER	This index links the record to its time record (see the TimeIndices table below)
recordIndex	INTEGER	The recordIndex links the data to the respective data dictionary record (see ReportVariableDataDictionary table above)
variableValue	REAL	The variable's value
extendedDataIndex	INTEGER	Links the record to its extended data, if any (see the ReportVariableExtendedData table below)

Report Variable Extended Data Table

The ReportVariableExtendedData table contains additional data (e.g., monthly maximums and minimums) that is available for certain report variables.

Table 7. SQL Report Variable Extended Data Table Contents

Field Name	Field Type	Description
extendedDataIndex	INTEGER PRIMARY KEY	Connects the ReportVariableExtendedData table with the ReportVariableData table
maxValue	REAL	The maximum value during the reporting interval
maxMonth	INTEGER	The month in which the maximum value occurred
maxDay	INTEGER	The day on which the maximum value occurred
maxHour	INTEGER	The hour in which the maximum value occurred
maxStartMinute	INTEGER	The starting minute of the interval in which the maximum value occurred

maxMinute	INTEGER	The minute that the maximum value occurred
minValue	REAL	The minimum value
minMonth	INTEGER	The month in which the minimum value occurred
minDay	INTEGER	The day on which the minimum value occurred
minHour	INTEGER	The hour in which the minimum value occurred
minStartMinute	INTEGER	The starting minute of the interval in which the minimum value occurred
minMinute	INTEGER	The minute that the minimum value occurred

Time Indices Table

The TimeIndices table provides the time information for both the "report variable" and "report meter" variables (the ReportVariableData and ReportMeterData tables).

Table 8. SQL Time Indices Table Contents

Field Name	Field Type	Description
timeIndex	INTEGER PRIMARY KEY	Connects the time information with the report variables and meter variables (see the ReportVariableData and ReportMeterData tables)
month	INTEGER	Month
day	INTEGER	Day
hour	INTEGER	Hour
minute	INTEGER	Minute
dst	INTEGER	Daylight saving time indicator
interval	INTEGER	Length of the reporting interval
intervalType	INTEGER	The index for the type of reporting interval (e.g., hourly)
simulationDays	INTEGER	Number of simulation days in the reporting interval
dayType	TEXT	The type of day (e.g., Monday)

Report Meter Data

Data in the following three tables is also found in EnergyPlus' eplusout.mtr (i.e., meter) output file. Like in the eplusout.mtr file (see the eplusout.mtr section), only data requested by "Report Meter" commands is contained in the data tables below. Note that the Report Meter tables are very similar to the Report Variable tables described above.

Report Meter Data Dictionary Table

The ReportMeterDataDictionary table provides the equivalent of the dictionary portion (i.e., the first section) of the eplusout.mtr file.

Table 9. SQL Report Meter Data Dictionary Table Contents

Field Name	Field Type	Description
recordIndex	INTEGER PRIMARY KEY	The recordIndex links the dictionary data to the sampled data (see ReportMeterData table below)
indexType	INTEGER	The type of variable
keyValue	TEXT	The identifying “key name” for the data record
variableName	TEXT	The actual meter variable name
reportingFrequency	INTEGER	The reporting frequency of the variable
scheduleName	TEXT	The name of the schedule that controls reporting frequency
variableUnits	TEXT	The variable’s units

Report Meter Data Table

The ReportMeterData table contains the meter variable data (e.g., the hourly, daily, and monthly meter data).

Table 10. SQL Report Meter Data Table Contents

Field Name	Field Type	Description
timeIndex	INTEGER	This index links the record to its time record (see the TimeIndices table below)
recordIndex	INTEGER	The recordIndex links the data to the respective data dictionary record (see the ReportMeterDataDictionary table)
variableValue	REAL	The variable’s value
extendedDataIndex	INTEGER	Links the record to its extended data, if any (see the ReportVariableExtendedData table below)

Report Meter Extended Data Table

The ReportMeterExtendedData table contains additional data (e.g., reporting interval maximums and minimums) that is available for certain meter variables.

Table 11. SQL Report Meter Extended Data Table Contents

Field Name	Field Type	Description
extendedDataIndex	INTEGER PRIMARY KEY	The index that connects the extended data with the variable’s primary data (see the ReportMeterData table)
maxValue	REAL	The maximum value during the reporting period
maxMonth	INTEGER	The month in which the maximum value occurred

maxDay	INTEGER	The day on which the maximum value occurred
maxHour	INTEGER	The hour in which the maximum value occurred
maxStartMinute	INTEGER	The starting minute of the interval in which the maximum value occurred
maxMinute	INTEGER	The minute in which the maximum value occurred
minValue	REAL	The minimum value during the reporting period
minMonth	INTEGER	The month in which the minimum value occurred
minDay	INTEGER	The day on which the minimum value occurred
minHour	INTEGER	The hour in which the minimum value occurred
minStartMinute	INTEGER	The starting minute of the interval in which the minimum value occurred
minMinute	INTEGER	The minute in which the minimum value occurred

One time (EIO) File Data

Data in the tables below can also be found in EnergyPlus input output file (i.e., in the eplusout.eio output file).

Zone Info Table

The ZoneInfo table provides a variety of information about the zones specified within EnergyPlus. One of its most common uses is to provide zone name and area information for the other tables within the SQL database (e.g., use the ZoneIndex to look up the ZoneName).

Table 12. SQL Zone Information Table Contents

Field Name	Field Type	Description
ZoneIndex	INTEGER PRIMARY KEY	The ZoneIndex is used to link this table to related tables
ZoneName	TEXT	Zone Name
RelNorth	REAL	Relative North, in degrees
OriginX	REAL	X origin, in degrees
OriginY	REAL	Y origin, in degrees
OriginZ	REAL	Z origin, in degrees
Multiplier	REAL	Zone multiplier
MinimumX	REAL	Minimum X value, in meters
MaximumX	REAL	Maximum X value, in meters
MinimumY	REAL	Minimum Y value, in meters
MaximumY	REAL	Maximum Y value, in meters
MinimumZ	REAL	Minimum Z value, in meters

MaximumZ	REAL	Maximum Z value, in meters
CeilingHeight	REAL	Ceiling height, in meters
Volume	REAL	Zone volume, in cubic meters
InsideConvectionAlgo	INTEGER	Inside convection algorithm
OutsideConvectionAlgo	INTEGER	Outside convection algorithm
FloorArea	REAL	Zone floor area, in square meters
ExtGrossWallArea	REAL	Zone external gross wall area (includes windows and doors), in square meters
ExtNetWallArea	REAL	Zone net wall area (excludes windows and doors), and square meters
ExtWindowArea	REAL	Zone window area (includes glass doors), and square meters
isPartOfTotalArea	INTEGER	See zone object documentation

Please see the Zone object in the Group-Thermal Zone Description/Geometry section of the Input-Output Reference for more information.

Nominal People Table

An overview of the NominalPeople SQL table is shown below.

Table 13. SQL Nominal People Table Contents

Field Name	Field Type	Description
StmtNum	INTEGER	The internal statement number
ObjectName	TEXT	The name of the People object
ZoneIndex	INTEGER	Connects the NominalPeople table to the ZoneInfo table
NumberOfPeople	INTEGER	Nominal number of people in the zone
NumberOfPeopleSchedNo	INTEGER	Number of people schedule number (see Schedule table)
ActivitySchedNo	INTEGER	Activity level schedule (see People object documentation)
FractionRadiant	REAL	see People object documentation
FractionConvected	REAL	see People object documentation
WorkEfficiencySchedNo	INTEGER	Work efficiency schedule number (see schedule table and people object documentation)
ClothingEfficiencySchedNo	INTEGER	Clothing efficiency schedule number (see schedule table and people object documentation)
AirVelocitySchedNo	INTEGER	Air velocity schedule number (see schedule table and people object documentation)
Fanger	INTEGER	Flag indicating whether Fanger calculations are active
Pierce	INTEGER	Flag indicating whether Pierce calculations are active

KSU	INTEGER	Flag indicating whether KSU calculations are active
MRTCalcType	INTEGER	see People object documentation
SurfaceIndex	INTEGER	see Surfaces table and People object documentation
UserSpecifeidSensibleFraction	REAL	see People object documentation
Show55Warning	INTEGER	see People object documentation

Please see the People object in the Group-Internal Gains section of the Input-Output Reference for more information.

Nominal Lighting Table

An overview of the NominalLighting SQL table is shown below.

Table 14. SQL Nominal Lighting Table Contents

Field Name	Field Type	Description
StmtNum	INTEGER	The internal statement number
ObjectName	TEXT	The LIGHTS object name
ZoneIndex	INTEGER	Connects the NominalLighting table to the ZoneInfo table
SchedNo	INTEGER	Lighting schedule number (see Schedule table)
DesignLevel	REAL	Nominal design level, in Watts
FractionReturnAir	REAL	User-specified return air fraction
FractionRadiant	REAL	User-specified radiant fraction
FractionReplaceable	REAL	Defines the daylighting control for the LIGHTS object
EndUseSubcategory	TEXT	User-specified end-use subcategory

Please see the LIGHTS object in the Group-Internal Gains section of the Input-Output Reference for more information.

Nominal Electric Equipment Table

An overview of the NominalElectricEquipment SQL table is shown below.

Table 15. SQL Nominal Electric Equipment Table Contents

Field Name	Field Type	Description
StmtNum	INTEGER	The internal statement number
ObjectName	TEXT	The Electric Equipment object name
ZoneIndex	INTEGER	Connects the NominalElectricEquipment table to the ZoneInfo table
SchedNo	INTEGER	Electric equipment schedule number (see Schedule table)
DesignLevel	REAL	Nominal design level, in Watts
FractionLatent	REAL	User-specified latent heat fraction
FractionRadiant	REAL	User-specified radiant heat fraction
FractionLost	REAL	User-specified lost heat fraction

FractionConvected	REAL	User-specified convicted heat fraction
EndUseSubcategory	TEXT	User-specified end-use subcategory

Please see the Electric Equipment object in the Group-Internal Gains section of the Input-Output Reference for more information.

Nominal Gas Equipment Table

An overview of the NominalGasEquipment SQL table is shown below.

Table 16. SQL Nominal Gas Equipment Table Contents

Field Name	Field Type	Description
StmtNum	INTEGER	The internal statement number
ObjectName	TEXT	The Gas Equipment object name
ZoneIndex	INTEGER	Connects the NominalGasEquipment table to the ZoneInfo table
SchedNo	INTEGER	Gas equipment schedule number (see Schedule table)
DesignLevel	REAL	Nominal design level, in Watts
FractionLatent	REAL	User-specified latent heat fraction
FractionRadiant	REAL	User-specified radiant heat fraction
FractionLost	REAL	User-specified lost heat fraction
FractionConvected	REAL	User-specified convicted heat fraction
EndUseSubcategory	TEXT	User-specified end-use subcategory

Please see the Gas Equipment object in the Group-Internal Gains section of the Input-Output Reference for more information.

Nominal Steam Equipment Table

An overview of the NominalSteamEquipment SQL table is shown below.

Table 17. SQL Nominal Steam Equipment Table Contents

Field Name	Field Type	Description
StmtNum	INTEGER	The internal statement number
ObjectName	TEXT	The Steam Equipment object name
ZoneIndex	INTEGER	Connects the NominalSteamEquipment table to the ZoneInfo table
SchedNo	INTEGER	Steam equipment schedule number (see Schedule table)
DesignLevel	REAL	Nominal design level, in Watts
FractionLatent	REAL	User-specified latent heat fraction
FractionRadiant	REAL	User-specified radiant heat fraction
FractionLost	REAL	User-specified lost heat fraction
FractionConvected	REAL	User-specified convicted heat fraction
EndUseSubcategory	TEXT	User-specified end-use subcategory

Please see the Steam Equipment object in the Group-Internal Gains section of the Input-Output Reference for more information.

Nominal Hot Water Equipment Table

An overview of the NominalHotWaterEquipment SQL table is shown below.

Table 18. SQL Nominal Hot Water Equipment Table Contents

Field Name	Field Type	Description
StmtNum	INTEGER	The internal statement number
ObjectName	TEXT	The Hot Water Equipment object name
ZoneIndex	INTEGER	Connects the NominalHotWaterEquipment table to the ZoneInfo table
SchedNo	INTEGER	Hot water equipment schedule number (see Schedule table)
DesignLevel	REAL	Nominal design level, in Watts
FractionLatent	REAL	User-specified latent heat fraction
FractionRadiant	REAL	User-specified radiant heat fraction
FractionLost	REAL	User-specified lost heat fraction
FractionConvected	REAL	User-specified convicted heat fraction
EndUseSubcategory	TEXT	User-specified end-use subcategory

Please see the Hot Water Equipment object in the Group-Internal Gains section of the Input-Output Reference for more information.

Nominal Other Equipment Table

An overview of the NominalOtherEquipment SQL table is shown below.

Table 19. SQL Nominal Other Equipment Table Contents

Field Name	Field Type	Description
StmtNum	INTEGER	The internal statement number
ObjectName	TEXT	The Other Equipment object name
ZoneIndex	INTEGER	Connects the NominalOtherEquipment table to the ZoneInfo table
SchedNo	INTEGER	Other equipment schedule number (see Schedule table)
DesignLevel	REAL	Nominal design level, in Watts
FractionLatent	REAL	User-specified latent heat fraction
FractionRadiant	REAL	User-specified radiant heat fraction
FractionLost	REAL	User-specified lost heat fraction
FractionConvected	REAL	User-specified convicted heat fraction
EndUseSubcategory	TEXT	User-specified end-use subcategory

Please see the Other Equipment object in the Group-Internal Gains section of the Input-Output Reference for more information.

Nominal Baseboard Heat Table

An overview of the NominalBaseboardHeat SQL table is shown below.

Table 20. SQL Nominal Baseboard Heat Table Contents

Field Name	Field Type	Description
StmtNum	INTEGER	The internal statement number
ObjectName	TEXT	The Baseboard Heat object name
ZoneIndex	INTEGER	Connects the NominalBaseboardHeat table to the ZoneInfo table
SchedNo	INTEGER	Baseboard heat schedule number (see Schedule table)
CapatLowTemperature	REAL	Capacity at low temperature, in Watts
LowTemperature	REAL	Low temperature capacity setpoint
CapatHighTemperature	REAL	Capacity at high temperature, in Watts
HighTemperature	REAL	High temperature capacity setpoint
FractionRadiant	REAL	User-specified radiant heat fraction
FractionConvected	REAL	User-specified convicted heat fraction
EndUseSubcategory	TEXT	User-specified end-use subcategory

Please see the Baseboard Heat object in the Group-Internal Gains section of the Input-Output Reference for more information.

Nominal Infiltration Table

An overview of the NominalInfiltration SQL table is shown below.

Table 21. SQL Nominal Infiltration Table Contents

Field Name	Field Type	Description
StmtNum	INTEGER PRIMARY KEY	The internal statement number
ObjectName	TEXT	The Infiltration object name
ZoneIndex	INTEGER	Connects the NominalInfiltration table to the ZoneInfo table
SchedNo	INTEGER	Infiltration schedule number (see Schedule table)
DesignLevel	REAL	Nominal design level, in m3/s

Please see the Infiltration object in the Group-Airflow section of the Input-Output Reference for more information.

Nominal Ventilation Table

An overview of the NominalVentilation SQL table is shown below.

Table 22. SQL Nominal Ventilation Table Contents

Field Name	Field Type	Description
StmtNum	INTEGER PRIMARY KEY	The internal statement number
ObjectName	TEXT	The Ventilation object name

ZoneIndex	INTEGER	Connects the NominalVentilation table to the ZoneInfo table
SchedNo	INTEGER	Ventilation schedule number (see Schedule table)
DesignLevel	REAL	Nominal design level, in m3/s

Please see the Ventilation object in the Group-Airflow section of the Input-Output Reference for more information.

Surfaces Table

An overview of the Surfaces SQL table is shown below.

Table 23. SQL Surfaces Table Contents

Field Name	Field Type	Description
SurfaceNumber	INTEGER	Surface number (used for cross-referencing)
SurfaceName	TEXT PRIMARY KEY	Surface name
Construction	INTEGER	Construction Index
Class	INTEGER	Surface class index (see ClassName below)
ClassName	TEXT	Surface class name (e.g., shading, wall)
Areay	REAL	Surface area (excluding cutouts)
GrossArea	REAL	Surface area (including cutouts)
Perimeter	REAL	Surface perimeter, in meters
Azimuth	REAL	As news angle, in degrees
Height	REAL	Surface height, in meters
Reveal	REAL	Reveal depth, in meters
Shape	INTEGER	Shape index
Sides	INTEGER	Number of sides
Tilt	REAL	Tilt angle, in degrees
Width	REAL	Surface width, in meters
HeatTransferSurf	INTEGER	Flag indicating whether the surface is a heat transfer surface
BaseSurfaceName	TEXT	Base surface name (for subsurfaces only)
BaseSurface	INTEGER	Based surface index
ZoneName	TEXT	Zone name
Zone	INTEGER	Zone index
ExtBoundCondName	TEXT	External boundary condition name
ExtBoundCond	INTEGER	External boundary condition index
ExtSolar	INTEGER	Flag indicating whether the surface is exposed to solar
ExtWind	INTEGER	Flag indicating whether the surface is exposed to wind

Please see the Surface(s) object in the Group-Thermal Zone Description/Geometry section of the Input-Output Reference for more information.

Constructions Table

An overview of the Constructions SQL table is shown below.

Table 24. SQL Constructions Table Contents

Field Name	Field Type	Description
ConstructionIndex	INTEGER PRIMARY KEY	Construction Index
Name	TEXT	Construction name
TotalLayers	INTEGER	Total number of layers
TotalSolidLayers	INTEGER	Total number of solid layers
TotalGlassLayers	INyTEGER	Total number of glass layers
InsideAbsorpVis	REAL	The visible absorptance of the inside layer (see Materials table)
OutsideAbsorpVis	REAL	The visible absorptance of the outside layer (see Materials table)
InsideAbsorpSolar	REAL	The solar absorptance of the inside layer (see Materials table)
OutsideAbsorpSolar	REAL	The solar absorptance of the outside layer (see Materials table)
InsideAbsorpThermal	REAL	The thermal absorptance of the inside layer (see Materials table)
OutsideAbsorpThermal	REAL	The thermal absorptance of the outside layer (see Materials table)
OutsideRoughness	INTEGER	The roughness of the outside layer
TypeIsWindow	INTEGER	Flag indicating whether the construction is a window or glass door
Uvalue	REAL	Nominal U-value for the construction

Please see the Construction object in the Group-Surface Construction Elements section of the Input-Output Reference for more information.

Construction Layers Table

An overview of the ConstructionLayers SQL table is shown below.

Table 25. SQL Construction Layers Table Contents

Field Name	Field Type	Description
ConstructionIndex	INTEGER	Construction Index (see Constructions table)
LayerIndex	INTEGER	Layer number (layer 1 is the outside layer)
MaterialIndex	INTEGER	Material index (see Materials table)

Please see the Construction object in the Group-Surface Construction Elements section of the Input-Output Reference for more information.

Materials Table

An overview of the Materials SQL table is shown below.

Table 26. SQL Materials Table Contents

Field Name	Field Type	Description
MaterialIndex	INTEGER PRIMARY KEY	Material Index (links the Materials table with the ConstructionLayers and Constructions tables)
Name	TEXT	Material name
MaterialType	INTEGER	Material type
Roughness	INTEGER	Roughness index
Conductivity	REAL	Conductivity, in W/(m-K)
Density	REAL	Density, in kg/m3
Porosity	REAL	Porosity
Resistance	REAL	Resistance
Ronly	INTEGER	Flag that indicates the material definition is of type Material:Regular-R
SpecHeat	REAL	Specific heat
ThermGradCoef	REAL	Thermal gradient coefficient
Thickness	REAL	Thickness, in meters
VaporDiffus	REAL	Vapor diffusivity

Please see the Materials object in the Group-Surface Construction Elements section of the Input-Output Reference for more information.

Room Air Model Table

An overview of the RoomAirModel SQL table is shown below. Please see the Group-RoomAir Models section of the Input-Output Reference for more information.

Table 27. SQL Room Air Model Table Contents

Field Name	Field Type	Description
ZoneIndex	INTEGER PRIMARY KEY	Zone index
AirModelName	TEXT	Air model name
AirModelType	INTEGER	Air model index
TempCoupleScheme	INTEGER	Temperature coupling index
SimAirModel	INTEGER	Simulation air model index

Component Sizing Table

An overview of the ComponentSizing SQL table is shown below.

Table 28. SQL Component Sizing Table Contents

Field Name	Field Type	Description
CompType	TEXT	Component type
CompName	TEXT	Component name
Description	TEXT	Component description
Value	REAL	Sizing value
Units	TEXT	Sizing units

Please see the Sizing object in the Group-Design Objects section of the Input-Output Reference for more information.

System Sizing Table

An overview of the SystemSizing SQL table is shown below. Please see the System Sizing object in the Group-Design Objects section of the Input-Output Reference for more information.

Table 29. SQL System Sizing Table Contents

Field Name	Field Type	Description
SystemName	TEXT	System name
Description	TEXT	System description
Value	REAL	Sizing value
Units	TEXT	Sizing units

Zone Sizing Table

An overview of the ZoneSizing SQL table is shown below.

Table 30. SQL Zone Sizing Table Contents

Field Name	Field Type	Description
ZoneName	TEXT	Zone name
LoadType	TEXT	Load type
DesLoad	REAL	Design load
CalcDesFlow	REAL	Calculated design flow
UserDesFlow	REAL	User-specified design flow
DesDayName	TEXT	Design day name
PeakHrMin	TEXT	Time of the peak temperature
PeakTemp	REAL	Peak temperature
PeakHumRat	REAL	Peak humidity ratio
CalcOutsideAirFlow	REAL	Calculated outside air flow rate, in m3/s

Please see the Zone Sizing object in the Group-Design Objects section of the Input-Output Reference for more information.

Zone Group Table

An overview of the ZoneGroup SQL table is shown below.

Table 31. SQL Zone Group Table Contents

Field Name	Field Type	Description
ZoneGroupIndex	INTEGER PRIMARY KEY	Zone group index
Name	TEXT	Zone list name
ZoneListMultiplier	INTEGER	Zone list multiplier

Please see the Zone Group object in the Group-Thermal Zone Description/Geometry section of the Input-Output Reference for more information.

Zone List Table

An overview of the ZoneList SQL table is shown below.

Table 32. SQL Zone List Table Contents

Field Name	Field Type	Description
ZoneListIndex	INTEGER PRIMARY KEY	Zone list index
Name	TEXT	Zone list name
Zone	INTEGER	Zone index

Please see the Zone List object in the Group-Thermal Zone Description/Geometry section of the Input-Output Reference for more information.

Miscellaneous Tables

Schedules Table

An overview of the Schedules SQL table is shown below.

Table 33. SQL Schedules Table Contents

Field Name	Field Type	Description
ScheduleIndex	INTEGER PRIMARY KEY	Schedule index
ScheduleName	TEXT	Schedule name
ScheduleType	TEXT	Schedule Type
ScheduleMinimum	REAL	ScheduleMinimum
ScheduleMaximum	REAL	ScheduleMaximum

Please see the Group-Schedules section of the Input-Output Reference for more information.

How to Access the SQLite Data

The SQL database can be accessed in a number of ways, including via the command line, through ODBC, or through as SQLite's API interface. SQLite uses the industry standard SQL 92 language.

Command Line

One of the simplest ways to access the data in the SQL database is by way of the SQL command line tool (i.e., sqlite3). A brief description of how to use sqlite3 for each computing platform is given below.

Windows XP and Windows Vista

While Windows does not ship with sqlite3 installed, the sqlite3 binary can be downloaded from the SQLite webpage (www.sqlite.org/download.html). After downloading the precompiled binary, install it in the EnergyPlus directory.

Once the sqlite3 executable is installed, access the program from the command line by typing "sqlite3" at the DOS prompt.

Linux

The sqlite3 command line tool comes preinstalled on a number of more recent Linux releases. To see if sqlite3 is available (and which version is installed), type "sqlite3 --version" from the command line. If sqlite3 is not installed, the sqlite3 binary, as well as source code, can be downloaded from the SQLite webpage (http://www.sqlite.org/download.html) and installed in the directory of your choice.

Macintosh OS X

The sqlite3 program comes standard on MacOS X 10.5. From the command line, type "sqlite3 --version" to see which version of sqlite3 is installed. In order to access the database created by EnergyPlus, version 3 or later is required.

Accessing the Data from the Command Line

Once it has been confirmed that SQLite3 is installed on your machine, the SQL database can be accessed by typing:

```
sqlite3 <database name>
```

at the command line, where <database name > is the name of the SQL database (e.g., sqlite3 eplusout.sql).

The sqlite.org website, http://www.sqlite.org/sqlite.html, gives examples of how sqlite3 can be used to access and output data in various formats.

ODBC

ODBC allows access to the SQL database from a variety of programs, including Microsoft Excel, Microsoft Access, and FileMaker. How to install and use ODBC drivers is outside the scope of this document, and more information can be found at the following websites:

Macintosh ODBC drivers:

http://www.actualtechnologies.com/

Windows and Linux ODBC information and drivers:

http://www.sqlite.org/cvstrac/wiki?p=SqliteOdbc

http://www.ch-werner.de/sqliteodbc/

API

Sqlite3 includes a rich C++ API (detailed on the SQLite website www.sqlite.org/cintro.html), and wrappers for the API interface are available in a variety of programming languages, including Fortran, TCL, and Ruby (see www.sqlite.org/cvstrac/wiki?p=SqliteWrappers for more information).

eplusssz.<ext>

This file is the result of the System Sizing object and execution. As usual, the file can be read into a spreadsheet for easy viewing. An excerpt:

```
Time,:Des Heat Mass Flow [kg/s],:Des Cool Mass Flow [kg/s],:Des Heat Cap [W],:Des Sens Cool Cap [W],
00:15:00,1.063942E+00,0.000000E+00,5.944201E+03,0.000000E+00,
00:30:00,1.063942E+00,0.000000E+00,5.944201E+03,0.000000E+00,
00:45:00,1.063942E+00,0.000000E+00,5.944201E+03,0.000000E+00,
01:00:00,1.063942E+00,0.000000E+00,5.944201E+03,0.000000E+00,
01:15:00,1.063942E+00,0.000000E+00,5.944200E+03,0.000000E+00,
01:30:00,1.063942E+00,0.000000E+00,5.944200E+03,0.000000E+00,
01:45:00,1.063942E+00,0.000000E+00,5.944200E+03,0.000000E+00,
02:00:00,1.063942E+00,0.000000E+00,5.944200E+03,0.000000E+00,
02:15:00,1.063942E+00,0.000000E+00,5.944200E+03,0.000000E+00,
02:30:00,1.063942E+00,0.000000E+00,5.944200E+03,0.000000E+00,
02:45:00,1.063942E+00,0.000000E+00,5.944200E+03,0.000000E+00,
03:00:00,1.063942E+00,0.000000E+00,5.944200E+03,0.000000E+00,
03:15:00,1.063942E+00,0.000000E+00,5.944200E+03,0.000000E+00,
03:30:00,1.063942E+00,0.000000E+00,5.944200E+03,0.000000E+00,
03:45:00,1.063942E+00,0.000000E+00,5.944200E+03,0.000000E+00,
04:00:00,1.063942E+00,0.000000E+00,5.944200E+03,0.000000E+00,
04:15:00,1.063942E+00,0.000000E+00,5.944200E+03,0.000000E+00,
04:30:00,1.063942E+00,0.000000E+00,5.944200E+03,0.000000E+00,
04:45:00,1.063942E+00,0.000000E+00,5.944200E+03,0.000000E+00,
05:00:00,1.063942E+00,0.000000E+00,5.944200E+03,0.000000E+00,
05:15:00,1.063942E+00,0.000000E+00,5.944200E+03,0.000000E+00,
05:30:00,1.063942E+00,0.000000E+00,5.944200E+03,0.000000E+00,
=== reduced for brevity ===
```

```
Coinc Peak   ,1.063943E+00,1.378986E+00,5.944199E+03,2.165922E+04,
NonCoinc Peak,1.063943E+00,1.553319E+00,5.944199E+03,2.165922E+04,
```

Or as depicted graphically:

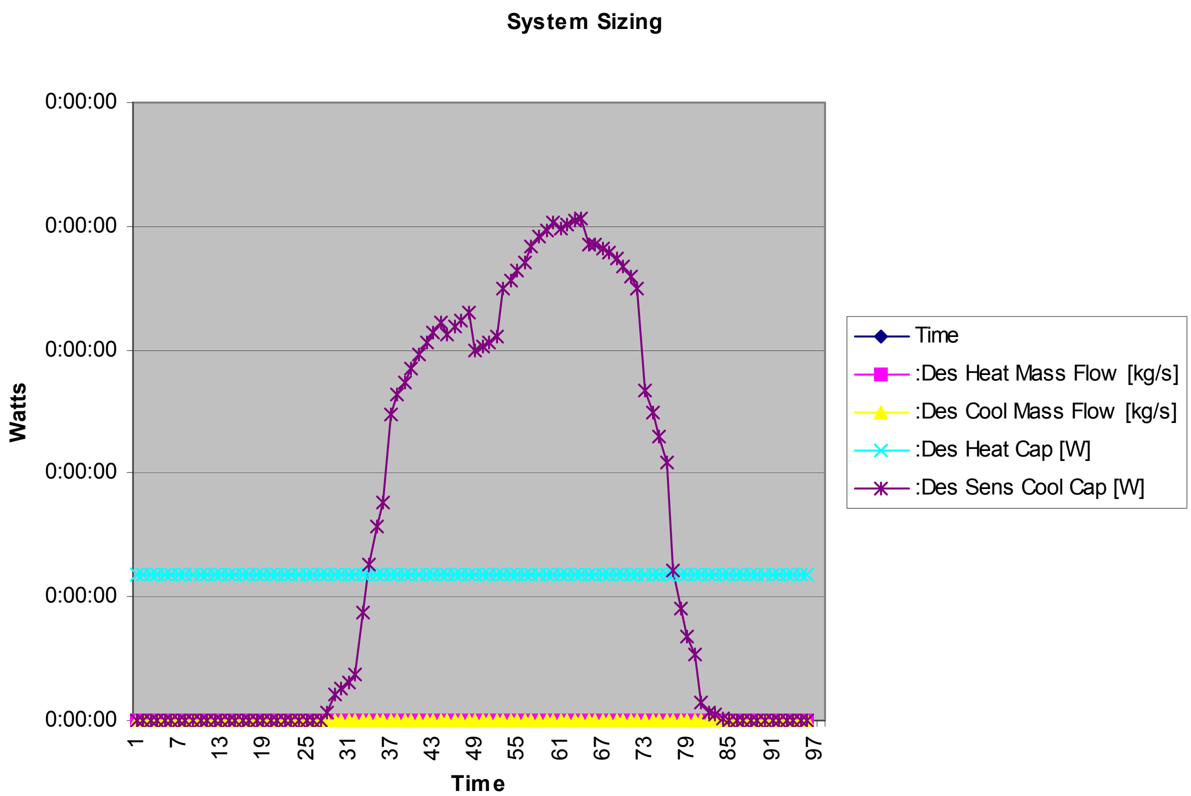


Figure 4. System Size depiction from eplusout.ssz

epluszsz.<ext>

This file is a result of the Zone Sizing Object. It has a similar format to the eplusssz.<ext> file.

An excerpt:

```
Time,SPACE1-1:CHICAGO ILLINOIS WINTER:Des Heat Load [W],SPACE1-1:CHICAGO ILLINOIS SUMMER:Des Cool Load
[W],SPACE1-1:CHICAGO ILLINOIS WINTER:Des Heat Mass Flow [kg/s],SPACE1-1:CHICAGO ILLINOIS SUMMER:Des Cool
Mass Flow [kg/s],SPACE2-1:CHICAGO ILLINOIS WINTER:Des Heat Load [W],SPACE2-1:CHICAGO ILLINOIS SUMMER:Des
Cool Load [W],SPACE2-1:CHICAGO ILLINOIS WINTER:Des Heat Mass Flow [kg/s],SPACE2-1:CHICAGO ILLINOIS
SUMMER:Des Cool Mass Flow [kg/s],SPACE3-1:CHICAGO ILLINOIS WINTER:Des Heat Load [W],SPACE3-1:CHICAGO
ILLINOIS SUMMER:Des Cool Load [W],SPACE3-1:CHICAGO ILLINOIS WINTER:Des Heat Mass Flow [kg/s],SPACE3-
1:CHICAGO ILLINOIS SUMMER:Des Cool Mass Flow [kg/s],SPACE4-1:CHICAGO ILLINOIS WINTER:Des Heat Load
[W],SPACE4-1:CHICAGO ILLINOIS SUMMER:Des Cool Load [W],SPACE4-1:CHICAGO ILLINOIS WINTER:Des Heat Mass Flow
[kg/s],SPACE4-1:CHICAGO ILLINOIS SUMMER:Des Cool Mass Flow [kg/s],SPACE5-1:CHICAGO ILLINOIS WINTER:Des
Heat Load [W],SPACE5-1:CHICAGO ILLINOIS SUMMER:Des Cool Load [W],SPACE5-1:CHICAGO ILLINOIS WINTER:Des Heat
Mass Flow [kg/s],SPACE5-1:CHICAGO ILLINOIS SUMMER:Des Cool Mass Flow [kg/s],
00:15:00,6.296981E+03,0.000000E+00,2.152065E-01,0.000000E+00,2.551769E+03,0.000000E+00,8.721081E-
02,0.000000E+00,6.033166E+03,0.000000E+00,2.061903E-01,0.000000E+00,2.551769E+03,0.000000E+00,8.721081E-
02,0.000000E+00,6.513257E+03,0.000000E+00,2.225982E-01,0.000000E+00,
00:30:00,6.296981E+03,0.000000E+00,2.152065E-01,0.000000E+00,2.551769E+03,0.000000E+00,8.721081E-
02,0.000000E+00,6.033167E+03,0.000000E+00,2.061903E-01,0.000000E+00,2.551769E+03,0.000000E+00,8.721081E-
02,0.000000E+00,6.513258E+03,0.000000E+00,2.225982E-01,0.000000E+00,
00:45:00,6.296981E+03,0.000000E+00,2.152065E-01,0.000000E+00,2.551769E+03,0.000000E+00,8.721082E-
02,0.000000E+00,6.033167E+03,0.000000E+00,2.061903E-01,0.000000E+00,2.551769E+03,0.000000E+00,8.721082E-
02,0.000000E+00,6.513258E+03,0.000000E+00,2.225982E-01,0.000000E+00,
01:00:00,6.296981E+03,0.000000E+00,2.152065E-01,0.000000E+00,2.551769E+03,0.000000E+00,8.721082E-
02,0.000000E+00,6.033167E+03,0.000000E+00,2.061903E-01,0.000000E+00,2.551769E+03,0.000000E+00,8.721082E-
02,0.000000E+00,6.513258E+03,0.000000E+00,2.225982E-01,0.000000E+00,
01:15:00,6.296981E+03,0.000000E+00,2.152065E-01,0.000000E+00,2.551769E+03,0.000000E+00,8.721082E-
02,0.000000E+00,6.033167E+03,0.000000E+00,2.061903E-01,0.000000E+00,2.551769E+03,0.000000E+00,8.721082E-
02,0.000000E+00,6.513259E+03,0.000000E+00,2.225982E-01,0.000000E+00,
01:30:00,6.296982E+03,0.000000E+00,2.152065E-01,0.000000E+00,2.551769E+03,0.000000E+00,8.721082E-
02,0.000000E+00,6.033167E+03,0.000000E+00,2.061903E-01,0.000000E+00,2.551769E+03,0.000000E+00,8.721082E-
02,0.000000E+00,6.513259E+03,0.000000E+00,2.225982E-01,0.000000E+00,
01:45:00,6.296982E+03,0.000000E+00,2.152065E-01,0.000000E+00,2.551769E+03,0.000000E+00,8.721083E-
02,0.000000E+00,6.033167E+03,0.000000E+00,2.061904E-01,0.000000E+00,2.551769E+03,0.000000E+00,8.721083E-
02,0.000000E+00,6.513259E+03,0.000000E+00,2.225983E-01,0.000000E+00,
02:00:00,6.296982E+03,0.000000E+00,2.152065E-01,0.000000E+00,2.551770E+03,0.000000E+00,8.721083E-
02,0.000000E+00,6.033167E+03,0.000000E+00,2.061904E-01,0.000000E+00,2.551770E+03,0.000000E+00,8.721083E-
02,0.000000E+00,6.513259E+03,0.000000E+00,2.225983E-01,0.000000E+00,
02:15:00,6.296982E+03,0.000000E+00,2.152065E-01,0.000000E+00,2.551770E+03,0.000000E+00,8.721083E-
02,0.000000E+00,6.033168E+03,0.000000E+00,2.061904E-01,0.000000E+00,2.551770E+03,0.000000E+00,8.721083E-
02,0.000000E+00,6.513260E+03,0.000000E+00,2.225983E-01,0.000000E+00,
02:30:00,6.296982E+03,0.000000E+00,2.152065E-01,0.000000E+00,2.551770E+03,0.000000E+00,8.721083E-
02,0.000000E+00,6.033168E+03,0.000000E+00,2.061904E-01,0.000000E+00,2.551770E+03,0.000000E+00,8.721083E-
02,0.000000E+00,6.513260E+03,0.000000E+00,2.225983E-01,0.000000E+00,
02:45:00,6.296982E+03,0.000000E+00,2.152065E-01,0.000000E+00,2.551770E+03,0.000000E+00,8.721083E-
02,0.000000E+00,6.033168E+03,0.000000E+00,2.061904E-01,0.000000E+00,2.551770E+03,0.000000E+00,8.721083E-
02,0.000000E+00,6.513260E+03,0.000000E+00,2.225983E-01,0.000000E+00,
=== reduced for brevity ===
```

```
Peak         ,6.296985E+03,2.619306E+03,2.152066E-01,2.590662E-01,2.551771E+03,1.974645E+03,8.721088E-
02,1.953002E-01,6.033171E+03,2.481187E+03,2.061905E-01,2.454047E-01,2.551771E+03,2.485711E+03,8.721088E-
02,2.458426E-01,6.513265E+03,2.519922E+03,2.225985E-01,2.492472E-01,
Peak Vol Flow,6.296985E+03,2.619306E+03,1.827742E-01,2.200241E-01,2.551771E+03,1.974645E+03,7.406790E-
02,1.658678E-01,6.033171E+03,2.481187E+03,1.751169E-01,2.084213E-01,2.551771E+03,2.485711E+03,7.406790E-
02,2.087933E-01,6.513265E+03,2.519922E+03,1.890521E-01,2.116848E-01,
```

Or as depicted in a chart:

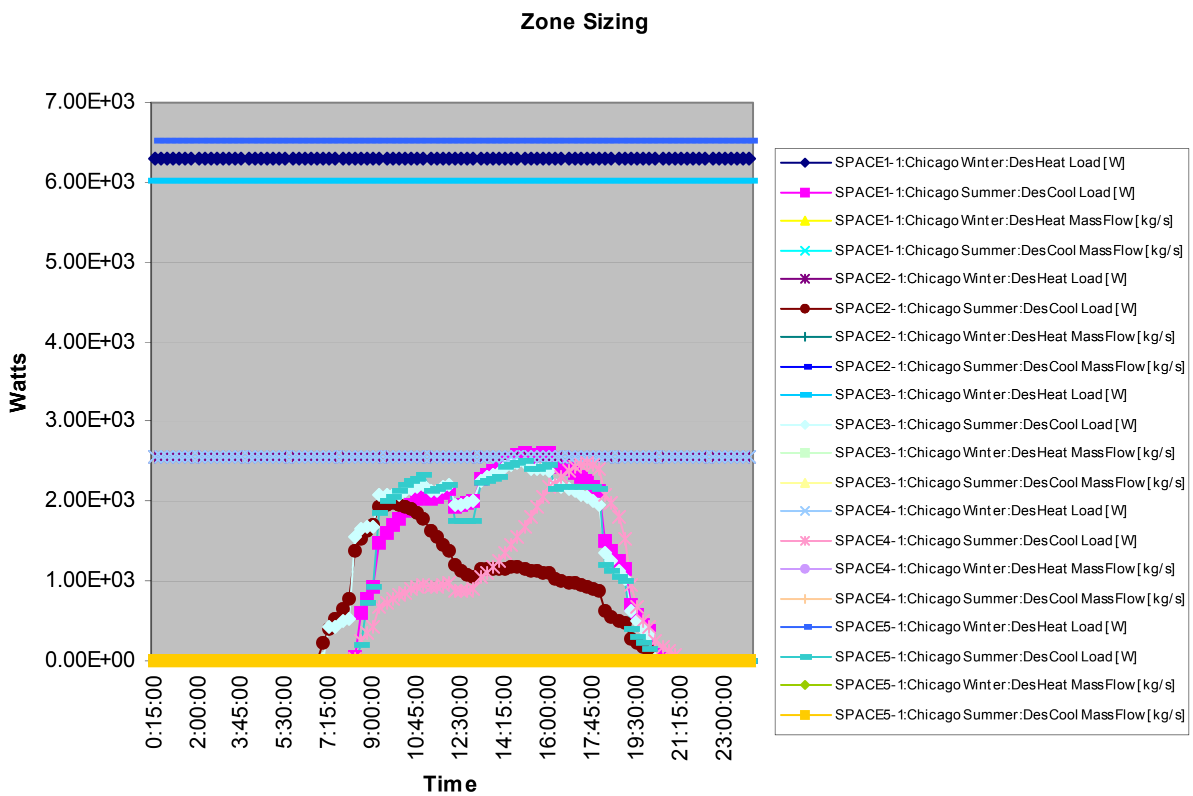


Figure 5. Zone Sizing from epluszsz.csv

eplusout.<ext>

The eplusout.csv (or txt or tab extension) is a file that can be produced by post-processing on the eplusout.eso file. EnergyPlus distributes a post-processing program (ReadVarsESO – see next section) with the installation.

eplusmtr.<ext>

The eplusmtr.csv (or txt or tab extension) is a file that can be produced by post-processing on the eplusout.mtr file. EnergyPlus distributes a post-processing program (ReadVarsESO – see next section) with the installation.

eplusmap.<ext>

The eplusmap.csv (or txt or tab extension) is a file that is generated by the DAYLIGHTING:ILLUMINANCE MAP object. By default, this is a comma delimited text file (csv) that can be imported into a spreadsheet program. For example, the input for the DAYLIGHTING:ILLUMINANCE MAP object shown below:

```
DAYLIGHTING:ILLUMINANCE MAP,
  Daylit Map,              !- Map Name
  Daylit Zone,             !- Zone Name
  0.8,                     !- Z height {m}
```

```
      0.1,                    !- X minimum coordinate {m}
      4.9,                    !- X maximum coordinate {m}
      10,                     !- Number of X grid points
      0.1,                    !- Y minimum coordinate {m}
      9.9,                    !- Y maximum coordinate {m}
      10;                     !- Number of Y grid points
```

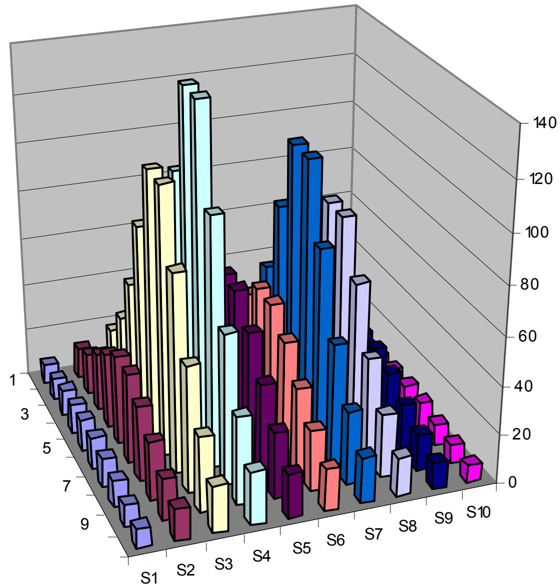
generates the following output in csv format when viewed with Microsoft Excel:

	A	B	C	D	E	F	G	H	I	J	K
1	Date/Time	CHICAGO	RefPt1=(2.	RefPt2=(2.50:3.00:0.80)							
2	7/21/2008 5:00	x=0.10	x=0.63	x=1.17	x=1.70	x=2.23	x=2.77	x=3.30	x=3.83	x=4.37	x=4.90
3	y=0.10	0	0	0	0	0	0	0	0	0	0
4	y=1.19	0	0	0	1	1	1	1	0	0	0
5	y=2.28	0	1	1	1	2	2	1	1	1	0
6	y=3.37	0	1	1	2	2	2	2	1	1	0
7	y=4.46	0	0	1	1	1	1	1	1	0	0
8	y=5.54	0	0	1	1	1	1	1	1	0	0
9	y=6.63	0	1	1	1	2	2	1	1	1	0
10	y=7.72	0	0	1	1	1	1	1	1	0	0
11	y=8.81	0	0	0	0	1	1	0	0	0	0
12	y=9.90	0	0	0	0	0	0	0	0	0	0
13	7/21/2008 6:00	x=0.10	x=0.63	x=1.17	x=1.70	x=2.23	x=2.77	x=3.30	x=3.83	x=4.37	x=4.90
14	y=0.10	2	2	3	3	3	3	3	3	2	2
15	y=1.19	3	4	6	8	9	9	8	6	4	3
16	y=2.28	5	8	13	20	26	26	20	13	8	5
17	y=3.37	5	9	15	25	34	34	25	15	9	5
18	y=4.46	4	6	9	13	15	15	13	9	6	4
19	y=5.54	4	6	8	11	13	13	11	8	6	4
20	y=6.63	4	7	12	19	27	27	19	12	7	4
21	y=7.72	4	6	10	16	21	21	16	10	6	4
22	y=8.81	3	3	5	6	7	7	6	5	3	3
23	y=9.90	2	2	2	3	3	3	3	2	2	2
24	7/21/2008 7:00	x=0.10	x=0.63	x=1.17	x=1.70	x=2.23	x=2.77	x=3.30	x=3.83	x=4.37	x=4.90
25	y=0.10	8	9	11	12	13	13	12	11	9	8
26	y=1.19	13	17	24	31	37	37	31	24	17	13
27	y=2.28	19	31	52	82	110	110	82	52	31	19
28	y=3.37	22	36	62	102	140	140	102	62	36	22
29	y=4.46	18	27	39	53	64	64	53	39	27	18
30	y=5.54	17	25	35	47	56	56	47	35	25	17
31	y=6.63	19	30	50	82	112	112	82	50	30	19
32	y=7.72	16	26	42	66	87	87	66	42	26	16
33	y=8.81	11	15	20	26	30	30	26	20	15	11
34	y=9.90	7	8	9	11	11	11	11	9	8	7
35	7/21/2008 8:00	x=0.10	x=0.63	x=1.17	x=1.70	x=2.23	x=2.77	x=3.30	x=3.83	x=4.37	x=4.90
36	y=0.10	17	20	23	26	28	28	26	23	20	17
37	y=1.19	27	36	50	65	76	76	65	50	36	27
38	y=2.28	40	65	108	171	228	228	171	108	65	40

<reduced for brevity>

Each cell reports the illuminance (in lux) at the location specified by the X and Y coordinates in the column and row header respectively. The date and time are indicated in the upper left cell of the map. One map is reported for every hour of the simulation.

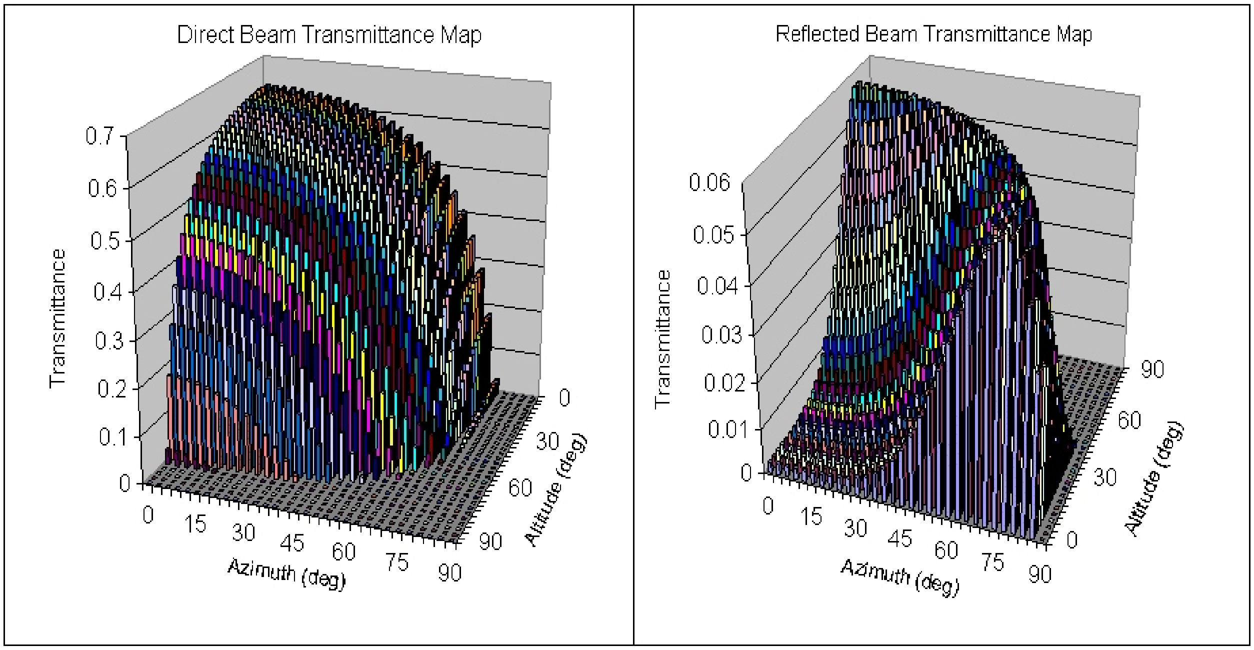
The illuminance values are organized to allow the user to rapidly plot a visualization of the data using Microsoft Excel's standard "3-D Column" graph. A 3-D graph is shown below for the data in the "7/21/2008 7:00" map of the earlier example.



Individual 3-D graphs can be generated for each hour of a given day and collected to generate a sequence of graphs representing the progression of daylighting conditions over the course of the day. Using additional software tools (not provided with EnergyPlus) the user can do further post-processing to link screenshots of the graphs into an animated sequence.

eplusscreen.csv

Results of the window screen transmittance map. This file can be used to create a 3-D Column chart for graphically viewing the direct beam and reflected beam transmittance at various relative azimuth and relative altitude angles. The "relative" angles in this file are the incident solar angles with respect to the outward surface normal. The figures below are example 3-D charts generated using the data provided in this output file.



eplustbl.<ext>

The eplustbl file contains the tabular output results that are created when using the following objects:

- Output:Table:Predefined
- Output:Table:TimeBins
- Output:Table:Monthly
- UtilityCost:Tariff
- ComponentCost:Line Item

The format and the extension for the file depends on the setting of the ColumnSeparator field of the Report:Table:Style object. The choices of HTML, tab, fixed and comma result in eplustbl.htm, eplustbl.tab, eplustbl.txt, or eplustbl.csv respectively. The HTML version of the report also includes a table of contents that allows easier navigation through the file.

By default the energy units reported in all of the eplustbl files are in Joules (J) but the UnitConversion field of the Report:Table:Style object allows for the values to be reported in MJ, GJ or in kWh.

Output:Table:Predefined

Several predefined reports are available from the Report:Table:Predefined object including the following.

- Annual Building Utility Performance Summary
- Input Verification and Results Summary
- Demand End Use Components Summary
- Climatic Data Summary
- Equipment Summary
- Envelope Summary
- Surface Shadowing Summary
- Shading Summary

- Lighting Summary
- HVAC Sizing Summary
- System Summary
- Component Sizing Summary
- Outside Air Summary
- Object Count Summary

Each of these reports is made up of several sub-tables of information. Examples of each table are shown below. To enable all of the reports the single All Summary may be specified.

Annual Building Utility Performance Summary

The Annual Building Utility Performance Summary provides an overview of energy consumption in the building for different end uses. The following is an example this report (some columns may be truncated due to page size).

```
Report: AnnualBuildingUtilityPerformanceSummary
For: Entire Facility
Timestamp: 2009-02-10 12:39:35
Values gathered over 8760.00 hours
```

Site and Source Energy

	Total Energy (GJ)	Energy Per Total Building Area (MJ/m2)	Energy Per Conditioned Building Area (MJ/m2)
Total Site Energy	194.80	210.09	210.09
Net Site Energy	194.80	210.09	210.09
Total Source Energy	532.25	574.04	574.04
Net Source Energy	532.25	574.04	574.04

Source to Site Energy Converstion Factors

	Source=>Site Conversion Factor
Electricity	3.167
Natural Gas	1.084
District Cooling	1.056
District Heating	3.613
Steam	0.300
Gasoline	1.050
Diesel	1.050
Coal	1.050
Fuel Oil #1	1.050
Fuel Oil #2	1.050
Propane	1.050

Building Area

	Area (m2)

Total Building Area	927.20
Net Conditioned Building Area	927.20
Unconditioned Building Area	0.00

End Uses

	Electricity (GJ)	Natural Gas (GJ)	Other Fuel (GJ)	District Cooling (GJ)	District Heating (GJ)	Water (m3)
Heating	0.00	40.65	0.00	0.00	0.00	0.00
Cooling	18.18	0.00	0.00	0.00	0.00	0.00
Interior Lighting	81.24	0.00	0.00	0.00	0.00	0.00
Exterior Lighting	0.00	0.00	0.00	0.00	0.00	0.00
Interior Equipment	47.70	0.00	0.00	0.00	0.00	0.00
Exterior Equipment	0.00	0.00	0.00	0.00	0.00	0.00
Fans	7.03	0.00	0.00	0.00	0.00	0.00
Pumps	0.00	0.00	0.00	0.00	0.00	0.00
Heat Rejection	0.00	0.00	0.00	0.00	0.00	0.00
Humidification	0.00	0.00	0.00	0.00	0.00	0.00
Heat Recovery	0.00	0.00	0.00	0.00	0.00	0.00
Water Systems	0.00	0.00	0.00	0.00	0.00	0.00
Refrigeration	0.00	0.00	0.00	0.00	0.00	0.00
Generators	0.00	0.00	0.00	0.00	0.00	0.00
Total End Uses	154.15	40.65	0.00	0.00	0.00	0.00

Note: Natural gas appears to be the principal heating source based on energy usage.

End Uses By Subcategory

	Subcategory	Electricity (GJ)	Natural Gas (GJ)	Other Fuel (GJ)	District Cooling (GJ)	District Heating (GJ)	Water (m3)
Heating	General	0.00	40.65	0.00	0.00	0.00	0.00
Cooling	General	18.18	0.00	0.00	0.00	0.00	0.00
Interior Lighting	GeneralLights	81.24	0.00	0.00	0.00	0.00	0.00
Exterior Lighting	General	0.00	0.00	0.00	0.00	0.00	0.00
Interior Equipment	General	47.70	0.00	0.00	0.00	0.00	0.00
Exterior Equipment	General	0.00	0.00	0.00	0.00	0.00	0.00
Fans	General	7.03	0.00	0.00	0.00	0.00	0.00
Pumps	General	0.00	0.00	0.00	0.00	0.00	0.00

Heat Rejection	General	0.00	0.00	0.00	0.00	0.00	0.00
Humidification	General	0.00	0.00	0.00	0.00	0.00	0.00
Heat Recovery	General	0.00	0.00	0.00	0.00	0.00	0.00
Water Systems	General	0.00	0.00	0.00	0.00	0.00	0.00
Refrigeration	General	0.00	0.00	0.00	0.00	0.00	0.00
Generators	General	0.00	0.00	0.00	0.00	0.00	0.00

Normalized Metrics

Utility Use Per Conditioned Floor Area

	Electricity Intensity (MJ/m2)	Natural Gas Intensity (MJ/m2)	Other Fuel Intensity (MJ/m2)	District Cooling Intensity (MJ/m2)	District Heating Intensity (MJ/m2)	Water Intensity (m3/m2)
Lighting	87.62	0.00	0.00	0.00	0.00	0.00
HVAC	27.19	43.84	0.00	0.00	0.00	0.00
Other	51.44	0.00	0.00	0.00	0.00	0.00
Total	166.25	43.84	0.00	0.00	0.00	0.00

Utility Use Per Total Floor Area

	Electricity Intensity (MJ/m2)	Natural Gas Intensity (MJ/m2)	Other Fuel Intensity (MJ/m2)	District Cooling Intensity (MJ/m2)	District Heating Intensity (MJ/m2)	Water Intensity (m3/m2)
Lighting	87.62	0.00	0.00	0.00	0.00	0.00
HVAC	27.19	43.84	0.00	0.00	0.00	0.00
Other	51.44	0.00	0.00	0.00	0.00	0.00
Total	166.25	43.84	0.00	0.00	0.00	0.00

Electric Loads Satisfied

	Electricity (GJ)	Percent Electricity (%)
Fuel-Fired Power Generation	0.00	0.00
High Temperature Geothermal*	0.00	0.00
Photovoltaic Power	0.00	0.00
Wind Power*	0.00	0.00
Net Decrease in On-Site Storage	0.00	0.00
Total On-Site Electric Sources	0.00	0.00
Electricity Coming From Utility	154.15	100.00
Surplus Electricity Going To Utility	0.00	0.00
Net Electricity From Utility	154.15	100.00
Total On-Site and Utility Electric Sources	154.15	100.00

Total Electricity End Uses	154.15	100.00

On-Site Thermal Sources

	Heat (GJ)	Percent Heat (%)
Water-Side Heat Recovery	0.00	
Air to Air Heat Recovery for Cooling	0.00	
Air to Air Heat Recovery for Heating	0.00	
High-Temperature Geothermal*	0.00	
Solar Water Thermal	0.00	
Solar Air Thermal	0.00	
Total On-Site Thermal Sources	0.00	

Water Source Summary

	Water (m3)	Percent Water (%)
Rainwater Collection	0.00	-
Condensate Collection	0.00	-
Groundwater Well	0.00	-
Total On Site Water Sources	0.00	-
-	-	-
Initial Storage	0.00	-
Final Storage	0.00	-
Change in Storage	0.00	-
-	-	-
Water Supplied by Utility	0.00	-
-	-	-
Total On Site, Change in Storage, and Utility Water Sources	0.00	-
Total Water End Uses	0.00	-

Comfort and Setpoint Not Met Summary

	Facility (Hours)
Time Set Point Not Met During Occupied Heating	0.00
Time Set Point Not Met During Occupied Cooling	406.00
Time Not Comfortable Based on Simple ASHRAE 55-2004	1033.00

Note 1: An asterisk (*) indicates that the feature is not yet implemented.

Input Verification and Results Summary

The Input Verification and Results Summary report provides a summary of some of the most common input assumptions that are not included in any of the other predefined reports. An example of the report is shown below:

```
Report: InputVerificationandResultsSummary
For: Entire Facility
```

Timestamp: 2009-02-10 12:39:35

General

	Value
Program Version and Build	EnergyPlus, Version 3.1
Weather	Chicago IL United States TMY2 94846 WMO#=725340
Latitude (deg)	41.78
Longitude (deg)	-87.8
Elevation (m)	190.00
Time Zone	-6.0
North Axis Angle (deg)	30.00
Hours Simulated (hrs)	8760.00

ENVELOPE

Window-Wall Ratio

	Total	North (315 to 45 deg)	East (45 to 135 deg)	South (135 to 225 deg)	West (225 to 315 deg)
Gross Wall Area (m2)	274.20	91.50	45.60	91.50	45.60
Window Opening Area (m2)	61.65	20.85	9.12	22.56	9.12
Window-Wall Ratio (%)	22.48	22.79	20.00	24.66	20.00

Skylight-Roof Ratio

	Total
Gross Roof Area (m2)	463.60
Skylight Area (m2)	0.00
Skylight-Roof Ratio (%)	0.00

PERFORMANCE

Zone Summary

	Area (m2)	Conditioned (Y/N)	Volume (m3)	Multipliers	Gross Wall Area (m2)	Window Glass Area (m2)	Lighting (W/m2)	People (m2/person)	Plug and Process (W/m2)
PLENUM-1	463.60	Yes	283.20	1.00	54.84	0.00	0.0000		0.0000
SPACE1-1	99.16	Yes	239.25	1.00	73.20	22.56	15.9742	9.01	10.6495
SPACE2-1	42.73	Yes	103.31	1.00	36.48	9.12	16.0056	8.55	10.6704
SPACE3-1	96.48	Yes	239.25	1.00	73.20	20.85	16.4179	8.77	10.9453
SPACE4-1	42.73	Yes	103.31	1.00	36.48	9.12	16.0056	8.55	10.6704
SPACE5-1	182.49	Yes	447.68	1.00	0.00	0.00	16.2420	9.12	10.8280
Total	927.20		1416.00		274.20	61.65	8.0889	17.83	5.3926
Conditioned Total	927.20		1416.00		274.20	61.65	8.0889	17.83	5.3926

Unconditioned Total	0.00		0.00		0.00	0.00			

Demand End Use Components Summary

The Demand End Use Components Summary shows the demand breakdown by component end use at the time that the peak demand for each source of energy is set. The time of the peak demand is shown in the first row. The contributions of each end use at the time of the peak demand of the energy source is shown in this report.

```
Report: DemandEndUseComponentsSummary
For: Entire Facility
Timestamp: 2009-02-10 12:39:35
End Uses
```

	Electricity (W)	Natural Gas (W)	Propane (W)	District Cooling (W)	Steam (W)	Water (m3/s)
Time of Peak	02-JUL-14:00	31-DEC-07:15	-	-	-	-
Heating	0.00	81764.44	0.00	0.00	0.00	0.00
Cooling	12342.62	0.00	0.00	0.00	0.00	0.00
Interior Lighting	7500.00	0.00	0.00	0.00	0.00	0.00
Exterior Lighting	0.00	0.00	0.00	0.00	0.00	0.00
Interior Equipment	4000.00	0.00	0.00	0.00	0.00	0.00
Exterior Equipment	0.00	0.00	0.00	0.00	0.00	0.00
Fans	1498.36	0.00	0.00	0.00	0.00	0.00
Pumps	0.00	0.00	0.00	0.00	0.00	0.00
Heat Rejection	0.00	0.00	0.00	0.00	0.00	0.00
Humidification	0.00	0.00	0.00	0.00	0.00	0.00
Heat Recovery	0.00	0.00	0.00	0.00	0.00	0.00
Water Systems	0.00	0.00	0.00	0.00	0.00	0.00
Refrigeration	0.00	0.00	0.00	0.00	0.00	0.00
Generators	0.00	0.00	0.00	0.00	0.00	0.00
Total End Uses	25340.97	81764.44	0.00	0.00	0.00	0.00

End Uses By Subcategory

	Subcategory	Electricity (W)	Natural Gas (W)	Propane (W)	District Cooling (W)	Steam (W)	Water (m3/s)
Heating	General	0.00	81764.44	0.00	0.00	0.00	0.00
Cooling	General	12342.62	0.00	0.00	0.00	0.00	0.00
Interior Lighting	GeneralLights	7500.00	0.00	0.00	0.00	0.00	0.00
Exterior Lighting	General	0.00	0.00	0.00	0.00	0.00	0.00
Interior	General	4000.00	0.00	0.00	0.00	0.00	0.00

Equipment							
Exterior Equipment	General	0.00	0.00	0.00	0.00	0.00	0.00
Fans	General	1498.36	0.00	0.00	0.00	0.00	0.00
Pumps	General	0.00	0.00	0.00	0.00	0.00	0.00
Heat Rejection	General	0.00	0.00	0.00	0.00	0.00	0.00
Humidification	General	0.00	0.00	0.00	0.00	0.00	0.00
Heat Recovery	General	0.00	0.00	0.00	0.00	0.00	0.00
Water Systems	General	0.00	0.00	0.00	0.00	0.00	0.00
Refrigeration	General	0.00	0.00	0.00	0.00	0.00	0.00
Generators	General	0.00	0.00	0.00	0.00	0.00	0.00

Equipment Summary

The Equipment Summary report provides a summary of the HVAC related equipment in the building. The central chiller example shows the most common type of chillers, boilers and towers used in EnergyPlus. The remaining subtables cover DX coils, fans and water heating equipment. Not every type of HVAC equipment is represented in this report. An example of the report is shown below:

```
Report: EquipmentSummary
For: Entire Facility
Timestamp: 2009-02-10 12:39:35
Central Plant
```

	Type	Nominal Capacity (W)	Nominal Efficiency (W/W)
None			

Cooling Coils

	Type	Nominal Total Capacity (W)	Nominal Sensible Capacity (W)	Nominal Latent Capacity (W)	Nominal Sensible Heat Ratio	Nominal Efficiency (W/W)
MAIN COOLING COIL 1	Coil:Cooling:DX:TwoSpeed	37506.82	25504.64	12002.18	0.68	3.00

Heating Coils

	Type	Nominal Total Capacity (W)	Nominal Efficiency (W/W)
SPACE1-1 ZONE COIL	Coil:Heating:Gas	17614.83	0.80
SPACE2-1 ZONE COIL	Coil:Heating:Gas	14619.82	0.80
SPACE3-1 ZONE COIL	Coil:Heating:Gas	16093.74	0.80
SPACE4-1 ZONE COIL	Coil:Heating:Gas	18942.35	0.80
SPACE5-1 ZONE COIL	Coil:Heating:Gas	19146.73	0.80
MAIN HEATING COIL 1	Coil:Heating:Gas	19754.61	0.80

Fans

	Type	Total Efficiency (W/W)	Delta Pressure (pa)	Max Flow Rate (m3/s)	Rated Power (W)	Motor Heat In Air Fraction	End Use
SUPPLY FAN 1	Fan:VariableVolume	0.70	600.00	2.27	1942.10	1.00	General

Pumps

	Type	Control	Head (pa)	Power (W)	Motor Efficiency (W/W)
None					

Service Water Heating

	Type	Storage Volume (m3)	Input(W)	Thermal Efficiency (W/W)	Recovery Efficiency (W/W)	Energy Factor
None						

Envelope Summary

The Envelope Summary report provides a summary of the elements of the envelope of the building. The first table describes the exterior opaque elements and the second table describes the fenestration elements. Reflectance is defined as one minus the thermal absorptance. An example of the report is shown below:

Report: EnvelopeSummary
For: Entire Facility
Timestamp: 2009-02-10 12:39:35
Opaque Exterior

	Construction	Reflectance	U-Factor with Film (W/m2-K)	U-Factor no Film (W/m2-K)	Gross Area (m2)	Azimuth (deg)	Tilt (deg)	Cardinal Direction
WALL-1PF	WALL-1	0.22	0.384	0.41	18.30	210.00	90.00	S
WALL-1PR	WALL-1	0.22	0.384	0.41	9.12	120.00	90.00	E
WALL-1PB	WALL-1	0.22	0.384	0.41	18.30	30.00	90.00	N
WALL-1PL	WALL-1	0.22	0.384	0.41	9.12	300.00	90.00	W
TOP-1	ROOF-1	0.35	0.268	0.28	463.60	210.00	0.00	
FRONT-1	WALL-1	0.22	0.384	0.41	73.20	210.00	90.00	S
F1-1	FLOOR-SLAB-1	0.35	1.454	2.25	99.16	30.00	180.00	
RIGHT-1	WALL-1	0.22	0.384	0.41	36.48	120.00	90.00	E
F2-1	FLOOR-SLAB-1	0.35	1.454	2.25	42.73	300.00	180.00	
BACK-1	WALL-1	0.22	0.384	0.41	73.20	30.00	90.00	N
F3-1	FLOOR-SLAB-1	0.35	1.454	2.25	96.48	74.22	180.00	
LEFT-1	WALL-1	0.22	0.384	0.41	36.48	300.00	90.00	W
F4-1	FLOOR-SLAB-1	0.35	1.454	2.25	42.73	120.00	180.00	
F5-1	FLOOR-SLAB-1	0.35	1.454	2.25	182.49	30.00	180.00	

Fenestration

	Construction	Area of One Opening (m2)	Area of Openings (m2)	U-Factor	SHGC	Visible Transmittance	Shade Control	Parent Surface	Azimuth (deg)	Cardinal Direction
WF-1	DBL CLR 3MM/13MM AIR	16.56	16.56	2.72	0.763	0.812	No	FRONT-1	210.00	S
DF-1	SGL GREY 3MM	6.00	6.00	5.89	0.708	0.611	No	FRONT-1	210.00	S
WR-1	DBL CLR 3MM/13MM AIR	9.12	9.12	2.72	0.763	0.812	No	RIGHT-1	120.00	E
WB-1	DBL CLR 3MM/13MM AIR	16.44	16.44	2.72	0.763	0.812	No	BACK-1	30.00	N
DB-1	SGL GREY 3MM	4.41	4.41	5.89	0.708	0.611	No	BACK-1	30.00	N
WL-1	DBL CLR 3MM/13MM AIR	9.12	9.12	2.72	0.763	0.812	No	LEFT-1	300.00	W
Total or Average			61.65	3.26	0.753	0.778				
North Total or Average			20.85	3.39	0.751	0.769				
Non-North Total or Average			40.80	3.19	0.755	0.782				

Surface Shadowing Summary

The Surface Shadowing Summary report summarizes how the surfaces may cast shadows on other surfaces.

Report: Surface Shadowing Summary
For: Entire Facility
Timestamp: 2007-10-17 08:54:27
Surfaces (Walls, Roofs, etc) that may be Shadowed by Other Surfaces

	Possible Shadow Casters
FRONT-1	MAIN SOUTH OVERHANG |Mir-MAIN SOUTH OVERHANG |
SOUTH DOOR OVERHANG	Mir-MAIN SOUTH OVERHANG |WALL-1PF |FRONT-1 |
WALL-1PF	Mir-MAIN SOUTH OVERHANG |SOUTH DOOR OVERHANG |Mir-SOUTH DOOR OVERHANG |
MAIN SOUTH OVERHANG	FRONT-1 |

Subsurfaces (Windows and Doors) that may be Shadowed by Surfaces

	Possible Shadow Casters
WF-1	FRONT-1 |
DF-1	FRONT-1 |
WR-1	RIGHT-1 |
WB-1	BACK-1 |
DB-1	BACK-1 |

WL-1	LEFT-1 |

Shading Summary

The Shading Summary report shows how much of each window is sunlit at different times of the year and also includes a summary of the window controls.

Report: Shading Summary
For: Entire Facility
Timestamp: 2007-10-17 08:54:27
Sunlit Fraction

	March 21 9am	March 21 noon	March 21 3pm	June 21 9am	June 21 noon	June 21 3pm	December 21 9am	December 21 noon	December 21 3pm
WF-1	0.00	0.00	0.43	0.00	0.00	0.00	0.30	0.52	0.86
DF-1	0.73	0.26	0.62	0.00	0.00	0.28	0.90	0.69	0.92
WR-1	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
WB-1	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
DB-1	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
WL-1	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00

Window Control

	Name	Type	Shaded Construction	Control	Glare Control
none					

Lighting Summary

The Lighting Summary report provides a description of the interior and exterior lighting systems being simulated. It also provides a summary of daylighting controls.

Report: Lighting Summary
For: Entire Facility
Timestamp: 2007-10-17 08:54:27
Interior Lighting

	Zone	Lighting Power Density (W/m2)	Zone Area (m2)	Total Power (W)	End Use Subcategory	Schedule Name	Average Hours/Week (hr)	Return Air Fraction	Conditioned (Y/N)
SPACE1-1 LIGHTS 1	SPACE1-1	15.9742	99.16	1584.00	GeneralLights	LIGHTS-1	0.00	0.2000	Y
SPACE2-1 LIGHTS 1	SPACE2-1	16.0056	42.73	684.00	GeneralLights	LIGHTS-1	0.00	0.2000	Y
SPACE3-1 LIGHTS 1	SPACE3-1	16.4179	96.48	1584.00	GeneralLights	LIGHTS-1	0.00	0.2000	Y
SPACE4-1 LIGHTS 1	SPACE4-1	16.0056	42.73	684.00	GeneralLights	LIGHTS-1	0.00	0.2000	Y
SPACE5-1 LIGHTS 1	SPACE5-1	16.2420	182.49	2964.00	GeneralLights	LIGHTS-1	0.00	0.2000	Y
Interior Lighting Total		16.1777	463.60	7500.00					

Daylighting

	Zone	Daylighting Type	Control Type	Fraction Controlled	Lighting Installed in Zone (W)	Lighting Controlled (W)
none						

Exterior Lighting

	Total Watts	Astronomical Clock/Schedule	Schedule Name	Average Annual Hours/Week
Exterior Lighting Total	0.00			

HVAC Sizing Summary

The HVAC Sizing Summary report provides information on the zone cooling and heating sizing and the peak load conditions as well as information about the system air flow sizing.

Report: HVAC Sizing Summary
For: Entire Facility
Timestamp: 2007-10-17 08:54:27
Zone Cooling

	Design Load (W)	Calculated Design Air Flow (m3/s)	User Design Air Flow (m3/s)	Design Day Name	Time Of Peak	Temperature at Peak (C)	Humidity Ratio at Peak (kgWater/kgAir)
SPACE1-1	2697.90	0.227	0.227	CHICAGO_IL_USA ANNUAL COOLING 1% DESIGN CONDITIONS DB/MCWB	16:00:00	31.18	0.01459
SPACE2-1	2101.79	0.177	0.177	CHICAGO_IL_USA ANNUAL COOLING 1% DESIGN CONDITIONS DB/MCWB	09:45:00	25.11	0.01459
SPACE3-1	2492.02	0.209	0.209	CHICAGO_IL_USA ANNUAL COOLING 1% DESIGN CONDITIONS DB/MCWB	15:00:00	31.50	0.01459
SPACE4-1	2649.20	0.223	0.223	CHICAGO_IL_USA ANNUAL COOLING 1% DESIGN CONDITIONS DB/MCWB	17:30:00	29.84	0.01459
SPACE5-1	2639.07	0.222	0.222	CHICAGO_IL_USA ANNUAL COOLING 1% DESIGN CONDITIONS DB/MCWB	15:00:00	31.50	0.01459

Zone Heating

	Design Load (W)	Calculated Design Air Flow (m3/s)	User Design Air Flow (m3/s)	Design Day Name	Time Of Peak	Temperature at Peak (C)	Humidity Ratio at Peak (kgWater/kgAir)

SPACE1-1	3947.71	0.119	0.119	CHICAGO_IL_USA ANNUAL HEATING 99% DESIGN CONDITIONS DB	24:00:00	-17.30	0.00084
SPACE2-1	1626.06	0.049	0.049	CHICAGO_IL_USA ANNUAL HEATING 99% DESIGN CONDITIONS DB	24:00:00	-17.30	0.00084
SPACE3-1	3753.71	0.113	0.113	CHICAGO_IL_USA ANNUAL HEATING 99% DESIGN CONDITIONS DB	24:00:00	-17.30	0.00084
SPACE4-1	1626.06	0.049	0.049	CHICAGO_IL_USA ANNUAL HEATING 99% DESIGN CONDITIONS DB	24:00:00	-17.30	0.00084
SPACE5-1	2985.28	0.090	0.103	CHICAGO_IL_USA ANNUAL HEATING 99% DESIGN CONDITIONS DB	24:00:00	-17.30	0.00084

System Design Air Flow Rates

	Calculated cooling (m3/s)	User cooling (m3/s)	Calculated heating (m3/s)	User heating (m3/s)
VAV SYS 1	1.06	1.06	0.43	0.43

System Summary

The System Summary report provides information about some of the primary components in the system including the economizer and demand controlled ventilation. In addition, this report describes when the zone conditions are not comfortable or when set points are not met.

Report: System Summary
For: Entire Facility
Timestamp: 2007-10-17 08:54:27
Economizer

	High Limit Shutoff Control	Minimum Outside Air (m3/s)	Maximum Outside Air (m3/s)	Return Air Temp Limit	Return Air Enthalpy Limit	Outside Air Temperature Limit (C)	Outside Air Enthalpy Limit (C)
none							

Demand Controlled Ventilation using VENTILATION:MECHANICAL

	Ventilation:Mechanical Name	Outside Air Per Person(m3/s-person)	Outside Air Per Area (m3/s-m2)
none			

Time Not Comfortable Based on Simple ASHRAE 55-2004

	Winter Clothes (hr)	Summer Clothes (hr)	Summer or Winter Clothes (hr)
SPACE1-1	429.00	1913.75	79.25
SPACE2-1	739.25	1719.75	22.50
SPACE3-1	482.00	1885.50	85.50
SPACE4-1	588.25	2039.75	59.50

SPACE5-1	14.75	2535.75	14.75
PLENUM-1	0.00	0.00	0.00
Facility	1041.75	2564.75	97.00

Time Setpoint Not Met

	During Heating (hr)	During Cooling (hr)	During Occupied Heating (hr)	During Occupied Cooling (hr)
SPACE1-1	321.00	45.25	35.00	45.25
SPACE2-1	104.25	44.00	0.25	10.75
SPACE3-1	297.50	0.75	36.25	0.75
SPACE4-1	77.75	27.00	0.25	0.00
SPACE5-1	292.25	1.00	13.75	1.00
PLENUM-1	0.00	0.00	0.00	0.00
Facility	333.50	117.00	37.25	56.75

Component Sizing Summary

The Component Sizing Summary report includes details on many of the HVAC components in the simulation. For each of the components, one or more parameters are shown.

Report: Component Sizing Summary
For: Entire Facility
Timestamp: 2007-10-17 08:54:27
SINGLE DUCT:VAV:REHEAT

	Maximum air flow rate [m3/s]	Max Reheat Water Flow [m3/s]
SPACE1-1 VAV REHEAT	0.226630	0.000059
SPACE2-1 VAV REHEAT	0.176548	0.000046
SPACE3-1 VAV REHEAT	0.209331	0.000054
SPACE4-1 VAV REHEAT	0.222526	0.000058
SPACE5-1 VAV REHEAT	0.221695	0.000057

COIL:Water:SimpleHeating

	Max Water Flow Rate of Coil [m3/s]	Design Coil Load [W]	UA of the Coil [W/delK]
SPACE1-1 ZONE COIL	0.000059	2698.50	66.13
SPACE2-1 ZONE COIL	0.000046	2102.17	51.51
SPACE3-1 ZONE COIL	0.000054	2492.52	61.08
SPACE4-1 ZONE COIL	0.000058	2649.63	64.93
SPACE5-1 ZONE COIL	0.000057	2639.74	64.69
OA HEATING COIL 1	0.000148	6812.27	84.72
MAIN HEATING COIL 1	0.000075	3458.59	55.80

BRANCH

	Maximum Branch Flow Rate [m3/s]

VAV SYS 1 MAIN BRANCH	1.06

AIR PRIMARY LOOP

	Primary air design volumetric flow rate [m3/s]
VAV SYS 1	1.06

CONTROLLER:OUTSIDE AIR

	maximum outside air flow rate [m3/s]	minimum outside air flow rate [m3/s]
OA CONTROLLER 1	1.06	0.264118

COIL:Water:Cooling

	Max Water Flow Rate of Coil [m3/s]	Max Air Flow Rate of Coil [m3/s]	Design Air Inlet Temperature [C]	Design Air Outlet Temperature [C]	Design Water Inlet Temperature [C]	Design Air Inlet Humidity Ratio	Design Air Outlet Humidity Ratio
OA COOLING COIL 1	0.001145	0.264118	30.01	11.00	7.00	0.014595	0.008000
MAIN COOLING COIL 1	0.000916	1.06	21.55	12.80	7.00	0.009333	0.008000

FAN:SIMPLE:VARIABLEVOLUME

	Max Flow Rate [m3/s]	Min Flow Rate [m3/s]
SUPPLY FAN 1	1.06	0.353263

CONTROLLER:SIMPLE

	Max Actuated Flow [m3/s]
OA CC CONTROLLER 1	0.001145
OA HC CONTROLLER 1	0.000148
CENTRAL COOLING COIL CONTROLLER 1	0.000916
CENTRAL HEATING COIL CONTROLLER 1	0.000075

PLANT LOOP

	Maximum Loop Volumetric Flow Rate [m3/s]	Volume of the plant loop [m3]
HOT WATER LOOP	0.000497	0.559158
CHILLED WATER LOOP	0.002061	2.32

BOILER:SIMPLE

	Nominal Capacity [W]	Design Boiler Water Flow Rate [m3/s]
CENTRAL BOILER	22853.43	0.000497

CHILLER:ELECTRIC

	Nominal Capacity [W]	Design Evaporator Volumetric Water Flow Rate [m3/s]
CENTRAL CHILLER	34468.25	0.002061

PUMP:VARIABLE SPEED

	Rated Volumetric Flow Rate [m3/s]	Rated Power Consumption [W]
HW CIRC PUMP	0.000497	126.98
CW CIRC PUMP	0.002061	526.69

Outside Air Summary

The Outside Air Summary provides information for each zone on the average and minimum ventilation provided.

The reports described so far in this section are displayed when specified in the Report:Table:Predefined object. They are either on or off and are not customizable. The next few types of tabular reports are customizable. You can specify the report variables being used in each one.

Report: Outside Air Summary
For: Entire Facility
Timestamp: 2007-10-17 08:54:27
Average Outside Air During Occupied Hours

	Average Number of Occupants	Nominal Number of Occupants	Zone Volume (m3)	Mechanical Ventilation (ach)	Infiltration (ach)	Simple Ventilation (ach)
SPACE1-1	9.50	11.00	239.25	0.365	0.050	0.000
SPACE2-1	4.32	5.00	103.31	0.630	0.051	0.000
SPACE3-1	9.50	11.00	239.25	0.338	0.050	0.000
SPACE4-1	4.32	5.00	103.31	0.708	0.051	0.000
SPACE5-1	17.27	20.00	447.68	0.214	0.052	0.000

Minimum Outside Air During Occupied Hours

	Average Number of Occupants	Nominal Number of Occupants	Zone Volume (m3)	Mechanical Ventilation (ach)	Infiltration (ach)	Simple Ventilation (ach)
SPACE1-1	9.50	11.00	239.25	0.000	0.000	0.000
SPACE2-1	4.32	5.00	103.31	0.000	0.000	0.000
SPACE3-1	9.50	11.00	239.25	0.000	0.000	0.000
SPACE4-1	4.32	5.00	103.31	0.000	0.000	0.000
SPACE5-1	17.27	20.00	447.68	0.000	0.000	0.000

Climatic Data Summary

The Climatic Data Summary provides some statistics from the .STAT file concerning the selected weather.

Report: ClimaticDataSummary
For: Entire Facility
Timestamp: 2009-02-10 13:27:45
SizingPeriod:DesignDay

	Maximum Dry Bulb (C)	Daily Temperature Range (C)	Humidity Value	Humidity Type	Wind Speed (m/s)	Wind Direction
CHICAGO_IL_USA ANNUAL HEATING 99% DESIGN CONDITIONS DB	-17.30	0.00	-17.30	WETBULB	4.90	270.00
CHICAGO_IL_USA ANNUAL COOLING 1% DESIGN CONDITIONS DB/MCWB	31.50	10.70	23.00	WETBULB	5.30	230.00

Weather Statistics File

	Value
Reference	USA_Chicago-OHare_TMY2
Site:Location	Chicago IL USA
Latitude	N 41° 58'
Longitude	W 87° 54'
Time Zone	GMT -6.0 Hours
Elevation	190m above sea level
Standard Pressure at Elevation	99063Pa
Data Source	Release Test
WMO Station	725300
Design Conditions	Climate Design Data 2005 ASHRAE Handbook
Heating Design Temperature 99.6% (C)	-20.6
Heating Design Temperature 99% (C)	-17.3
Cooling Design Temperature 0.4% (C)	33.2
Cooling Design Temperature 1% (C)	31.5
Cooling Design Temperature 2% (C)	29.9
Maximum Dry Bulb Temperature (C)	35.6°
Maximum Dry Bulb Occurs on	Jul 9
Minimum Dry Bulb Temperature (C)	-22.8°
Minimum Dry Bulb Occurs on	Jan 7
Maximum Dew Point Temperature (C)	25.6
Maximum Dew Point Occurs on	Aug 4

Minimum Dew Point Temperature (C)	-28.9
Minimum Dew Point Occurs on	Dec 31
Heating Degree-Days (base 10°C)	1745
Cooling Degree-Days (base 18°C)	464
Köppen Classification	Dfa
Köppen Description	Humid continental (hot summer, cold winter, no dry season, lat. 30-60°N)
Köppen Recommendation	Unbearably humid periods in summer, but passive cooling is possible
ASHRAE Climate Zone	5A
ASHRAE Description	Cool-Humid

Object Count Summary

Provides the count on the number of specific objects in the file.

Report: ObjectCountSummary
For: Entire Facility
Timestamp: 2009-02-10 12:39:35
Surfaces by Class

	Total	Outdoors
Wall	24	8
Floor	10	5
Roof	6	1
Internal Mass	0	0
Building Detached Shading	0	0
Fixed Detached Shading	0	0
Window	6	6
Door	0	0
Glass Door	0	0
Shading	4	4
Overhang	0	0
Fin	0	0
Tubular Daylighting Device Dome	0	0
Tubular Daylighting Device Diffuser	0	0

HVAC

	Count
HVAC Air Loops	1
Conditioned Zones	6

Unconditioned Zones	0
Supply Plenums	0
Return Plenums	1

Output:Table:TimeBins

A TimeBins report shows a grid of the number of hours that specific report variable spend in a range of values. The first table is broken into two parts. The first part is monthly and the second part is for each hour of the day. The columns show the range of values. A second table is provided to show some statistics on the report variable for the entire year including the maximum and minimum. These statistics are helpful in setting the field values for the interval in the Report:Table:TimeBins object. Due to this, it is often necessary to run two simulations to fully utilize the TimeBins report with the first run used to find the minimum and maximum of the variable, these values are then used in the TimeBins object and the second run a better table of binned results are displayed.

Report: PURCHASEDCOOLING:FACILITY J per second
For: Meter
Timestamp: 2006-08-30 07:48:55
Values in table are in hours.

		1	2	3	4	5	6	7	8	9	10		
Interval Start	less than	0.<=	2000.<=	4000.<=	6000.<=	8000.<=	10000.<=	12000.<=	14000.<=	16000.<=	18000.<=	equal to or more than	Row
Interval End	0.	2000.>	4000.>	6000.>	8000.>	10000.>	12000.>	14000.>	16000.>	18000.>	20000.>	20000.	Total
January	0.00	744.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	744.00
February	0.00	672.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	672.00
March	0.00	744.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	744.00
April	0.00	524.17	40.67	40.33	45.67	45.50	19.67	4.00	0.00	0.00	0.00	0.00	720.00
May	0.00	480.33	44.50	55.50	41.00	53.50	38.17	20.67	10.33	0.00	0.00	0.00	744.00
June	0.00	393.50	31.83	55.33	19.83	53.00	65.83	62.83	24.00	13.83	0.00	0.00	720.00
July	0.00	372.67	30.83	40.83	45.67	53.83	42.83	48.33	45.33	47.83	15.83	0.00	744.00
August	0.00	373.50	24.50	37.17	44.50	64.50	56.67	50.67	52.33	35.00	5.17	0.00	744.00
September	0.00	406.33	52.00	42.50	14.83	54.50	64.67	54.50	27.17	3.50	0.00	0.00	720.00
October	0.00	744.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	744.00
November	0.00	720.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	720.00
December	0.00	744.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	744.00
12:01 to 1:00 am	0.00	365.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	365.00
1:01 to 2:00 am	0.00	365.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	365.00
2:01 to 3:00 am	0.00	365.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	365.00
3:01 to 4:00 am	0.00	365.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	365.00
4:01 to 5:00 am	0.00	365.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	365.00
5:01 to 6:00 am	0.00	365.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	365.00
6:01 to 7:00 am	0.00	365.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	365.00
7:01 to 8:00 am	0.00	294.33	33.83	25.00	5.17	2.17	1.67	1.17	1.00	0.67	0.00	0.00	365.00

8:01 to 9:00 am	0.00	238.00	14.17	16.50	17.00	40.33	29.67	9.33	0.00	0.00	0.00	0.00	365.00
9:01 to 10:00 am	0.00	231.83	14.50	13.00	21.83	38.83	31.83	12.00	1.17	0.00	0.00	0.00	365.00
10:01 to 11:00 am	0.00	226.33	14.00	12.50	17.50	36.50	31.33	22.17	4.67	0.00	0.00	0.00	365.00
11:01 to 12:00 pm	0.00	221.33	12.17	13.00	14.50	30.67	33.50	27.83	11.00	1.00	0.00	0.00	365.00
12:01 to 1:00 pm	0.00	211.00	18.00	14.00	14.00	29.17	32.33	25.67	17.67	3.17	0.00	0.00	365.00
1:01 to 2:00 pm	0.00	208.00	15.00	15.33	11.00	22.17	27.83	27.50	26.83	10.83	0.50	0.00	365.00
2:01 to 3:00 pm	0.00	205.33	11.83	18.17	11.00	17.50	23.17	29.50	26.17	18.17	4.17	0.00	365.00
3:01 to 4:00 pm	0.00	203.00	9.50	17.67	14.00	16.17	20.67	30.17	22.00	24.83	7.00	0.00	365.00
4:01 to 5:00 pm	0.00	201.17	10.83	18.83	13.67	16.33	19.50	29.67	22.83	25.17	7.00	0.00	365.00
5:01 to 6:00 pm	0.00	200.00	13.50	21.33	14.83	22.17	22.67	26.00	25.83	16.33	2.33	0.00	365.00
6:01 to 7:00 pm	0.00	227.33	29.17	43.17	28.33	27.50	9.50	0.00	0.00	0.00	0.00	0.00	365.00
7:01 to 8:00 pm	0.00	235.83	27.83	43.17	28.67	25.33	4.17	0.00	0.00	0.00	0.00	0.00	365.00
8:01 to 9:00 pm	0.00	365.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	365.00
9:01 to 10:00 pm	0.00	365.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	365.00
10:01 to 11:00 pm	0.00	365.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	365.00
11:01 to 12:00 am	0.00	365.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	365.00
Total	0.00	6918.50	224.33	271.67	211.50	324.83	287.83	241.00	159.17	100.17	21.00	0.00	8760.00

Statistics

	Statistic
Minimum	0.00
Mean minus two standard deviations	-6496.35
Mean	1995.71
Mean plus two standard deviations	10487.78
Maximum	19476.00
Standard deviation	4246.03

Output:Table:Monthly

Monthly reports are not predefined. Instead each column is defined when using the Output:Table:Monthly object. In that object each column is defined by a variable and how it should be aggregated. The StandardReports.idf file is located in DataSets directory where EnergyPlus is installed and contains a large number of examples of how to use Output:Table:Monthly to get summaries of the performance of different components in the building model. These examples include:

- Zone Cooling Summary
- Zone Heating Summary
- Zone Electric Summary
- Space Gains

- Peak Space Gains
- Space Gain Components at Cooling Peak
- Energy Consumption - Electricity & Natural Gas
- Energy Consumption - Electricity Generated & Propane
- Energy Consumption - Diesel & Fuel Oil
- Energy Consumption - Purchased Heating & Cooling
- Energy Consumption - Coal & Gasoline
- End-Use Energy Consumption - Electricity
- End-Use Energy Consumption - Natural Gas
- End-Use Energy Consumption - Diesel
- End-Use Energy Consumption - Fuel Oil
- End-Use Energy Consumption - Coal
- End-Use Energy Consumption - Propane
- End-Use Energy Consumption - Gasoline
- Peak Energy End-Use - Electricity Part 1
- Peak Energy End-Use - Electricity Part 2
- Electric Components of Peak Demand
- Peak Energy End-Use - Natural Gas
- Peak Energy End-Use - Diesel
- Peak Energy End-Use - Fuel Oil
- Peak Energy End-Use - Coal
- Peak Energy End-Use - Propane
- Peak Energy End-Use - Gasoline
- Setpoints Not Met With Temperatures
- Comfort Report - Simple 55
- Unglazed Transpired Solar Collector Summary
- Occupant Comfort Data Summary
- Chiller Report
- Tower Report
- Boiler Report
- DX Report
- Window Report
- Window Energy Report
- Window Zone Summary
- Average Outdoor Conditions
- Outdoor Conditions Maximum Drybulb
- Outdoor Conditions Minimum Drybulb
- Outdoor Conditions Maximum Wetbulb
- Outdoor Conditions Maximum Dewpoint
- Outdoor Ground Conditions
- Window AC Report
- Water Heater Report
- Generator Report
- Daylighting Report

- Coil Report
- Plant Loop Demand Report
- Fan Report
- Pump Report
- Cond Loop Demand Report
- Zone Temperature Oscillation Report
- Air Loop System Energy and Water Use
- Air Loop System Component Loads
- Air Loop System Component Energy Use
- Mechanical Ventilation Loads

An example of the Zone Cooling Summary monthly report is shown below.

```
Report: ZONE COOLING SUMMARY
For: SPACE2-1
Timestamp: 2006-08-29 07:21:57
```

	ZONE/SYS SENSIBLE COOLING ENERGY [J]	ZONE/SYS SENSIBLE COOLING RATE {MAXIMUM}[W]	ZONE/SYS SENSIBLE COOLING RATE {TIMESTAMP}	OUTDOOR DRY BULB {AT MAX/MIN} [C]	OUTDOOR WET BULB {AT MAX/MIN} [C]	ZONE TOTAL INTERNAL LATENT GAIN [J]	ZONE TOTAL INTERNAL LATENT GAIN {MAXIMUM}[W]	ZONE TOTAL INTERNAL LATENT GAIN {TIMESTAMP}	OUTDOOR DRY BULB {AT MAX/MIN} [C]	OUTDOOR WET BULB {AT MAX/MIN} [C]
January	281755456.00	1427.84	17-JAN-10:07	8.30	5.48	0.00	0.00	01-JAN-00:15	-4.32	-5.53
February	306879872.00	1440.59	28-FEB-10:46	11.27	6.67	0.00	0.00	01-FEB-00:15	-3.17	-4.91
March	419829728.00	1822.13	26-MAR-09:14	3.90	-0.20	0.00	0.00	01-MAR-00:15	-1.40	-2.84
April	752874688.00	1986.25	29-APR-10:22	21.10	11.44	0.00	0.00	01-APR-00:15	17.12	10.64
May	0.100670E+10	2163.18	22-MAY-09:45	25.17	15.42	0.00	0.00	01-MAY-00:15	3.75	1.60
June	0.100822E+10	2129.73	28-JUN-09:45	28.02	22.39	0.00	0.00	01-JUN-00:15	17.30	14.95
July	0.120671E+10	2312.36	08-JUL-09:00	31.70	23.35	0.00	0.00	01-JUL-00:15	15.60	12.95
August	0.109213E+10	2352.64	02-AUG-09:45	27.08	20.48	0.00	0.00	01-AUG-00:15	17.20	15.70
September	0.100619E+10	2453.23	06-SEP-10:15	28.35	20.53	0.00	0.00	01-SEP-00:15	16.75	15.45
October	771385600.00	2181.25	10-OCT-10:16	15.25	10.12	0.00	0.00	01-OCT-00:15	4.88	3.31
November	384831744.00	1566.35	11-NOV-10:45	14.00	8.89	0.00	0.00	01-NOV-00:15	14.65	11.75
December	246930448.00	1306.75	11-DEC-10:07	5.00	1.69	0.00	0.00	01-DEC-00:15	1.80	-0.11
Annual Sum or Average	0.848444E+10					0.00				
Minimum of Months	246930448.00	1306.75		3.90	-0.20	0.00	0.00		-4.32	-5.53
Maximum of Months	0.120671E+10	2453.23		31.70	23.35	0.00	0.00		17.30	15.70

UtilityCost:Tariff

The use of UtilityCost:Tariff objects automatically generates two reports related to the calculation of annual utility costs. The first report is a summary across multiple tariffs and is called the Economics Results Summary report and is shown directly below. After that example is an example of the Tariff report which is created for each of the UtilityCost:Tariff Objects defined in the IDF file (some columns may be truncated due to page size).

Report: Economics Results Summary Report
For: Entire Facility
Timestamp: 2006-08-29 07:21:57
Annual Cost

	Facility:Electric	Facility:Gas	Other	Total
Cost ($)	2269.11	612.08	0.00	2881.19
Cost per Total Building Area ($/m2)	2.45	0.66	0.00	3.11
Cost per Net Conditioned Building Area ($/m2)	2.45	0.66	0.00	3.11

Tariff Summary

	Selected	Qualified	Meter	Group	Annual Cost
EXAMPLEA	No	Yes	ELECTRICITY:FACILITY	(none)	2359.48
EXAMPLEA-GAS	Yes	Yes	GAS:FACILITY	(none)	612.08
EXAMPLEAWITHVARIABLEMONTHLYCHARGE	No	Yes	ELECTRICITY:FACILITY	(none)	2407.36
EXAMPLEB	No	Yes	ELECTRICITY:FACILITY	(none)	2668.34
EXAMPLEC	No	Yes	ELECTRICITY:FACILITY	(none)	3017.45
EXAMPLED	Yes	Yes	ELECTRICITY:FACILITY	(none)	2269.11
EXAMPLEDWITHRATCHET	No	Yes	ELECTRICITY:FACILITY	(none)	3745.90
EXAMPLEE	No	Yes	ELECTRICITY:FACILITY	(none)	3766.76
EXAMPLEF	No	Yes	ELECTRICITY:FACILITY	(none)	3512.12
EXAMPLEFMC	No	Yes	ELECTRICITY:FACILITY	(none)	3512.12
EXAMPLEG	No	Yes	ELECTRICITY:FACILITY	(none)	3866.91

The following is an example of the Tariff report which is created for each of the UtilityCost:Tariff objects defined in the file.

Report: Tariff Report
For: EXAMPLEA
Timestamp: 2006-08-29 07:21:57

	Parameter
Meter	ELECTRICITY:FACILITY
Selected	No
Group	(none)
Qualified	Yes
Disqualifier	n/a
Computation	automatic
Units	kWh

Categories

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Sum	Max
EnergyCharges	181.84	159.97	170.98	178.85	207.28	207.97	249.10	234.09	202.57	191.20	169.19	176.34	2329.36	249.10
DemandCharges	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ServiceCharges	2.51	2.51	2.51	2.51	2.51	2.51	2.51	2.51	2.51	2.51	2.51	2.51	30.12	2.51

Basis	184.35	162.48	173.49	181.36	209.79	210.48	251.61	236.60	205.08	193.71	171.70	178.85	2359.48	251.61
Adjustment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Surcharge	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Subtotal	184.35	162.48	173.49	181.36	209.79	210.48	251.61	236.60	205.08	193.71	171.70	178.85	2359.48	251.61
Taxes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	184.35	162.48	173.49	181.36	209.79	210.48	251.61	236.60	205.08	193.71	171.70	178.85	2359.48	251.61

Charges

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Sum	Max	Category
FLATENERGYCHARGE	181.84	159.97	170.98	178.85	207.28	207.97	249.10	234.09	202.57	191.20	169.19	176.34	2329.36	249.10	none

Ratchets

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Sum	Max

Qualifies

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Sum	Max

Native Variables

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Sum	Max
TotalEnergy	3285.70	2890.52	3089.52	3231.79	3745.42	3757.86	4501.09	4229.79	3660.28	3454.82	3057.13	3186.33	42090.24	4501.09
TotalDemand	12.52	12.53	12.53	14.53	17.40	20.71	21.08	19.50	18.63	15.53	12.90	12.55	190.42	21.08
PeakEnergy	3285.70	2890.52	3089.52	3231.79	3745.42	3757.86	4501.09	4229.79	3660.28	3454.82	3057.13	3186.33	42090.24	4501.09
PeakDemand	12.52	12.53	12.53	14.53	17.40	20.71	21.08	19.50	18.63	15.53	12.90	12.55	190.42	21.08
ShoulderEnergy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ShoulderDemand	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OffPeakEnergy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OffPeakDemand	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MidPeakEnergy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MidPeakDemand	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PeakExceedsOffPeak	12.52	12.53	12.53	14.53	17.40	20.71	21.08	19.50	18.63	15.53	12.90	12.55	190.42	21.08
OffPeakExceedsPeak	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PeakExceedsMidPeak	12.52	12.53	12.53	14.53	17.40	20.71	21.08	19.50	18.63	15.53	12.90	12.55	190.42	21.08
MidPeakExceedsPeak	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PeakExceedsShoulder	12.52	12.53	12.53	14.53	17.40	20.71	21.08	19.50	18.63	15.53	12.90	12.55	190.42	21.08
ShoulderExceedsPeak	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IsWinter	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	12.00	1.00
IsNotWinter	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IsSpring	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IsNotSpring	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	12.00	1.00
IsSummer	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IsNotSummer	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	12.00	1.00
IsAutumn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IsNotAutumn	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	12.00	1.00
PeakAndShoulderEnergy	3285.70	2890.52	3089.52	3231.79	3745.42	3757.86	4501.09	4229.79	3660.28	3454.82	3057.13	3186.33	42090.24	4501.09
PeakAndShoulderDemand	12.52	12.53	12.53	14.53	17.40	20.71	21.08	19.50	18.63	15.53	12.90	12.55	190.42	21.08
PeakAndMidPeakEnergy	3285.70	2890.52	3089.52	3231.79	3745.42	3757.86	4501.09	4229.79	3660.28	3454.82	3057.13	3186.33	42090.24	4501.09
PeakAndMidPeakDemand	12.52	12.53	12.53	14.53	17.40	20.71	21.08	19.50	18.63	15.53	12.90	12.55	190.42	21.08
ShoulderAndOffPeakEnergy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ShoulderAndOffPeakDemand	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

PeakAndOffPeakEnergy	3285.70	2890.52	3089.52	3231.79	3745.42	3757.86	4501.09	4229.79	3660.28	3454.82	3057.13	3186.33	42090.24	4501.09
PeakAndOffPeakDemand	12.52	12.53	12.53	14.53	17.40	20.71	21.08	19.50	18.63	15.53	12.90	12.55	190.42	21.08

Other Variables

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Sum	Max
NotIncluded	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

```
Computation - Automatic
FLATENERGYCHARGE FROM TotalEnergy
EnergyCharges SUM FLATENERGYCHARGE
Basis SUM EnergyCharges DemandCharges ServiceCharges
Subtotal SUM Basis Adjustment Surcharge
Total SUM Subtotal Taxes
```

Construction Cost Estimate Summary

The Construction Cost Estimate Summary report shows the details of a simplified cost estimate of the building along with a comparison with reference building costs entered by the user. An example of the Construction Cost Estimate Summary report is shown below.

Construction Cost Estimate Summary

	Reference Bldg.	Current Bldg. Model	Difference
Line Item SubTotal ($)	665082.04	720964.07	55882.03
Misc. Costs ($)	928979.09	928979.09	0.00
Regional Adjustment ($)	216792.31	224392.27	7599.96
Design Fee ($)	108651.21	149946.83	41295.63
Contractor Fee ($)	126759.74	131203.48	4443.74
Contigency ($)	181085.34	187433.54	6348.20
Permits, Bonds, Insurance ($)	0.00	0.00	0.00
Commissioning ($)	9054.27	18743.35	9689.09
Cost Estimate Total ($)	2236404.00	2361662.65	125258.65
Cost Per Conditioned Building Area ($/m2)	1203.69	1271.11	67.42

Cost Line Item Details

	Line No.	Item Name	Quantity.	Units	$ per Qty.	SubTotal $
--	1	EXTERIOR WALLS	627.57	m2	168.64	105832.65
--	2	INTERIOR WALLS	854.18	m2	31.16	26616.23
--	3	ROOF	1857.96	m2	104.69	194509.64
--	4	GROUND FLR SLAB	1857.96	m2	56.06	104157.14
--	5	ACOUSTICAL DROP CEILINGS	1857.96	m2	23.79	44200.83
--	6	QUAD HIGH SHGC SUPERWINDOWS	226.22	m2	687.84	155604.96
--	7	QUAD LOW SHGC SUPERWINDOWS	42.68	m2	687.84	29359.55
--	8	CENTRAL CHILLER	153.48	kW (tot cool cap.)	340.00	52183.09

--	9	CONTINUOUS AIR BARRIER	1.00	Ea.	8500.00	8500.00
Line Item SubTotal	--	--	--	--	--	720964.07

readvars.rvaudit

This file is available from standard EnergyPlus runs (batch file, EP-Launch, etc) where the included utility “ReadVarsESO” is used to create .csv or other delimited files. It shows what steps were taken during the read vars run(s) – in standard EnergyPlus runs there are two: one for the .eso file and one for the .mtr file. Contents might be:

```
Mon 04/02/2007 19:34:17.09 ReadVars
 ReadVarsESO
 processing:eplusout.inp
 input file:eplusout.eso
 output file:eplusout.csv
 found/finding:
     1 Outdoor Dry Bulb
     6 Zone/Sys Air Temperature
     6 Zone/Sys Sensible Cooling Rate
     6 Zone/Sys Sensible Heating Rate
     6 Total Water Heating Coil Rate
     1 Total Water Cooling Coil Rate
     1 Sensible Water Cooling Coil Rate
     2 Plant Loop Cooling Demand
     2 Plant Loop Heating Demand
     1 Boiler Gas Consumption Rate
     1 Boiler Heating Output Rate
     1 Chiller Electric Power
     1 Chiller Evap Heat Trans Rate
     1 Chiller Evap Water Inlet Temp
     1 Chiller Evap Water Outlet Temp
     1 Chiller Evap Water Mass Flow Rate
     1 Chiller Cond Heat Trans Rate
     0 Chiller Cond Water Inlet Temp
     0 Chiller Cond Water Outlet Temp
     0 Chiller Cond Water Mass Flow Rate
     2 Pump Mass Flow Rate
     2 Pump Outlet Temp
 ReadVars Run Time=00hr 00min  1.78sec
 ReadVarsESO program completed successfully.
 ReadVarsESO
 processing:test.mvi
 input file:eplusout.mtr
 output file:eplusmtr.csv
 getting all vars from:eplusout.mtr
 ReadVars Run Time=00hr 00min  0.00sec
 ReadVarsESO program completed successfully.
```

eplusout.svg

This is a Scalable Vector Graphics (SVG) file that shows a diagram of the HVAC system from the inputs of the simulation. The diagram is generated for most HVAC systems but a few valid HVAC configurations cannot be displayed correctly. The SVG file is generated by the HVAC Diagram utility that is included with EnergyPlus and is run automatically when using EP-Launch.

The SVG format is a graphics format that includes a descriptions of lines, boxes, text, etc. set in a two dimensional perspective. To learn more about the SVG format see:

http://www.w3.org/Graphics/SVG/

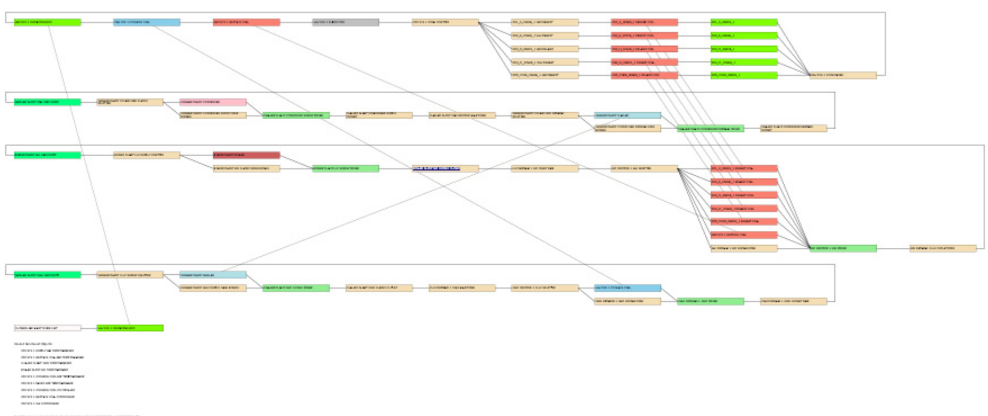
Several viewers are available so that you can view these files including plug-ins for Internet Explorer by Adobe and Corel. The Adobe SVG plug in can be found at:

http://www.adobe.com/svg/viewer/install/

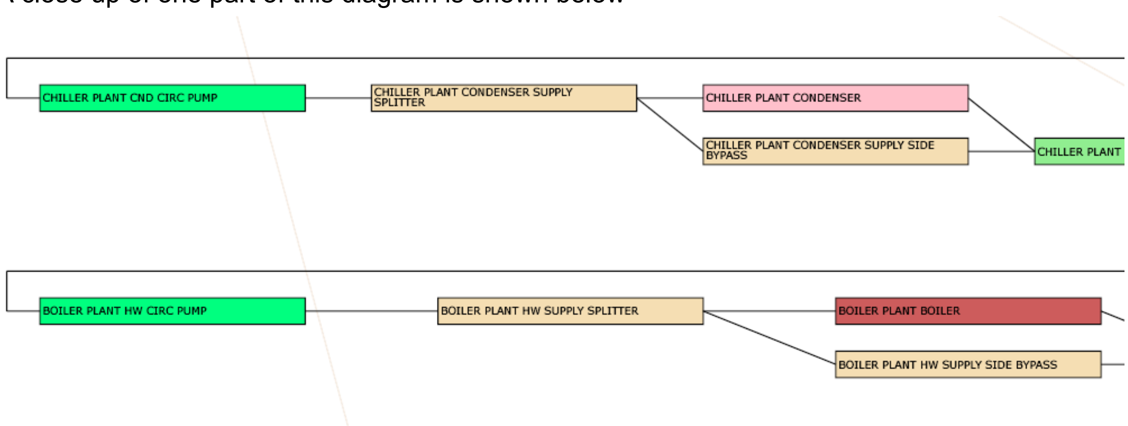
But many different viewers are available and links are shown at:

http://www.svgi.org/

An example of a diagram generated by HVAC Diagram is shown



A close up of one part of this diagram is shown below



The SVG file format is an XML based format so it is text based. The diagram shown above is shown below in text (reduced).

```
<?xml version="1.0" standalone="no"?>
<!DOCTYPE svg>
<svg width="250mm" height="200mm" viewBox="0 0   3200    1500" xmlns:ev="http://www.w3.org/2001/xml-
events" xmlns:xlink="http://www.w3.org/1999/xlink" xmlns="http://www.w3.org/2000/svg"
preserveAspectRatio="xMidYMid meet" zoomAndPan="magnify">
<g font-family="Verdana" font-size="8">
  <line x1="  2400" y1="   470" x2="  2100" y2="    30" style="stroke:linen ;"/>
  <line x1="  2400" y1="   510" x2="  2100" y2="    70" style="stroke:linen ;"/>
  <line x1="  2400" y1="   550" x2="  2100" y2="   110" style="stroke:linen ;"/>
  <line x1="  2400" y1="   590" x2="  2100" y2="   150" style="stroke:linen ;"/>
  <line x1="  2400" y1="   630" x2="  2100" y2="   190" style="stroke:linen ;"/>
  <line x1="  2400" y1="   670" x2="   900" y2="    30" style="stroke:linen ;"/>
  <line x1="  2050" y1="   830" x2="   600" y2="    30" style="stroke:linen ;"/>
  <line x1="   300" y1="    30" x2="   550" y2="   950" style="stroke:linen ;"/>
  <line x1="   800" y1="   790" x2="  2050" y2="   310" style="stroke:linen ;"/>
  <rect x="   200" y="   940" width="   200" height="    20" style="fill:snow; stroke: Black;"/>     1
  <text x="   202" y="   953" startOffset="0">OUTSIDE AIR INLET NODE LIST</text>
  <rect x="  2300" y="    20" width="   200" height="    20" style="fill:chartreuse; stroke: Black;"/>
2
  <text x="  2302" y="    33" startOffset="0">ZN1_S_SPACE_1</text>
  <rect x="  1400" y="    20" width="   200" height="    20" style="fill:wheat; stroke: Black;"/>     7
  <text x="  1402" y="    33" startOffset="0">VAV SYS 1 ZONE SPLITTER</text>
  <rect x="  1700" y="    20" width="   200" height="    20" style="fill:wheat; stroke: Black;"/>     8
  <text x="  1702" y="    33" startOffset="0">ZN1_S_SPACE_1 VAV REHEAT</text>
<reduced>
  <line x1="  1600" y1="    30" x2="  1700" y2="    30" style="stroke: Black;"/>
  <line x1="  1600" y1="    30" x2="  1700" y2="    70" style="stroke: Black;"/>
  <line x1="  1600" y1="    30" x2="  1700" y2="   110" style="stroke: Black;"/>
  <line x1="  1600" y1="    30" x2="  1700" y2="   150" style="stroke: Black;"/>
  <line x1="  1600" y1="    30" x2="  1700" y2="   190" style="stroke: Black;"/>
  <line x1="  1900" y1="    30" x2="  2000" y2="    30" style="stroke: Black;"/>
  <line x1="  1900" y1="    70" x2="  2000" y2="    70" style="stroke: Black;"/>
  <line x1="  1900" y1="   110" x2="  2000" y2="   110" style="stroke: Black;"/>
<reduced>
  <text x="   200" y="  1000" startOffset="0">Unused Non-Parent Objects:</text>
  <text x="   220" y="  1020" startOffset="0">VAV SYS 1 SUPPLY AIR TEMP MANAGER</text>
  <text x="   220" y="  1040" startOffset="0">VAV SYS 1 HEATING COIL AIR TEMP MANAGER</text>
  <text x="   220" y="  1060" startOffset="0">CHILLER PLANT CHW TEMP MANAGER</text>
  <text x="   220" y="  1080" startOffset="0">BOILER PLANT HW TEMP MANAGER</text>
  <text x="   220" y="  1100" startOffset="0">VAV SYS 1 COOLING COIL AIR TEMP MANAGER</text>
  <text x="   220" y="  1120" startOffset="0">VAV SYS 1 MIXED AIR TEMP MANAGER</text>
  <text x="   220" y="  1140" startOffset="0">VAV SYS 1 COOLING COIL CONTROLLER</text>
  <text x="   220" y="  1160" startOffset="0">VAV SYS 1 HEATING COIL CONTROLLER</text>
  <text x="   220" y="  1180" startOffset="0">VAV SYS 1 OA CONTROLLER</text>
  <text x="   200" y="  1220" startOffset="0">
The following are not supported:  objects related to controls, DIRECT AIR, or  PURCHASED AIR</text>
</g>
</svg>
```

eplusout.sci

This is the surface cost information report. This report file is obtained by including the following in the input file:

```
Output:Surfaces:List, CostInfo;
```

The intent is to make available a separate file that lists the unique surfaces and their construction types for potential use in external calculations that need to estimate the cost of construction. Note that such cost estimating can now also be performed internal to EnergyPlus using Cost Estimate objects. The listing can also be used to check that the input for surfaces is producing the expected areas (although the DXF is probably more useful for such checking).

The output file contains a list of the unique surfaces and their net and gross areas. The area information is calculated by EnergyPlus from the vertices entered for individual surfaces. The net area is the area remaining after the areas of subsurfaces are subtracted. The file contains six columns of comma-separate-data as shown in the following table:

Column	Description
1	Integer counter for surfaces. The surfaces are listed in the order that they are stored internally in EnergyPlus. Note that in this report, the algorithms sort out and exclude duplicate surfaces that are entered for the interior partitions between adjacent thermal zones. Therefore the list is usually not consecutive.
2	The name of the surface entered by the user
3	The name of the construction for the surface entered by the user
4	The type of the surface (e.g. wall, roof, floor, window …)
5	The net area of the surface in m^2
6	The gross area of the surface in m^2

eplusout.wrl

The VRML output report file is formatted according to the “Virtual Reality Modeling Language” standard rules for representing building type surfaces. The file can be used in several inexpensive, shareware or freeware viewers. There are a variety of stand alone and viewers integrated within browsers. A good list of viewers can be found at:

http://cic.nist.gov/vrml/vbdetect.html

This site detects what, if any, VRML plugin is installed in your browser as well as gives a list of active ones with links to their sites.

This file is generated when the following line is included in the IDF.

```
Output:Surfaces:Drawing, VRML;
```

In addition, like the DXF output, you can ask it to triangulate (algorithm within EnergyPlus) surfaces with >4 sides:

```
Output:Surfaces:Drawing, VRML, Triangulate 3dface;
```

Most viewers will illustrate a solid model by default:

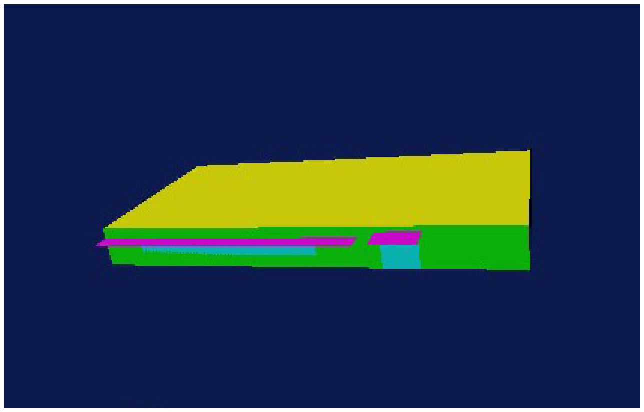


Figure 6. VRML output - solid model

With some/many viewers, you can also see a wireframe model; some will even fill this model. Also, viewers can triangulate any surface that isn’t labeled as “convex” by the software writing the file (i.e. EnergyPlus). However, this triangulation may not be correct so you may wish to do it from within EnergyPlus as illustrated above.

A wireframe model of the same building as above is:

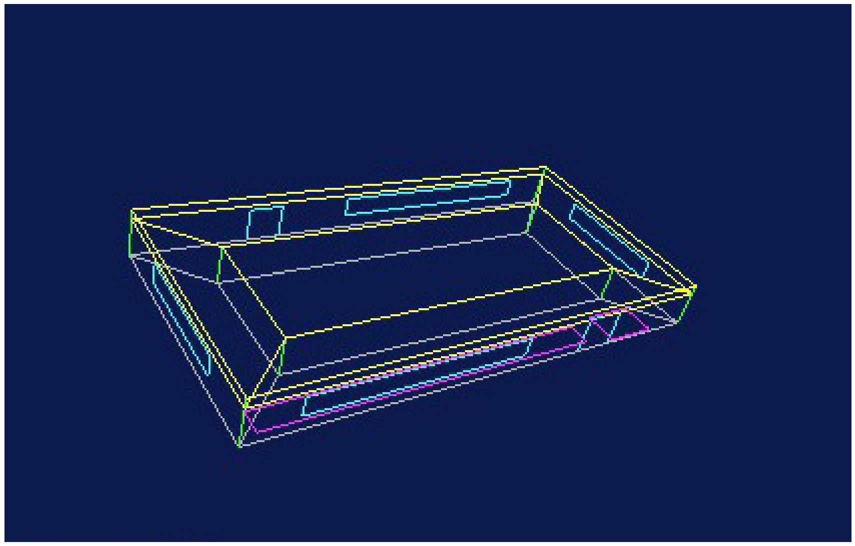


Figure 7. VRML output - wireframe model

The actual file produced is a text file. EnergyPlus adds some comments, such as the list of zone names and surface names before each coordinate specification. The line/solid colors are set as Floor, Wall, etc. so the file is somewhat readable.

```
#VRML V2.0 utf8
WorldInfo {
   title "Building - Building"
   info ["EnergyPlus Program Version EnergyPlus <version>, 9/14/2006 1:31 PM"]
}
# Zone Names
# Zone=1:PLENUM-1
# Zone=2:SPACE1-1
# Zone=3:SPACE2-1
# Zone=4:SPACE3-1
# Zone=5:SPACE4-1
# Zone=6:SPACE5-1
Shape {
appearance DEF FLOOR Appearance {
material Material { diffuseColor 0.502 0.502 0.502 }
}
}
```

```
# PLENUM-1:WALL-1PF
Shape {
appearance USE WALL
geometry IndexedFaceSet {
solid TRUE
coord DEF Surf5 Coordinate {
point [
        0.00000         0.00000         3.00000,
        0.00000         0.00000         2.40000,
       26.41377       -15.25000         2.40000,
       26.41377       -15.25000         3.00000,
]
}
coordIndex [
 0 1 2 3 -1
]
ccw TRUE
solid TRUE
}
}
```

```
# PLENUM-1:WALL-1PR
Shape {
appearance USE WALL
geometry IndexedFaceSet {
solid TRUE
coord DEF Surf6 Coordinate {
point [
       26.41377       -15.25000         3.00000,
       26.41377       -15.25000         2.40000,
       34.01377        -2.08641         2.40000,
       34.01377        -2.08641         3.00000,
]
}
coordIndex [
 0 1 2 3 -1
]
ccw TRUE
solid TRUE
}
}
```

Delight output files

eplusout.delightin

Following completion of an EnergyPlus run that includes Daylighting:DElight objects, an ASCII text file created during the run is given a file name that consists of the project name appended with DElight.in (e.g., MyProjectDElight.in).

This text file is a formatted DElight input file that was created from the EnergyPlus input data relevant to a DElight simulation. This file can be manually reviewed to determine the exact data that were transformed from EnergyPlus into DElight input.

eplusout.delightout

Following completion of an EnergyPlus run that includes Daylighting:DElight objects, an ASCII text file created during the run is given a file name that consists of the project name appended with DElight.out (e.g., MyProjectDElight.out).

This text file is a formatted DElight output file that was generated by the DElight simulation engine following the pre-processing daylight factors calculation. This file can be manually reviewed to see the results of these calculations. The file contains an echo of DElight input data, as well as the results of intermediate calculations such as geometrical transformations, surface gridding, and daylight factors, including the following.

Surface Data

- Vertex coordinates in the Building coordinate system. Search for the string "BldgSystem_Surface_Vertices" within the output file.
- Exterior face luminance values under overcast skies, and for each sun position under clear skies. Search for the string "Surface Exterior Luminance" within the output file.
- Common data for radiosity nodal patches for each surface including Area and Number of Nodes. Search for the string "Surface_Node_Area" within the output file.
- Individual data for radiosity nodal patches for each node on each surface including: building coordinate system coordinates; direct and total luminance values under overcast skies, and for each sun position under clear skies. Search for the string "BldgSystem_Node_Coordinates" within the output file.

Reference Point Data

- Illuminance values from the daylighting factors preprocessor for overcast skies, and for each sun position under clear skies.
- Daylight Factor values from the daylighting factors preprocessor for overcast skies, and for each sun position under clear skies.
- NOTE: The Monthly Average data for Daylight Illuminances and Electric Lighting Reduction will all be zero since these data are not calculated as part of the pre-processing done by the point at which this output file is generated for EnergyPlus.

Example Input Files

The EnergyPlus install includes a sample of example input files. For the most part, the developers create these files to illustrate and test a specific feature in EnergyPlus. Then, we pass them along to you for illustrative purposes. The install will contain a spreadsheet file “ExampleFiles.xls” that will list all the files available – whether through the install or through an external site.

Following convention, each example file should have at the top a set of comments that tell what the purpose of the file is and the key features.

For example, the file titled “5ZoneAirCooled.idf” has:

```
! 5ZoneAirCooled.idf
! Basic file description:  1 story building divided into 4 exterior and one interior conditioned zones and
return plenum.
!
! Highlights:              Electric chiller with air cooled condenser; autosized preheating and precooling
water coils in the
!                          outside air stream controlled to preheat and precool setpoints.
!
! Simulation Location/Run: CHICAGO_IL_USA TMY2-94846, 2 design days, 2 run periods,
!                          Run Control executes the run periods using the weather file
!
! Location:                Chicago, IL
!
! Design Days:             CHICAGO_IL_USA Annual Heating 99% Design Conditions DB, MaxDB= -17.3°C
!                          CHICAGO_IL_USA Annual Cooling 1% Design Conditions, MaxDB=  31.5°C MCWB=
23.0°C
!
! Run Period (Weather File): Winter 1/14, Summer 7/7, CHICAGO_IL_USA TMY2-94846
!
! Run Control:             Zone and System sizing with weather file run control (no design days run)
!
! Building: Single floor rectangular building 100 ft x 50 ft. 5 zones - 4 exterior, 1 interior, zone
height 8 feet.
!           Exterior zone depth is 12 feet. There is a 2 foot high return plenum: the overall building
height is
!           10 feet. There are windows on all 4 facades; the south and north facades have glass doors.
!           The south facing glass is shaded by overhangs. The walls are woodshingle over plywood, R11
insulation,
!           and gypboard. The roof is a gravel built up roof with R-3 mineral board insulation and plywood
sheathing.
!           The windows are of various single and double pane construction with 3mm and 6mm glass and
either 6mm or
!           13mm argon or air gap.  The window to wall ratio is approxomately 0.29.
!           The south wall and door have overhangs.
!
!           The building is oriented 30 degrees east of north.
!
```

```
! Floor Area:        463.6 m2 (5000 ft2)
! Number of Stories: 1
!
! Zone Description Details:
!
!      (0,15.2,0)                      (30.5,15.2,0)
!           _____ ________              ____
!         |\     ***        ****************    /|
!         | \                                  / |
!         |  \                (26.8,11.6,0) /  |
!         *   \_____________________________/   *
!         *    |(3.7,11.6,0)               |    *
!         *    |                           |    *
!         *    |                           |    *
!         *    |              (26.8,3.7,0)|    *
!         *    |___________________________|    *
!         *   / (3.7,3.7,0)                 \   *
!         |  /                               \  |
!         | /                                 \ |
!         |/___*****************___***________\|
!          |       Overhang       |   |
!          |______________________|   |   window/door = *
!                                 |___|
!
!      (0,0,0)                            (30.5,0,0)
!
! Internal gains description:     lighting is 1.5 watts/ft2, office equip is 1.0 watts/ft2. There is 1
occupant
!                                 per 100 ft2 of floor area. The infiltration is 0.25 air changes per
hour.
!
! Interzone Surfaces:             6 interzone surfaces (see diagram)
! Internal Mass:                  None
! People:                         50
! Lights:                         7500 W
! Windows:                        4 ea.: 1) Double pane clear, 3mm glass, 13mm air gap
!                                        2) Double pane clear, 3mm glass, 13mm argon gap
!                                        3) Double pane clear, 6mm glass, 6mm air gap
!                                        4) Double pane lowE,  6mm lowE glass outside, 6mm air gap, 6mm
clear glass
!
! Doors:                          2 ea.:    Single pane grey,  3mm glass
!
! Detached Shading:               None
! Daylight:                       None
! Natural Ventilation:            None
! Compact Schedules:              Yes
!
! HVAC:                           Standard VAV system with outside air, hot water reheat coils,
!                                 central chilled water cooling coil. Central Plant is single hot water
!                                 boiler, electric compression chiller with air cooled condenser.
!                                 All equipment is autosized. HW and ChW coils are used in the outside air
!                                 stream to precondition the outside air.
!
! Zonal Equipment:                AirTerminal:SingleDuct:VAV:Reheat
! Central Air Handling Equipment: Yes
! System Equipment Autosize:      Yes
! Purchased Cooling:              None
! Purchased Heating:              None
! Coils:                          Coil:Cooling:Water, Coil:Heating:Water
! Pumps:                          Pump:VariableSpeed
! Boilers:                        Boiler:HotWater
! Chillers:                       Chiller:Electric
!
! Results:
! Standard Reports:               None
! Timestep or Hourly Variables:   Hourly
! Time bins Report:               None
! HTML Report:                    None
! Environmental Emissions:        None
! Utility Tariffs:                None
```

In addition to the idf files, usually an .rvi and perhaps a .mvi of the same file set is included. As discussed previously, the .rvi is used with the ReadVarsESO post-processing program and the .eso file to create a .csv file which can be read easily into Excel™. Like the .rvi, the .mvi file can be used with the .mtr file to create a similar version for “metered” outputs.

Data Sets

Data sets are the EnergyPlus answer to “libraries”. Data sets come in two flavors – a simple list and a “macroized” list. Macroized lists are files that could have the elements extracted using a simple macro name.

Simple List Data Sets

ASHRAE_2005_HOF_Materials.idf

This reference data set contains content from two chapters in the ASHRAE 2005 Handbook of Fundamentals, Chapter 30 - the Cooling and Heating Loads calculations chapter has both materials with thermal properties and constructions for Light, Medium, and Heavy buildings. Chapter 25 contains details thermal properties of many materials -- no constructions are created from that data.

The following materials and constructions are created from ASHRAE Handbook of Fundamentals, 2005, Chapter 30, Table 19 and Table 22. These are representative of materials and constructions used in Cooling and Heating Load Calculations.

Boilers.idf

This dataset includes performance curves for non-electric boilers. Reference: Condensing Technology, Technical Series, Viessmann, 9446 803 - 1 GB Nov. 2004.

California_Title_24-2008.idf

This dataset includes occupancy data and non-residential schedules for California Title 24-2008 compliance calculations when lighting plans are submitted for the Entire Building or when lighting compliance is not performed. Data is based on Table N2-5 of the 2008 Non-residential ACM Manual.

Chillers.idf

This dataset includes object types for specific (by manufacturer and type) Chiller:Electric:EIR and Chiller: Electric:ReformulatedEIR and associated performance curves.

Knowing the type of chiller that you want to simulate, you can find it and the associated performance curves in the dataset file. By example, here is part of the comments in the Chiller.idf file:

```
! Summary Table for Electric EIR Chiller reference data sets (Ref. CoolTools project).
! Chillers are listed in order of compressor type and reference capacity (model calibration
! point). Reference capacity and COP do not necessarily indicate rated capacity and COP at
! standard rating conditions (e.g. ARI Standard 550/590).
!
! Performance curves developed from information collected over a 10-year period from 1991 to 2001.
!
!                                                       Compressor   Reference  Reference Unloading
! Chiller Name                                             Type       Capacity    COP     Mechanism
!                                                                     kW (tons)
!-----------------------------------------------------------------------------------------------
! ElectricEIRChiller McQuay WSC 471kW/5.89COP/Vanes    Centrifugal   471 (134)   5.89   Inlet Vanes
! ElectricEIRChiller York YT 563kW/10.61COP/Vanes      Centrifugal   563 (160)   10.61  Inlet Vanes
! ElectricEIRChiller McQuay PEH 703kW/7.03COP/Vanes    Centrifugal   703 (200)   7.03   Inlet Vanes
! ElectricEIRChiller Carrier 23XL 724kW/6.04COP/Vanes  Centrifugal   724 (206)   6.04   Inlet Vanes
```

CompositeWallConstructions.idf

The Reference Data Set CompositeWallConstructions.idf contains constructions and associated materials for a set of **composite** walls. These are walls—such as stud walls—that have complicated heat-flow paths so that the conduction is two- or three-dimensional.

An example entry in this data set--for an insulated 2”x4” steel-stud wall--looks like:

```
CONSTRUCTION,Composite 2x4 Steel Stud R11,
! ASHRAE 1145-RP Wall Assembly 10
! 2"x4" steel studs at 24" on center with between-stud R11 fibreglass insulation.
! Studs are 3.5", 16 gauge, 15 flange.
! Layers are 1/2" wood siding, 1/2" plywood, 2x4 steel studs and R11 insulation, 1/2" gypsum board.
! Area-average R-Value = 8.796 ft2-F-h/Btu (1.548 m2-K/W).
! Total wall thickness = 5.00in (0.127m)
! Material layer names follow:
  Composite 2x4 Steel Stud R11 #3,
  Composite 2x4 Steel Stud R11 #2,
  Composite 2x4 Steel Stud R11 #1;
```

```
MATERIAL,Composite 2x4 Steel Stud R11 #1,
  Smooth,  !- Roughness
  0.013,   !- Thickness (m)
  0.720,   !- Conductivity (W/m-K)
  640.0,   !- Density (kg/m3)
  1048,    !- Specific Heat (J/kg-K)
  0.9,     !- Absorptance:Thermal
  0.7,     !- Absorptance:Solar
  0.7;     !- Absorptance:Visible
MATERIAL,Composite 2x4 Steel Stud R11 #2,
  Smooth,  !- Roughness
  0.089,   !- Thickness (m)
  0.060,   !- Conductivity (W/m-K)
  118.223, !- Density (kg/m3)
  1048,    !- Specific Heat (J/kg-K)
  0.9,     !- Absorptance:Thermal
  0.7,     !- Absorptance:Solar
  0.7;     !- Absorptance:Visible
MATERIAL,Composite 2x4 Steel Stud R11 #3,
  Smooth,  !- Roughness
  0.025,   !- Thickness (m)
  0.452,   !- Conductivity (W/m-K)
  413.782, !- Density (kg/m3)
  1048,    !- Specific Heat (J/kg-K)
  0.9,     !- Absorptance:Thermal
  0.7,     !- Absorptance:Solar
  0.7;     !- Absorptance:Visible
```

The materials here are **not** real materials but are “equivalent” materials obtained from finite-difference modeling.[1] EnergyPlus will calculate conduction transfer functions using these materials. The heat transfer based on these conduction transfer functions will then be very close to what would be calculated with a two- or three-dimensional heat transfer calculation.

For stud walls, using these composite constructions will give more accurate heat flow than you would get by manually dividing the wall into a stud section and a non-stud section.

If your wall’s exterior or interior roughness or thermal, solar or visible absorptances are different from those in the data set, you can make the appropriate changes to the first material (the outside layer) or the third material (the inside layer). **None of the other values should be changed.**

Following is a summary of the constructions in the composite wall data set:

[1] The thickness, conductivity, density and specific heat values of the material layers for the different constructions have been taken from the ASHRAE report “Modeling Two- and Three-Dimensional Heat Transfer through Composite Wall and Roof Assemblies in Hourly Energy Simulation Programs (1145-TRP),” by Enermodal Engineering Limited, Oak Ridge National Laboratory, and the Polish Academy of Sciences, January 2001.

```
CONSTRUCTION,Composite 2x4 Wood Stud R11,
! ASHRAE 1145-RP Wall Assembly 1
! 2"x4" wood studs at 24" on center with between-stud R11 fibreglass insulation.
! Layers are 1/2" wood siding, 1/2" plywood, 2x4 wood studs and R11 insulation, 1/2" gypsum board.
! Area-average R-Value = 11.391 ft2-F-h/Btu (2.005 m2-K/W).

CONSTRUCTION,Composite 2x6 Wood Stud R19,
! ASHRAE 1145-RP Wall Assembly 2
! 2"x6" wood studs at 24" on center with between-stud R19 fibreglass insulation.
! Layers are 1/2" wood siding, 1/2" plywood, 2x6 wood studs and R19 insulation, 1/2" gypsum board.
! Area-average R-Value = 17.487 ft2-F-h/Btu (3.078 m2-K/W).

CONSTRUCTION,Composite Insulated Concrete Form Wall With Steel Ties,
! ASHRAE 1145-RP Wall Assembly 7
! Wall system is made of two rigid insulation sides held together with wire mesh.
! The two sides come together to create the formwork for the concrete.
! Layers are 3/4" concrete stucco, outer polystyrene shell, concrete core, inner polystyrene shell.
! Area-average R-Value = 11.230 ft2-F-h/Btu (1.977 m2-K/W).

CONSTRUCTION,Composite Concrete/Foam/Concrete With Steel Connectors,
! ASHRAE 1145-RP Wall Assembly 8
! Wall system is made of two 3" concrete slabs separated by 2" rigid insulation.
! The slab connectors are steel ties with a 0.15"x0.15" cross section.
! Layers are 3" concrete, 2" polystyrene, 3" concrete.
! Area-average R-Value = 7.659 ft2-F-h/Btu (1.348 m2-K/W).

CONSTRUCTION,Composite Concrete/Foam/Concrete With Plastic Connectors,
! ASHRAE 1145-RP Wall Assembly 9
! Wall system is made of two 3" concrete slabs separated by 2" rigid insulation.
! The slab connectors are plasic ties with a 0.25"x0.25" cross section.
! Layers are 3" concrete, 2" polystyrene, 3" concrete.
! Area-average R-Value = 10.582 ft2-F-h/Btu (1.862 m2-K/W).

CONSTRUCTION,Composite 2x4 Steel Stud R11,
! ASHRAE 1145-RP Wall Assembly 10
! 2"x4" steel studs at 24" on center with between-stud R11 fibreglass insulation.
! Studs are 3.5", 16 gauge, 15 flange.
! Layers are 1/2" wood siding, 1/2" plywood, 2x4 steel studs and R11 insulation, 1/2" gypsum board.
! Area-average R-Value = 8.796 ft2-F-h/Btu (1.548 m2-K/W).

CONSTRUCTION,Composite Brick Foam 2x4 Steel Stud R11,
! ASHRAE 1145-RP Wall Assembly 15
! Brick veneer, polystyrene, 2"x4" steel studs at 24" on center with
!  between-stud R11 fibreglass insulation.
! Studs are 3.5", 16 gauge, 15 flange.
! Layers are 3.25" brick,1" polystyrene insulation, 1/2" plywood, 2x4 steel studs and R11 insulation,
!  1/2" gypsum board.
! Area-average R-Value = 12.792 ft2-F-h/Btu (2.251 m2-K/W).

CONSTRUCTION,Composite 2x6 Steel Stud R19,
! ASHRAE 1145-RP Wall Assembly 16
! 2"x6" steel studs at 24" on center with between-stud R19 fibreglass insulation.
! Studs are 5.5", 16 gauge, 15 flange.
! Layers are 1/2" wood siding, 1/2" plywood, 2x6 steel studs and R19 insulation, 1/2" gypsum board.
! Area-average R-Value = 12.792 ft2-F-h/Btu (1.991 m2-K/W).

CONSTRUCTION,Composite Foam 2x6 Steel Stud R19,
! ASHRAE 1145-RP Wall Assembly 17
! Polystyrene, 2"x6" steel studs at 24" on center with between-stud R19 fibreglass insulation.
! Studs are 5.5", 16 gauge, 15 flange.
! Layers are 3/4" concrete stucco,1" polystyrene insulation, 1/2" plywood, 2x6 steel studs and R19
insulation,
!  1/2" gypsum board.
! Area-average R-Value = 15.157 ft2-F-h/Btu (2.668 m2-K/W).
```

```
CONSTRUCTION,Composite Brick Foam 2x6 Steel Stud R19,
! ASHRAE 1145-RP Wall Assembly 18
! Brick veneer, polystyrene, 2"x6" steel studs at 24" on center with
!  between-stud R19 fibreglass insulation.
! Studs are 5.5", 16 gauge, 15 flange.
! Layers are 3.25" brick,1" polystyrene insulation, 1/2" plywood, 2x6 steel studs and R19 insulation,
!  1/2" gypsum board.
! Area-average R-Value = 15.465 ft2-F-h/Btu (2.722 m2-K/W).

CONSTRUCTION,Composite 2-Core Filled Concrete Block Uninsulated,
! ASHRAE 1145-RP Wall Assembly 19
! Wall system is made of 12" 2-core concrete blocks without insulation.
! The core area is filled with rebar and poured concrete.
! Area-average R-Value = 1.326 ft2-F-h/Btu (0.239 m2-K/W).

CONSTRUCTION,Composite 2-Core Filled Concrete Block Insulated,
! ASHRAE 1145-RP Wall Assembly 20
! Wall system is made of 12" 2-core concrete blocks with 1.875"-thick
!  foam inserts in the block cores.
! The remaining core area is filled with poured concrete.
! Area-average R-Value = 2.291 ft2-F-h/Btu (0.403 m2-K/W).
```

ElectricGenerators.idf

This dataset includes inputs for the GENERATOR:MICROTURBINE object and associated performance curves. The performance curves were developed from manufacturer data collected in Summer 2007.

Includes data for generators: Capstone C65, Elliott TA100, Ingersoll Rand MT70, Ingersoll Rand MT250.

Further documentation is contained in the dataset file.

Electricity USA Environmental Impact Factors.idf

United States 1999 national average electricity emissions factors based on eGRID, 1605, AirData. United States Water Emission Fuel Factors are the combined thermoelectric and hydroelectric weighted averages from:

Torcellini, Paul; Long, Nicholas; Judkoff, Ron; "Consumptive Water Use for U.S. Power Production";NREL Report No. TP-550-33905. Golden, CO; 2003; http://www.nrel.gov/docs/fy04osti/33905.pdf;

or

Torcellini, Paul; Long, Nicholas; Judkoff, Ron; "Consumptive Water Use for U.S. Power Production"; ASHRAE Transactions 2003, Vol 110, Part 1. Atlanta, GA; January 2004;

ElectronicEnthalpyEconomizerCurves.idf

These curves approximate the electronic (variable) enthalpy curves used to simulate humidity biased economizer control. This control scheme adjusts the upper outdoor air humidity ratio based on outdoor air dry-bulb temperature as shown in the figure below. California Title 24 ACM 2005 lists the optional economizer control strategies. One of these control strategies is referred to as variable enthalpy control curve A. This control strategy is also cited in ASHRAE Standard 90.1-2004, using the term “electronic enthalpy”. Electronic enthalpy curves A-D are included in this dataset.

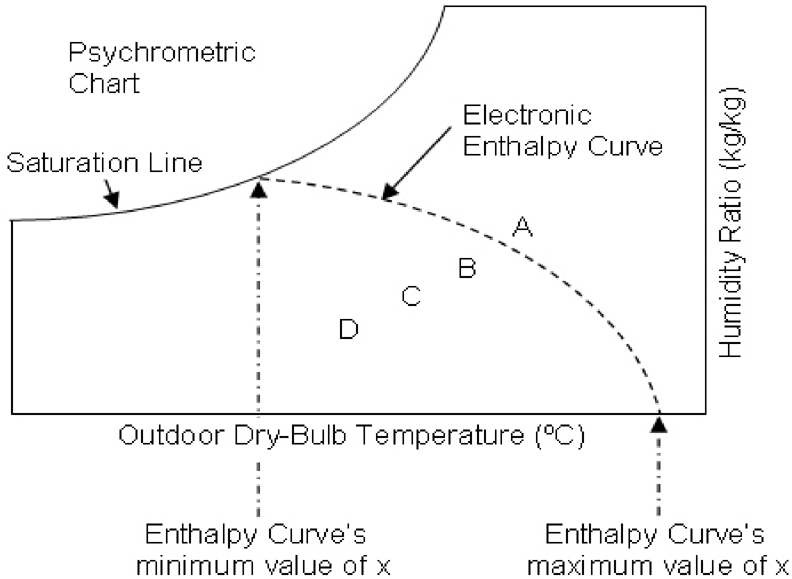


Figure 8. Psychrometric Chart Illustration of the Electronic (Variable) Enthalpy Economizer Limit Example Curve Objects

For the curves provided, curve A has the highest limit and curve D has the lowest limit. These curve objects represent a single-point electronic enthalpy control curve with the curve object’s minimum value of x (temperature) crossing the psychrometric chart's saturation line and the curve object’s maximum value of x crossing the psychrometric chart's dry-bulb temperature axis. The curve object’s minimum (maximum) value of x should be just low (high) enough to ensure that the curve crosses the psychrometric chart’s saturation line (temperature axis). The curves are evaluated at an outdoor dry-bulb temperature to provide a maximum operating outdoor humidity ratio for economizer operation. If the outdoor humidity ratio is greater than this maximum value, economizer operation is terminated. These curves may be used with other economizer limits to create multi-point economizer control (Temperature Limit, Temperature Low Limit, Enthalpy Limit, and Dewpoint Temperature Limit).

Form of the Electronic Enthalpy Curve Equation:

The electronic enthalpy curve equation represents a unique curve and is a function of both temperature and relative humidity. The equation is set equal to a constant which provides a unique temperature for each relative humidity entered into the equation. Each control curve has a unique constant as shown in the table below. Other constants may be used to develop specialized electronic enthalpy curves.

$$K = 45.672192 - 1.1559942 * T - 0.144599 * RH$$

where: K = Constant value to represent specific curve
T = Outdoor Dry-Bulb Temperature (C)
RH = Outdoor Relative Humidity (%)

NOTE: modifying the RH multiplier (-0.144599) tends to "wag" the curvature at the upper relative humidities. Decreasing the multiplier "wags" the upper portion of the curve downward, increasing "wags" it upwards. Modifying the constant (K) moves the intersection of the curve with the Dry-Bulb Temperature axis. Increasing the constant moves the intersection to the left as shown in the figure, decreasing moves to the right. The minimum and/or maximum x boundaries in the curve objects may have to be adjusted when modifying the equation.

Table 34. Electronic Enthalpy Curve Constants and approximate control point at 50% RH

Control Curve	Curve Constant K	Approximate Control Point at 50% RH (ºC)
A	12	22.9
B	14	21.1
C	16	19.4
D	18	17.7

Example Curve A:

The method described here was used to create each of the four "cubic" curve objects provided in the electronic enthalpy economizer control data set.

Step 1: Substitute the curve constant K for curve A (12) into the electronic enthalpy curve equation and solve for temperature. Then identify the outdoor air dry-bulb temperatures at known values of relative humidity (e.g., columns 1 and 2 in the table below). Psychrometric routines are helpful for this step.

$$Temperature = \frac{\left(12 - 45.672192 + 0.144599 \ * \ RelativeHumidity\right)}{-1.1559942}$$

Step 2: Identify humidity ratio at each point (e.g. column 3 in the following table). Psychrometric routines are helpful for this step.

Relative Humidity (%)	Temperature (ºC)	Calculated Humidity Ratio (kg/kg)
0	29.128	0.00000
10	27.877	0.00232
20	26.627	0.00433
30	25.376	0.00605
40	24.125	0.00750
50	22.874	0.00872
60	21.623	0.00971
70	20.372	0.01051
80	19.121	0.01112
90	17.871	0.01158
100	16.620	0.01189

Step 3: Use multiple linear regression to solve one of the following equations:

Quadratic Curve: Humidity Ratio = A0 + A1*Temperature + A2*Temperature^2

Cubic Curve: Humidity Ratio = A0 + A1*Temperature + A2*Temperature^2 + A3*Temperature^3

Step 4: Use the coefficients calculated in the multiple linear regression to create a cubic (or quadratic) curve object.

Fossil Fuel Environmental Impact Factors.idf

Impact factors for environmental reporting. References for each fuel are given in the dataset.

FluidPropertiesRefData.idf

This data set includes fluid properties reference data. Included are:

Refrigerants
R11
R12
R22
R123
R134a
R404a
R410a
R507a
NH3
Steam

To use the data, copy the appropriate data for the refrigerant you desire into your input file.

GlycolPropertiesRefData.idf

This data set includes fluid properties (glycol) reference data. Included are:

Glycols
EthyleneGlycol
PropyleneGlycol
Water

To use the data, copy the appropriate data for the glycol you desire into your input file.

GHLERefData.idf

This file contains sample input for the ground loop heat exchanger model. The response of the borehole/ground is found from the 'G-function' that is defined in the input as series of 'n' pairs of values (LNTTSn, GNFCn). It is important to note that the G-functions have to be calculated for specific GHE configurations and borehole resitance, length and borehole/ length ratio. That is, the parameters for the units vary with each design. The data in this file are intended as examples/samples and may not represent actual designs.

The sample data has been calculated for a number of configurations:

1 x 2 boreholes

4 x 4 boreholes

8 x 8 boreholes

Data is given for both 'standard' grout (k=0.744 W/m.K) and 'thermally enhanced' grout (k= 1.471 W/m.K). The flow rate per borehole is .1514 kg/s. The pipe given is 0.75in. Dia. SDR11 HDPE. The fluid is water. The borehole/length ratio is 0.06 (76.2m/4.572m [300ft/15ft])

MoistureMaterials.idf

This data set includes the special moisture materials that can be used with the Moisture Penetration Depth Conduction Transfer Function (EMPD) and Combined Heat and Moisture Finite Element (HAMT) calculation procedures.

PerfCurves.idf

This file contains performance curves for various EnergyPlus equipment objects.

- Variable speed DX cooling: These curves are appropriate for small DX cooling units with variable speed compressors. These curves would be referenced by the EnergyPlus object COIL:DX:MultiSpeed:CoolingEmpirical. See the example input file 5ZoneAutoDXVAV for an example of their use.
- Variable Speed Cooling Tower: These model coefficient objects are appropriate for use with the variable speed cooling tower object and represent the coefficients used in the YorkCalc and CoolTools empirical models. These model coefficient objects would be referenced by the EnergyPlus object Cooling Tower:Variable Speed. See the example input file CoolingTower_VariableSpeed.idf for an example of where these curves could be used (these model coefficient objects are not specifically used in this idf but could be used by the Cooling Tower:Variable Speed object). Additional information on variable speed cooling tower model coefficients can be found in the Input Output Reference and Engineering Reference documents.
- Note that performance curves for the Electric EIR chiller and the Electric Reformulated EIR chiller are contained in the Chillers.idf dataset.

PrecipitationSchedulesUSA.idf

This file contains schedules (for an entire year) of precipitation for use with the SitePrecipitation object. Use these schedules for adding rain water to the simulation. The values are in meters per hour and are scaled to match the average monthly precipitation. They also coincide with the EPW rain/snow flags from the original source files.

RefrigerationCompressorCurves.idf

This dataset includes object types for specific (by manufacturer and type) Refrigeration:Compressor and associated performance curves. Knowing the nominal refrigerating capacity, power, and refrigerant for the compressor(s) that you want to simulate, you can find it and the associated performance curves in the dataset file. By example, here is part of the RefrigerationCompressorCurves.idf file:

```
! Capacity Curve for Carlyle_R-22_Low_06CC016,   !nominal MBtu/h = 18561.0
! Results in Watts, Inputs:  Sat Suction Temp (C), Sat Discharge Temp (C)
Curve:Bicubic,
06CC016_R-22_Low_qcurv,        !unique name of capacity curve
  2.350e+004,                  !Coef1 Constant
       816.7,                  !Coef2 x
       10.70,                  !Coef3 x**2
      -28.24,                  !Coef4 y
      0.1131,                  !Coef5 y^2
     -0.4553,                  !Coef6 x*y
     0.05604,                  !Coef7 x**3
   -0.004120,                  !Coef8 y**3
   -0.006728,                  !Coef9 x**2*y
    0.006782,                  !Coef10 x*y**2
 -40.0,                        !minimum x
 -17.8,                        !maximum x
  10.0,                        !minimum y
  48.9;                        !maximum y

! Power Curve for Carlyle_R-22_Low_06CC016,   !nominal kW = 3.1
! Results in Watts, Inputs:  Sat Suction Temp (C), Sat Discharge Temp (C)
Curve:Bicubic,
06CC016_R-22_Low_pwrcurv,      !unique name of power curve
       4018.,                  !Coef1 Constant
       95.00,                  !Coef2 x
       1.507,                  !Coef3 x**2
       5.705,                  !Coef4 y
       1.247,                  !Coef5 y^2
      -1.381,                  !Coef6 x*y
     0.01277,                  !Coef7 x**3
   -0.007518,                  !Coef8 y**3
    -0.02424,                  !Coef9 x**2*y
     0.02917,                  !Coef10 x*y**2
 -40.0,                        !minimum x
 -17.8,                        !maximum x
  10.0,                        !minimum y
  48.9;                        !maximum y

!Detailed Compressor: Carlyle_R-22_Low_06CC016,   !nominal MBtu/h = 18561.0, !nominal kW = 3.1
Refrigeration:Compressor,
Carlyle_R-22_Low_06CC016,      !name of compressor, model, Refrig, duty
06CC016_R-22_Low_pwrcurv,      !unique name of power curve
06CC016_R-22_Low_qcurv,        !unique name of capacity curve
RatedReturnGasTemperature,     !Superheat Rating Type
  18.3,                        !Compressor Rated Suction Temperature
RatedLiquidTemperature,        !Subcooling Rating Type
   4.4;                        !Compressor Rated Subcooling
```

SandiaPVData.idf

Use these PV statements for implementing PV modules in an EnergyPlus input file when using the Sandia model.

Schedules.idf

This data set contains the schedule information for various common (e.g. Office Occupancy) scheduling instances. Derived from the Schedules Library issued with the BLAST program. Includes the building types schedules from ASHRAE 90.1-1989, Section 13. Schedules are listed alphabetically, with general schedules first, followed by the ten 90.1 building type schedules.

SolarCollectors.idf

Use these SOLAR COLLECTOR PARAMETERS objects for implementing solar collector modules in an EnergyPlus input file.

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StandardReports.idf

This file contains the Report Table:Monthly command for some commonly used/desired monthly reports.

SurfaceColorSchemes.idf

This file offers examples for using custom color schemes for DXF output.

USHolidays-DST.idf

This is the set of US national holidays as well as daylight saving period defaults.

Window5DataFile.dat

This is an example data file from the Window5 program that can be used with EnergyPlus windows.

WindowBlindMaterials.idf

This is a data set of Window Blind materials.

WindowConstructs.idf

This is a data set of Window constructions. It does not include the required pieces of the Window construction (glass materials, gas materials).

WindowGasMaterials.idf

This is a data set of Window Gas materials.

WindowGlassMaterials.idf

This is a data set of Window Glass materials.

WindowShadeMaterials.idf

This is a data set of Window Shade materials.

WindowScreenMaterials.idf

This is a data set of Window Screen materials.

Macro Data Sets

Locations-DesignDays.xls

- Strictly speaking, the locations-designdays.xls file is not a macro enabled input file. Rather, it is the “pointer” to other files and can be searched by city name, country, etc. All the Design Conditions from the ASHRAE Handbook of Fundamentals (2005) have been encoded into Design Day definitions and are stored on the EnergyPlus web site by WMO Region (similarly to how the weather data is stored). The spreadsheet contains a “readme” page as well as cities, countries, and links to the proper web pages.

SandiaPVData.idf

Use these PV statements for implementing PV modules in an EnergyPlus input file when using the Sandia model.

SolarCollectors.idf

Use these SOLAR COLLECTOR PARAMETERS objects for implementing solar collector modules in an EnergyPlus input file.

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UtilityTariffObjects.imf

Use the large collections of input objects to model the costs of energy supplied by utility companies. This file is ready for use in macro processing but the input objects can readily be copied out of the macro file and used in a regular input file. The data were assembled by NREL researcher Brent Griffith and represent a best effort at putting together a comprehensive set of utility tariffs for commercial buildings for the USA as of Spring 2005. Use the data at your own risk and note that utility tariffs need to be continually updated to reflect current conditions.