

Volume

4

# DOE-2.2

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Building Energy Use and Cost Analysis Program

Volume 4: Libraries & Reports

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DOE-2.2 BUILDING ENERGY USE AND COST ANALYSIS PROGRAM

# Volume 4: Libraries & Reports

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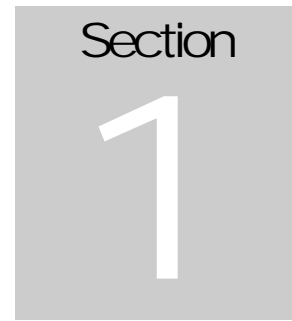
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# Envelope Libraries

This section contains the libraries used to construct the building envelope. Included here are:

- Materials Libraries
- Constructions
- Windows

## MATERIAL LIBRARY

The following tables list the materials in the Library. Three categories are given: (1) building materials, (2) insulating materials and (3) air spaces.

The format of the tables is as follows. The left-hand column gives the code-word that you use as one of the entries in the list of values of the MATERIAL keyword in the LAYERS command. The next two columns give the description and thickness of the material. The last four columns give the thermophysical properties in both English and metric units.

Because the code-words contain blanks they must be enclosed in parentheses when used in your input. For example:

```
WA-1-2 = LAYERS
      MATERIAL      = ("Wood Sft 3/4in (WD01)",
                      "MinWool Batt R11 (IN02)",
                      "GypBd 1/2in (GP01)") ..
```

The portion of a code-word in parentheses gives the DOE-2.1E name for the material. For example, for the code-word "Wood Sft 3/4in (WD01)" the DOE-2.1E name is WD01.

Materials whose code-words contain "HF", such as "ClayTile 4in (HF-C1)" are so-called "ASHRAE" materials. These materials are listed in Table 11, Chapter 28 of *ASHRAE Handbook, 1997 Fundamentals*, American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc.

### Building Materials

Table 1 Building Materials						
Code-Word	Description	Thickness ft (m)	Conductivity Btu/hr-ft <sup>2</sup> -F (W/m-K)	Density lb/ft <sup>3</sup> (kg/m <sup>3</sup> )	Specific Heat Btu/lb-F (kJ/kg-K)	Resistance hr-ft <sup>2</sup> -F/Btu (K-m <sup>2</sup> /W)
<b>Acoustic Tile</b>						
AcousTile 3/8in (AC01)	3/8 in (1 cm)	0.0313 (0.0095)	0.0330 (0.057)	18.0 (288)	0.32 (1339)	0.95 (0.167)
AcousTile 1/2in (AC02)	1/2 in (1.3cm)	0.0417 (0.0127)	0.0330 (0.057)	18.0 (288)	0.32 (1339)	1.26 (0.222)
AcousTile 3/4in (AC03)	3/4 in (1.9cm)	0.0625 (0.0191)	0.0330 (0.057)	18.0 (288)	0.32 (1339)	1.89 (0.333)
AcousTile (HF-E5)	3/4 in (1.9cm)	0.0625 (0.0191)	0.0350 (0.061)	30.0 (480)	0.20 (2142)	1.79 (0.313)
<b>Aluminum or Steel Siding</b>						
Steel Siding (AS01)		0.0050 (0.0015)	26.000 (44.97)	480.0 (7690)	0.10 (418)	1.9x10 <sup>-4</sup> (3.3x10 <sup>-5</sup> )
<b>Asbestos-Cement</b>						
AbsCem Bd 1/8in (AB01)	Board, 1/8 in (0.32 cm)	0.0104 (0.0032)	0.3450 (0.597)	120.0 (1922)	0.2 (837)	0.03 (0.005)
AbsCem Bd 1/4in (AB02)	Board, 1/4 in (0.63 cm)	0.0208 (0.0063)	0.3450 (0.597)	120.0 (1922)	0.2 (837)	0.06 (0.011)



<b>Table 1 Building Materials</b>						
<b>Code-Word</b>	<b>Description</b>	<b>Thickness</b> ft (m)	<b>Conductivity</b> Btu/hr-ft <sup>2</sup> -F (W/m-K)	<b>Density</b> lb/ft <sup>3</sup> (kg/m <sup>3</sup> )	<b>Specific Heat</b> Btu/lb-F (kJ/kg-K)	<b>Resistance</b> hr-ft <sup>2</sup> -F/Btu (K-m <sup>2</sup> /W)
AbsCem Shingle (AB03)	Shingle					0.21 (0.037)
AbsCem Siding (AB04)	Lapped Siding, 1/4 in (0.63 cm)					0.21 (0.037)
<b>Asbestos Vinyl Tile</b>						
AbsVinyl Tile (AV01)						0.05 (0.009)
<b>Asphalt</b>						
Asph Roll Roof (AR01)	Roofing Roll					0.15 (0.026)
Asph Siding (AR02)	Shingle and Siding					0.44 (0.078)
Asph Tile (AR03)	Tile					0.05 (0.009)
<b>Brick</b>						
Com Brick 4in (BK01)	4 in (10.1cm) Common	0.3333 (0.1016)	0.4167 (0.721)	120.0 (1922)	0.20 (837)	0.80 (0.141)
Com Brick 8in (BK02)	8 in (20.3 cm) Common	0.6667 (0.2032)	0.4167 (0.721)	120.0 (1922)	0.20 (837)	1.60 (0.282)
Com Brick 12in (BK03)	12 in (30.5 cm) Common	1.0000 (0.3048)	0.4167 (0.721)	120.0 (1922)	0.20 (837)	2.40 (0.423)
Face Brick 3in (BK04)	3 in (7.6cm) Face	0.2500 (0.0762)	0.7576 (1.310)	130.0 (2083)	0.22 (921)	0.33 (0.058)
Face Brick 4in (BK05)	4 in (10.1cm) Face	0.3333 (0.1016)	0.7576 (1.310)	130.0 (2083)	0.22 (921)	0.44 (0.078)
Face Brick 4in (HF-A2)	4 in (10.1cm) Face	0.3333 (0.1016)	0.7700 (1.331)	130.0 (2083)	0.22 (921)	0.43 (0.076)
Face Brick 4in (HF-A7)	4 in (10.1cm) Face	0.3333 (0.1016)	0.7700 (1.331)	125.0 (2003)	0.22 (921)	0.43 (0.076)
Com Brick 4in (HF-C4)	4 in (10.1cm) Common	0.3333 (0.1016)	0.4200 (0.727)	120.0 (1922)	0.2 (837)	0.79 (0.140)
Com Brick 8in (HF-C9)	8 in (20.3cm) Common	0.6667 (0.2032)	0.4200 (0.727)	120.0 (1922)	0.2 (837)	1.59 (0.280)
<b>Building Paper</b>						
Bldg Paper Felt (BP01)	Permeable Felt					0.06 (0.011)
Bldg Paper Seal (BP02)	2-Layer Seal					0.12 (0.022)
Plastic Film Seal (BP03)	Plastic Film Seal					0.01 (0.002)
<b>Built-Up Roof</b>						
Blt-Up Roof 3/8in (BR01)	3/8 in (1 cm)	0.0313 (0.0095)	0.0939 (0.162)	70.0 (1121)	0.35 (1464)	0.33 (0.026)
<b>Carpet</b>						
Carpet & Fiber Pad (CP01)	With Fibrous Pad					2.08 (0.367)
Carpet & Rubber Pad (CP02)	With Rubber Pad					1.23 (0.217)
<b>Cement</b>						
Cmt Mortar 1in (CM01)	Mortar, 1in	0.0833 (0.0254)	0.4167 (0.721)	116.0 (1858)	0.2 (837)	0.20 (0.035)

<b>Table 1 Building Materials</b>						
<b>Code-Word</b>	<b>Description</b>	<b>Thickness ft (m)</b>	<b>Conductivity Btu/hr-ft<sup>2</sup>-F (W/m-K)</b>	<b>Density lb/ft<sup>3</sup> (kg/m<sup>3</sup>)</b>	<b>Specific Heat Btu/lb-F (kJ/kg-K)</b>	<b>Resistance hr-ft<sup>2</sup>-F/Btu (K-m<sup>2</sup>/W)</b>
	(2.5 cm)					
Cmt Mortar 1.75in (CM02)	Mortar, 1.75 in (4.4 cm)	0.1458 (0.0444)	0.4167 (0.721)	116.0 (1858)	0.2 (837)	0.35 (0.062)
Cmt Plaster 1in (CM03)	Plaster with Sand Aggregate, 1 in (2.5 cm)	0.0833 (0.0254)	0.4167 (0.721)	116.0 (1858)	0.2 (837)	0.20 (0.035)
<b>Clay Tile, Hollow</b>						
Hol ClayTile 3in (CT01)	1 Cell, 3in (7.6cm)	0.2500 (0.0762)	0.3125 (0.498)	70.0 (1121)	0.2 (837)	0.80 (0.272)
Hol ClayTile 4in (CT02)	1 Cell, 4 in (10.1cm)	0.3333 (0.1016)	0.2999 (0.519)	70.0 (1121)	0.2 (837)	1.11 (0.196)
Hol ClayTile 6in (CT03)	2 Cells, 6 in (15.2 cm)	0.5000 (0.1524)	0.3300 (0.571)	70.0 (1121)	0.2 (837)	1.52 (0.268)
Hol ClayTile 8in (CT04)	2 Cells, 8 in (20.3cm)	0.6667 (0.2032)	0.3600 (0.623)	70.0 (1121)	0.2 (837)	1.85 (0.326)
Hol ClayTile 10in (CT05)	2 Cells, 10 in (25.4 cm)	0.8333 (0.2540)	0.3749 (0.648)	70.0 (1121)	0.2 (837)	2.22 (0.391)
Hol ClayTile 12in (CT06)	3 Cells, 12 in (30.5 cm)	1.0000 (0.3048)	0.4000 (0.692)	70.0 (1121)	0.2 (837)	2.50 (0.441)
ClayTile 4in (HF-C1)	4 in (10.1cm)	0.3333 (0.1016)	0.3300 (0.571)	70.0 (1121)	0.2 (837)	1.01 (0.178)
ClayTile 8in (HF-C6)	8 in (20.3cm)	0.6667 (0.2032)	0.3300 (0.571)	70.0 (1121)	0.2 (837)	2.02 (0.357)
<b>Clay Tile, Paver</b>						
ClayTile Paver 3/8in (CT11)	3/8 in (1 cm)	0.0313 (0.0095)	1.0416 (1.802)	120.0 (1922)	0.2 (837)	0.03 (0.005)
<b>Concrete, Heavy Weight Dried Aggregate, 140 lbs.</b>						
Conc HW 140lb 1.25in (CC01)	1.25 in (3.2 cm)	0.1042 (0.0318)	0.7576 (1.310)	140.0 (2243)	0.2 (837)	0.14 (0.025)
Conc HW 140lb 2in (CC02)	2 in (5.1 cm)	0.1667 (0.0508)	0.7576 (1.310)	140.0 (2243)	0.2 (837)	0.22 (0.039)
Conc HW 140lb 4in (CC03)	4 in (10.1cm)	0.3333 (0.1016)	0.7576 (1.310)	140.0 (2243)	0.2 (837)	0.44 (0.078)
Conc HW 140lb 6in (CC04)	6 in (15.2 cm)	0.5000 (0.1524)	0.7576 (1.310)	140.0 (2243)	0.2 (837)	0.66 (0.116)
Conc HW 140lb 8in (CC05)	8 in (20.3cm)	0.6667 (0.2032)	0.7576 (1.310)	140.0 (2243)	0.2 (837)	0.88 (0.155)
Conc HW 140lb 10in (CC06)	10 in (25.4 cm)	0.8333 (0.2540)	0.7576 (1.310)	140.0 (2243)	0.2 (837)	1.10 (0.194)
Conc HW 140lb 12in (CC07)	12 in (30.5 cm)	1.0000 (0.3048)	0.7576 (1.310)	140.0 (2243)	0.2 (837)	1.32 (0.233)
<b>Concrete, Heavy Weight Undried Aggregate, 140 lbs.</b>						
Conc HW 140lb 3/4in (CC11)	3/4 in (1.9 cm)	0.0625 (0.0191)	1.0417 (1.802)	140.0 (2243)	0.2 (837)	0.06 (0.011)
Conc HW 140lb 1-3/8in (CC12)	1 3/8 in (3.5 cm)	0.1146 (0.0349)	1.0417 (1.802)	140.0 (2243)	0.2 (837)	0.11 (0.019)
Conc HW 140lb 3.25in (CC13)	3 1/4 in (8.3 cm)	0.2708 (0.0825)	1.0417 (1.802)	140.0 (2243)	0.2 (837)	0.26 (0.046)
Conc HW 140lb 4in (CC14)	4 in (10.2 cm)	0.3333 (0.1016)	1.0417 (1.802)	140.0 (2243)	0.2 (837)	0.32 (0.056)
Conc HW 140lb 6in (CC15)	6 in (15.2 cm)	0.5000 (0.1524)	1.0417 (1.802)	140.0 (2243)	0.2 (837)	0.48 (0.085)
Conc HW 140lb 18in (CC16)	8 in (20.2 cm)	0.6667 (0.2032)	1.0417 (1.802)	140.0 (2243)	0.2 (837)	0.64 (0.113)

<b>Table 1 Building Materials</b>						
<b>Code-Word</b>	<b>Description</b>	<b>Thickness ft (m)</b>	<b>Conductivity Btu/hr-ft<sup>2</sup>-F (W/m-K)</b>	<b>Density lb/ft<sup>3</sup> (kg/m<sup>3</sup>)</b>	<b>Specific Heat Btu/lb-F (kJ/kg-K)</b>	<b>Resistance hr-ft<sup>2</sup>-F/Btu (K-m<sup>2</sup>/W)</b>
Conc HW 140lb 2in (HF-C12)	2 in (5.1 cm)	0.1667 (0.0508)	1.0000 (1.730)	140.0 (2243)	0.2 (837)	0.17 (0.029)
Conc HW 140lb 4in (HF-C5)	4 in (10.2 cm)	0.3333 (0.1016)	1.0000 (1.730)	140.0 (2243)	0.2 (837)	0.33 (0.059)
Conc HW 140lb 6in (HF-C13)	6 in (15.2 cm)	0.5000 (0.1524)	1.0000 (1.730)	140.0 (2243)	0.2 (837)	0.50 (0.088)
Conc HW 140lb 8in (HF-C10)	8 in (20.2 cm)	0.6667 (0.2032)	1.0000 (1.730)	140.0 (2243)	0.2 (837)	0.67 (0.118)
Conc HW 140lb 12in (HF-C11)	12 in (30.5 cm)	1.0000 (0.3048)	1.0000 (1.730)	140.0 (2243)	0.2 (837)	1.00 (0.176)
<b>Concrete, Light Weight, 80 lb.</b>						
ConcLW 80lb 3/4in (CC21)	3/4 in (1.9 cm)	0.0625 (0.0191)	0.2083 (0.360)	80.0 (1282)	0.2 (837)	0.30 (0.053)
ConcLW 80lb 1.25in (CC22)	1.25 in (3.2 cm)	0.1042 (0.0318)	0.2083 (0.360)	80.0 (1282)	0.2 (837)	0.50 (0.088)
ConcLW 80lb 2in (CC23)	2 in (5.1 cm)	0.1667 (0.0508)	0.2083 (0.360)	80.0 (1282)	0.2 (837)	0.80 (0.141)
ConcLW 80lb 4in (CC24)	4 in (10.2 cm)	0.3333 (0.1016)	0.2083 (0.360)	80.0 (1282)	0.2 (837)	1.60 (0.282)
ConcLW 80lb 6in (CC25)	6 in (15.2 cm)	0.5000 (0.1524)	0.2083 (0.360)	80.0 (1282)	0.2 (837)	2.40 (0.423)
ConcLW 80lb 8in (CC26)	8 in (20.2 cm)	0.6667 (0.2032)	0.2083 (0.360)	80.0 (1282)	0.2 (837)	3.20 (0.564)
<b>Concrete, Light Weight, 30 lb.</b>						
ConcLW 30lb 3/4in (CC31)	3/4 in (1.9 cm)	0.0625 (0.0191)	0.0751 (0.130)	30.0 (481)	0.2 (837)	0.83 (0.146)
ConcLW 30lb 1.25in (CC32)	1.25 in (3.2 cm)	0.1042 (0.0191)	0.0751 (0.130)	30.0 (481)	0.2 (837)	1.39 (0.245)
ConcLW 30lb 2in (CC33)	2 in (5.1 cm)	0.1667 (0.0508)	0.0751 (0.130)	30.0 (481)	0.2 (837)	2.22 (0.391)
ConcLW 30lb 4in (CC34)	4 in (10.2 cm)	0.3333 (0.1016)	0.0751 (0.130)	30.0 (481)	0.2 (837)	4.44 (0.782)
ConcLW 30lb 6in (CC35)	6 in (15.2 cm)	0.5000 (0.1524)	0.0751 (0.130)	30.0 (481)	0.2 (837)	6.66 (1.174)
ConcLW 30lb 8in (CC36)	8 in (20.2 cm)	0.6667 (0.2032)	0.0751 (0.130)	30.0 (481)	0.2 (837)	8.88 (1.565)
<b>Concrete, Light Weight, 40 lb.</b>						
ConcLW 40lb 4in (HF-C14)	4 in (10.2 cm)	0.3333 (0.1016)	0.1 (.173)	40.0 (641)	0.2 (837)	3.33 (0.587)
ConcLW 40lb 6in (HF-C15)	6 in (15.2 cm)	0.5000 (0.1524)	0.1 (.173)	40.0 (641)	0.2 (837)	5.00 (0.881)
ConcLW 40lb 8in (HF-C16)	8 in (20.2 cm)	0.6667 (0.2032)	0.1 (.173)	40.0 (641)	0.2 (837)	6.67 (1.175)
<b>Concrete Block, Light Weight</b>						
CMU LW 4in (HF-C2)	4 in (10.2 cm)	0.3333 (0.1016)	0.2200 (0.380)	38.0 (609)	0.2 (837)	1.51 (0.267)
<b>Concrete Block, 4 inch (10.2 cm) Heavy Weight</b>						
CMU HW 4in Hollow (CB01)	Hollow	0.3333 (0.1016)	0.4694 (0.812)	101.0 (1618)	0.2 (837)	0.71 (0.125)
CMU HW 4in ConcFill (CB02)	Concrete Filled	0.3333 (0.1016)	0.7575 (1.310)	140.0 (2234)	0.2 (837)	0.44 (0.078)
CMU HW 4in PerlFill (CB03)	Perlite Filled	0.3333 (0.1016)	0.3001 (0.384)	103.0 (1650)	0.2 (837)	1.11 (0.196)
CMU HW 4in PartFill (CB04)	Part-Filled Concrete *	0.3333 (0.1016)	0.5844 (1.011)	114.0 (1826)	0.2 (837)	0.57 (0.100)
CMU HW 4in Conc/Perl (CB05)	Concrete and Perlite **	0.3333 (0.1016)	0.4772 (0.825)	115.0 (1842)	0.2 (837)	0.70 (0.123)
* One filled and reinforced concrete core every 24 in (61 cm) of wall length						
** One filled and reinforced concrete core every 24 in (61 cm) of wall length with the remaining cores filled with Perlite insulation						
<b>Concrete Block, 6 inch (15.2 cm) Heavy Weight</b>						
CMU HW 6in Hollow (CB06)	Hollow	0.5000 (0.1524)	0.5555 (0.961)	85.0 (1362)	0.2 (837)	0.90 (0.159)

<b>Table 1 Building Materials</b>						
<b>Code-Word</b>	<b>Description</b>	<b>Thickness ft (m)</b>	<b>Conductivity Btu/hr-ft<sup>2</sup>-F (W/m-K)</b>	<b>Density lb/ft<sup>3</sup> (kg/m<sup>3</sup>)</b>	<b>Specific Heat Btu/lb-F (kJ/kg-K)</b>	<b>Resistance hr-ft<sup>2</sup>-F/Btu (K-m<sup>2</sup>/W)</b>
CMU HW 6in ConcFill (CB07)	Concrete Filled	0.5000 (0.1524)	0.7575 (1.310)	140.0 (2243)	0.2 (837)	0.66 (0.116)
CMU HW 6in PerlFill (CB08)	Perlite Filled	0.5000 (0.1524)	0.2222 (0.384)	88.0 (1410)	0.2 (837)	2.25 (0.397)
CMU HW 6in PartFill (CB09)	Part-Filled Concrete*	0.5000 (0.1524)	0.6119 (1.058)	104.0 (1666)	0.2 (837)	0.82 (0.145)
CMU HW 6in Conc/Perl (CB10)	Concrete and Perlite**	0.5000 (0.1524)	0.4238 (0.733)	104.0 (1666)	0.2 (837)	1.18 (0.208)
<b>Concrete Block, 8 inch (20.3 cm) Heavy Weight</b>						
CMU HW 8in Hollow (CB11)	Hollow	0.6667 (0.2032)	0.6060 (1.048)	69.0 (1105)	0.2 (837)	1.10 (0.194)
CMU HW 8in ConcFill (CB12)	Concrete Filled	0.6667 (0.2032)	0.7575 (1.310)	140.0 (2243)	0.2 (837)	0.88 (0.155)
CMU HW 8in PerlFill (CB13)	Perlite Fill	0.6667 (0.2032)	0.2272 (0.393)	70.0 (1121)	0.2 (837)	2.93 (0.516)
CMU HW 8in PartFill (CB14)	Part-Filled Concrete*	0.6667 (0.2032)	0.6746 (1.167)	93.0 (1490)	0.2 (837)	0.99 (0.174)
CMU HW 8in Conc/Perl (CB15)	Concrete and Perlite**	0.6667 (0.2032)	0.4160 (0.720)	93.0 (1490)	0.2 (837)	1.60 (0.282)
<b>Concrete Block, 12 inch (30.5 cm) Heavy Weight</b>						
CMU HW 12in Hollow (CB16)	Hollow	1.0000 (0.3048)	0.7813 (1.350)	76.0 (1218)	0.2 (837)	1.28 (0.226)
CMU HW 12in ConcFill (CB17)	Concrete Filled	1.0000 (0.3048)	0.7575 (1.310)	140.0 (2243)	0.2 (837)	1.32 (0.233)
CMU HW 12in PartFill (CB18)	Part-Filled Concrete*	1.0000 (0.3048)	0.7773 (1.344)	98.0 (1570)	0.2 (837)	1.29 (0.227)
<b>Concrete Block, 4 inch (10.1 cm) Medium Weight</b>						
CMU MW 4in Hollow (CB21)	Hollow	0.3333 (0.1016)	0.3003 (0.519)	76.0 (1218)	0.2 (837)	1.11 (0.196)
CMU MW 4in ConcFill (CB22)	Concrete Filled	0.3333 (0.1016)	0.4456 (0.771)	115.0 (1842)	0.2 (837)	0.75 (0.132)
CMU MW 4in PerlFill (CB23)	Perlite Filled	0.3333 (0.1016)	0.1512 (0.262)	78.0 (1250)	0.2 (837)	2.20 (0.388)
CMU MW 4in PartFill (CB24)	Part-Filled Concrete*	0.3333 (0.1016)	0.3306 (0.572)	89.0 (1426)	0.2 (837)	1.01 (0.178)
CMU MW 4in Conc/Perl (CB25)	Concrete and Perlite**	0.3333 (0.1016)	0.2493 (0.431)	90.0 (1442)	0.2 (837)	1.34 (0.236)
* One filled and reinforced concrete core every 24 in (61 cm) of wall length						
** One filled and reinforced concrete core every 24 in (61 cm) of wall length with the remaining cores filled with Perlite insulation						
<b>Concrete Block, 6 inch (15.2 cm) Medium Weight</b>						
CMU MW 6in Hollow (CB26)	Hollow	0.5000 (0.1524)	0.3571 (0.618)	65.0 (1041)	0.2 (837)	1.40 (0.247)
CMU MW 6in ConcFill (CB27)	Concrete Filled	0.5000 (0.1524)	0.4443 (0.768)	119.0 (1906)	0.2 (837)	1.13 (0.199)
CMU MW 6in PerlFill (CB28)	Perlite Filled	0.5000 (0.1524)	0.1166 (0.202)	67.0 (1073)	0.2 (837)	4.29 (0.756)
CMU MW 6in PartFill (CB29)	Part-Filled Concrete*	0.5000 (0.1524)	0.3686 (0.638)	83.0 (1330)	0.2 (837)	1.36 (0.240)
CMU MW 6in Conc/Perl (CB30)	Concrete and Perlite**	0.5000 (0.1524)	0.2259 (0.391)	84.0 (1346)	0.2 (837)	2.21 (0.389)

<b>Table 1 Building Materials</b>						
<b>Code-Word</b>	<b>Description</b>	<b>Thickness</b> ft (m)	<b>Conductivity</b> Btu/hr-ft <sup>2</sup> -F (W/m-K)	<b>Density</b> lb/ft <sup>3</sup> (kg/m <sup>3</sup> )	<b>Specific Heat</b> Btu/lb-F (kJ/kg-K)	<b>Resistance</b> hr-ft <sup>2</sup> -F/Btu (K-m <sup>2</sup> /W)
<b>Concrete Block, 8 inch (20.3 cm) Medium Weight</b>						
CMU MW 8in Hollow (CB31)	Hollow	0.6667 (0.2032)	0.3876 (0.670)	53.0 (849)	0.2 (837)	1.72 (0.303)
CMU MW 8in ConcFill (CB32)	Concrete Filled	0.6667 (0.2032)	0.4957 (0.857)	123.0 (1970)	0.2 (837)	1.34 (0.236)
CMU MW 8in PerlFill (CB33)	Perlite Filled	0.6667 (0.2032)	0.1141 (0.197)	56.0 (897)	0.2 (837)	5.84 (1.029)
CMU MW 8in PartFill (CB34)	Part-Filled Concrete*	0.6667 (0.2032)	0.4348 (0.752)	76.0 (1218)	0.2 (837)	1.53 (0.270)
CMU MW 8in PartFill (CB35)	Concrete and Perlite**	0.6667 (0.2032)	0.2413 (0.417)	77.0 (1234)	0.2 (837)	2.76 (0.486)
<b>Concrete Block, 12 inch (30.5 cm) Medium Weight</b>						
CMU MW 12in Hollow (CB36)	Hollow	1.0000 (0.3048)	0.4959 (0.858)	58.0 (929)	0.2 (837)	2.02 (0.356)
CMU MW 12in ConcFill (CB37)	Concrete Filled	1.0000 (0.3048)	0.4814 (0.833)	121.0 (1938)	0.2 (837)	2.08 (0.367)
CMU MW 12in PartFill (CB38)	Part-Filled Concrete*	1.0000 (0.3048)	0.4919 (0.851)	79.0 (1266)	0.2 (837)	2.03 (0.358)
<b>Concrete Block, 4 inch (10.1 cm) Light Weight</b>						
CMU LW 4in Hollow (CB41)	Hollow	0.3333 (0.1016)	0.2222 (0.384)	65.0 (1041)	0.2 (837)	1.50 (0.264)
CMU LW 4in ConcFill (CB42)	Concrete Filled	0.3333 (0.1016)	0.3695 (0.639)	104.0 (1666)	0.2 (837)	0.90 (0.159)
CMU LW 4in PerlFill (CB43)	Perlite Filled	0.3333 (0.1016)	0.1271 (0.220)	67.0 (1073)	0.2 (837)	2.62 (0.462)
CMU LW 4in PartFill (CB44)	Part-Filled Concrete*	0.3333 (0.1016)	0.2808 (0.486)	78.0 (1250)	0.2 (837)	1.19 (0.210)
CMU LW 4in Conc/Perl (CB45)	Concrete and Perlite**	0.3333 (0.1016)	0.2079 (0.360)	79.0 (1266)	0.2 (837)	1.60 (0.282)
* One filled and reinforced concrete core every 24 in (61 cm) of wall length						
** One filled and reinforced concrete core every 24 in (61 cm) of wall length with the remaining cores filled with Perlite insulation						
<b>Concrete Block, 6 inch (15.2 cm) Light Weight</b>						
CMU LW 6in Hollow (CB46)	Hollow	0.5000 (0.1524)	0.2777 (0.480)	55.0 (881)	0.2 (837)	1.80 (0.317)
CMU LW 6in ConcFill (CB47)	Concrete Filled	0.5000 (0.1524)	0.3819 (0.661)	110.0 (1762)	0.2 (837)	1.31 (0.231)
CMU LW 6in PerlFill (CB48)	Perlite Filled	0.5000 (0.1524)	0.0985 (0.170)	57.0 (913)	0.2 (837)	5.08 (0.895)
CMU LW 6in PartFill (CB49)	Part-Filled Concrete*	0.5000 (0.1524)	0.3189 (0.552)	73.0 (1169)	0.2 (837)	1.57 (0.277)
CMU LW 6in Conc/Perl (CB50)	Concrete and Perlite**	0.5000 (0.1524)	0.1929 (0.334)	74.0 (1185)	0.2 (837)	2.59 (0.456)
<b>Concrete Block, 8 inch (20.3 cm) Light Weight</b>						
CMU LW 8in Hollow (CB51)	Hollow	0.6667 (0.2032)	0.3333 (0.576)	45.0 (721)	0.2 (837)	2.00 (0.352)
CMU LW 8in ConcFill (CB52)	Concrete Filled	0.6667 (0.2032)	0.4359 (0.754)	115.0 (1842)	0.2 (837)	1.53 (0.270)
CMU LW 8in PerlFill (CB53)	Perlite Filled	0.6667 (0.2032)	0.0963 (0.167)	48.0 (769)	0.2 (837)	6.92 (1.219)
CMU LW 8in PartFill (CB54)	Part-Filled Concrete*	0.6667 (0.2032)	0.3846 (0.665)	68.0 (1089)	0.2 (837)	1.73 (0.305)

<b>Table 1 Building Materials</b>						
<b>Code-Word</b>	<b>Description</b>	<b>Thickness</b> ft (m)	<b>Conductivity</b> Btu/hr-ft <sup>2</sup> -F (W/m-K)	<b>Density</b> lb/ft <sup>3</sup> (kg/m <sup>3</sup> )	<b>Specific Heat</b> Btu/lb-F (kJ/kg-K)	<b>Resistance</b> hr-ft <sup>2</sup> -F/Btu (K-m <sup>2</sup> /W)
CMU LW 8in Conc/Perl (CB55)	Concrete and Perlite**	0.6667 (0.2032)	0.2095 (0.362)	69.0 (1105)	0.2 (837)	3.18 (0.560)
<b>Concrete Block, 12 inch (30.5 cm) Light Weight</b>						
CMU LW 12in Hollow (CB56)	Hollow	1.0000 (0.3048)	0.4405 (0.762)	49.0 (785)	0.2 (837)	2.27 (0.400)
CMU LW 12in ConcFill (CB57)	Concrete Filled	1.0000 (0.3048)	0.4194 (0.725)	113.0 (1810)	0.2 (837)	2.38 (0.419)
CMU LW 12in PartFill (CB58)	Part-Filled Concrete*	1.0000 (0.3048)	0.4274 (0.739)	70.0 (1121)	0.2 (837)	2.34 (0.412)
<b>Felt and Membrane</b>						
Felt 3/8in (HF-E3)	3/8 in (1 cm)	0.0313 (0.0095)	0.1100 (0.190)	70.0 (1121)	0.4 (1674)	0.28 (0.050)
Finish (HF-A6)	1/2 in (1.3 cm)	0.0417 (0.0127)	0.2400 (0.415)	78.0 (1249)	0.26 (1088)	0.17 (0.031)
<b>Gypsum or Plaster Board</b>						
GypBd 1/2in (GP01)	1/2 in (1.3 cm)	0.0417 (0.0127)	0.0926 (0.160)	50.0 (801)	0.2 (837)	0.45 (0.079)
GypBd 5/8in (GP02)	5/8 in (1.6 cm)	0.0521 (0.0159)	0.0926 (0.160)	50.0 (801)	0.2 (837)	0.56 (0.099)
GypBd 3/4in (GP03)	3/4 in (1.9 cm)	0.0625 (0.0191)	0.0926 (0.160)	50.0 (801)	0.2 (837)	0.67 (0.118)
* One filled and reinforced concrete core every 24 in (61 cm) of wall length						
** One filled and reinforced concrete core every 24 in (61 cm) of wall length with the remaining cores filled with Perlite insulation						
<b>Gypsum Plaster</b>						
Gypsum LW Agg 3/4in (GP04)	3/4 in (1.9cm) Lt. Wt. Aggregate	0.0625 (0.0191)	0.1330 (0.230)	45.0 (721)	0.2 (837)	0.47 (0.083)
Gypsum LW Agg 1in (GP05)	1 in (2.5 cm) Lt. Wt. Aggregate	0.0833 (0.0254)	0.1330 (0.230)	45.0 (721)	0.2 (837)	0.63 (0.111)
Gypsum Sand Agg 3/4in (GP06)	3/4 in (1.9cm) Sand Aggregate	0.0625 (0.0191)	0.4736 (0.819)	105.0 (1682)	0.2 (837)	0.13 (0.023)
Gypsum Sand Agg 1in (GP07)	1 in (2.5 cm) Sand Aggregate	0.0833 (0.0254)	0.4736 (0.819)	105.0 (1682)	0.2 (837)	0.18 (0.032)
<b>Hard Board, 3/4 inch (1.9 cm)</b>						
Hd Bd 3/4in Md Dens (HB01)	Medium Density Siding	0.0625 (0.0191)	0.0544 (0.094)	40.0 (641)	0.28 (1171)	1.15 (0.203)
Hd Bd 3/4in Md Dens (HB02)	Medium Density Others	0.0625 (0.0191)	0.0608 (0.105)	50.0 (801)	0.31 (1297)	1.03 (0.182)
Hd Bd 3/4in Std Temp (HB03)	High Density Standard Tempered	0.0625 (0.0191)	0.0683 (0.118)	55.0 (881)	0.33 (1381)	0.92 (0.162)
Hd Bd 3/4in Srv Temp (HB04)	High Density Service Tempered	0.0625 (0.0191)	0.0833 (0.144)	63.0 (1009)	0.33 (1381)	0.75 (0.132)
<b>Linoleum Tile</b>						
Linoleum Tile (LT01)						0.05 (0.009)

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<b>Code-Word</b>	<b>Description</b>	<b>Thickness</b> ft (m)	<b>Conductivity</b> Btu/hr-ft <sup>2</sup> -F (W/m-K)	<b>Density</b> lb/ft <sup>3</sup> (kg/m <sup>3</sup> )	<b>Specific Heat</b> Btu/lb-F (kJ/kg-K)	<b>Resistance</b> hr-ft <sup>2</sup> -F/Btu (K-m <sup>2</sup> /W)
<b>Particle Board</b>						
PartBd Lo Dens 3/4in (PB01)	Low Density, 3/4 in (1.9 cm)	0.0625 (0.0191)	0.0450 (0.078)	75.0 (1202)	0.31 (1297)	1.39 (0.245)
PartBd Md Dens 3/4in (PB02)	Medium Density, 3/4 in (1.9 cm)	0.0625 (0.0191)	0.7833 (1.355)	75.0 (1202)	0.31 (1297)	0.08 (0.014)
PartBd Hi Dens 3/4in (PB03)	High Density, 3/4 in (1.9 cm)	0.0625 (0.0191)	0.9833 (1.701)	75.0 (1202)	0.31 (1297)	0.06 (0.011)
PartBd Underlay 5/8in (PB04)	Underlayment, 5/8 in (1.6 cm)	0.0521 (0.0159)	0.1796 (0.311)	75.0 (1202)	0.29 (1213)	0.29 (0.051)
<b>Plywood</b>						
Plywd 1/4in (PW01)	1/4 in (0.64 cm)	0.0209 (0.0064)	0.0667 (0.115)	34.0 (545)	0.29 (1213)	0.31 (0.055)
Plywd 3/8in (PW02)	3/8 in (1 cm)	0.0313 (0.0095)	0.0667 (0.115)	34.0 (545)	0.29 (1213)	0.47 (0.083)
Plywd 1/2in (PW03)	1/2 in (1.3 cm)	0.0417 (0.0127)	0.0667 (0.115)	34.0 (545)	0.29 (1213)	0.63 (0.111)
Plywd 5/8in (PW04)	5/8 in (1.6 cm)	0.0521 (0.0159)	0.0667 (0.115)	34.0 (545)	0.29 (1213)	0.78 (0.137)
Plywd 3/4 (PW05)	3/4 in (1.9 cm)	0.0625 (0.0191)	0.0667 (0.115)	34.0 (545)	0.29 (1213)	0.94 (0.166)
Plywd 1in (PW06)	1 in (2.5 cm)	0.0833 (0.0254)	0.0667 (0.115)	34.0 (545)	0.29 (1213)	1.25 (0.220)
<b>Roof Gravel or Slag</b>						
Gravel 1/2in (RG01)	1/2 in (1.3cm)	0.0417 (0.0127)	0.8340 (1.442)	55.0 (881)	0.4 (1674)	0.05 (0.009)
Gravel 1in (RG02)	1 in (2.5 cm)	0.0833 (0.0254)	0.8340 (1.442)	55.0 (881)	0.4 (1674)	0.10 (0.018)
<b>Rubber Tile</b>						
Rubber Tile (RT01)						0.05 (0.009)
<b>Slate</b>						
Slate 1/2in (SL01)	1/2 in (1.3 cm)	0.0417 (0.0127)	0.8340 (1.442)	100.0 (1602)	0.35 (1464)	0.05 (0.009)
<b>Soil</b>						
Soil 12in	12in (30.5cm)	1.000 (0.3048)	1.000 (1.729)	115.0 (1842)	0.2 (837)	1.0000 (0.176)
<b>Steel Siding</b>						
Steel Siding (HF-A3)	0.06in (0.15cm)	0.0050 (0.0015)	26.000 (45.0)	480.0 (7690)	0.10 (419)	0.0002 (3.5x10 <sup>-5</sup> )
<b>Stone</b>						
Stone 1in (ST01)	1 in (2.5 cm)	0.0833 (0.0254)	1.0416 (1.802)	140.0 (2243)	0.2 (837)	0.08 (0.014)
Stone 1/2in (HF-E2)	1/2 in (1.3 cm)	0.0417 (0.0127)	0.8300 (1.435)	55.0 (881)	0.4 (1674)	0.05 (0.009)
<b>Stucco</b>						
Stucco 1in (SC01)	1 in (2.5 cm)	0.0833 (0.0254)	0.4167 (0.721)	166.0 (2659)	0.2 (837)	0.20 (0.035)
<b>Terrazzo</b>						
Terrazzo 1in (TZ01)	1 in (2.5 cm)	0.0833 (0.0254)	1.0416 (1.802)	140.0 (2243)	0.2 (837)	0.08 (0.014)
<b>Wood, Soft</b>						
Wood Sft 3/4in (WD01)	3/4 in (1.9 cm)	0.0625 (0.0191)	0.0667 (0.115)	32.0 (513)	0.33 (1381)	0.94 (0.166)

<b>Table 1 Building Materials</b>						
<b>Code-Word</b>	<b>Description</b>	<b>Thickness</b> ft (m)	<b>Conductivity</b> Btu/hr-ft <sup>2</sup> -F (W/m-K)	<b>Density</b> lb/ft <sup>3</sup> (kg/m <sup>3</sup> )	<b>Specific Heat</b> Btu/lb-F (kJ/kg-K)	<b>Resistance</b> hr-ft <sup>2</sup> -F/Btu (K-m <sup>2</sup> /W)
Wood Sft 1.5in (WD02)	1.5 in (3.8 cm)	0.1250 (0.0381)	0.0667 (0.115)	32.0 (513)	0.33 (1381)	1.87 (0.330)
Wood Sft 2.5in (WD03)	2.5 in (6.4 cm)	0.2083 (0.0635)	0.0667 (0.115)	32.0 (513)	0.33 (1381)	3.12 (0.550)
Wood Sft 3.5in (WD04)	3.5 in (8.9 cm)	0.2917 (0.0889)	0.0667 (0.115)	32.0 (513)	0.33 (1381)	4.37 (0.770)
Wood Sft 4in (WD05)	4 in (10.2 cm)	0.3333 (0.1016)	0.0667 (0.115)	32.0 (513)	0.33 (1381)	5.00 (0.881)
<b>Wood, Hard</b>						
Wood Hd 3/4in (WD11)	3/4 in (1.9 cm)	0.0625 (0.0191)	0.0916 (0.158)	45.0 (721)	0.30 (1255)	0.68 (0.120)
Wood Hd 1in (WD12)	1 in (2.5 cm)	0.0833 (0.0254)	0.0916 (0.158)	45.0 (721)	0.30 (1255)	0.91 (0.160)
<b>Wood, Shingle</b>						
Wood Shingle (WS01)	For Wall	0.0583(0.178)	0.0667 (0.115)	32.0 (513)	0.30 (1255)	0.87 (0.153)
Wood Shingle (WS02)	For Roof					0.94 (0.166)
<b>Wood</b>						
Wood 1in (HF-B7)	1 in (2.5 cm)	0.0833 (0.0254)	0.0700 (0.121)	37.0 (593)	0.2 (837)	1.19 (0.210)
Wood 2in (HF-B10)	2 in (3.1 cm)	0.1667 (0.0508)	0.0700 (0.121)	37.0 (593)	0.2 (837)	2.38 (0.420)
Wood 2.5in (HF-B8)	2.5 in (6.4 cm)	0.2083 (0.0635)	0.0700 (0.121)	37.0 (593)	0.2 (837)	2.98 (0.526)
Wood 3in (HF-B11)	3 in (7.6 cm)	0.2500 (0.0762)	0.0700 (0.121)	37.0 (593)	0.2 (837)	3.57 (0.630)
Wood 4in (HF-B9)	4 in (10.2 cm)	0.3330 (0.1016)	0.0700 (0.121)	37.0 (593)	0.2 (837)	4.76 (0.840)



## Insulating Materials

Table 1 Insulating Materials						
Code-Word	Description	Thickness	Conductivity	Density	Specific Heat	Resistance
		ft (m)	Btu/hr-ft <sup>2</sup> -F (W/m-K)	lb/ft <sup>3</sup> (kg/m <sup>3</sup> )	Btu/lb-F (kJ/kg-K)	hr-ft <sup>2</sup> -F/Btu (K-m <sup>2</sup> /W)
<b>Mineral Wool/Fiber</b>						
MinWool Batt R7 (IN01)	Batt, R-7*	0.1882 (0.0574)	0.0250 (0.043)	0.60 (10)	0.2 (837)	7.53 (1.327)
MinWool Batt R11 (IN02)	Batt, R-11	0.2957 (0.0901)	0.0250 (0.043)	0.60 (10)	0.2 (837)	11.83 (2.085)
MinWool Batt R19 (IN03)	Batt, R-19	0.5108 (0.1557)	0.0250 (0.043)	0.60 (10)	0.2 (837)	20.43 (3.600)
MinWool Batt R24 (IN04)	Batt, R-24	0.6969 (0.2124)	0.0250 (0.043)	0.60 (10)	0.2 (837)	27.88 (4.913)
MinWool Batt R30 (IN05)	Batt, R-30	0.8065 (0.2458)	0.0250 (0.043)	0.60 (10)	0.2 (837)	32.26 (5.685)
MinWool Fill 3.5in R11 (IN11)	Fill, 3.5 in (8.9 cm), R-11	0.2917 (0.0889)	0.0270 (0.046)	0.60 (10)	0.2 (837)	10.80 (1.903)
MinWool Fill 5.5in R19 (IN12)	Fill, 5.5 in (13.4 cm), R-19	0.4583 (0.1397)	0.0270 (0.046)	0.63 (11)	0.2 (837)	16.97 (2.991)
<b>Cellulose Fill</b>						
Cellulose 3.5in R-13 (IN13)	3.5 in (8.9 cm), R-13	0.2917 (0.0889)	0.0225 (0.039)	3.0 (48)	0.33 (1381)	12.96 (2.284)
Cellulose 5.5in R-20 (IN14)	5.5 in (13.4 cm), R-20	0.4583 (0.1397)	0.0225 (0.039)	3.0 (48)	0.33 (1381)	20.37 (3.590)
<b>Insulation</b>						
Insul Bd 1in (HF-B2)	1 in (2.5 cm)	0.0830 (0.0254)	0.0250 (0.043)	2.0 (32)	0.2 (837)	3.32 (0.585)
Insul Bd 2in (HF-B3)	2 in (3.1 cm)	0.1670 (0.0508)	0.0250 (0.043)	2.0 (32)	0.2 (837)	6.68 (1.177)
Insul Bd 3in (HF-B4)	3 in (7.6 cm)	0.2500 (0.0762)	0.0250 (0.043)	2.0 (32)	0.2 (837)	10.00 (1.762)
Insul Bd 1in (HF-B5)	1 in (2.5 cm)	0.0830 (0.0254)	0.0250 (0.043)	5.7 (91)	0.2 (837)	3.29 (0.580)
Insul Bd 2in (HF-B6)	2 in (3.1 cm)	0.1670 (0.0508)	0.0250 (0.043)	5.7 (91)	0.2 (837)	6.68 (1.177)
Insul Bd 3in (HF-B12)	3 in (7.6 cm)	0.2500 (0.0762)	0.0250 (0.043)	5.7 (91)	0.2 (837)	10.00 (1.762)
<b>Preformed Mineral Board</b>						
MinBd 7/8in R-3 (N21)	7/8 in (2.2 cm), R-3	0.0729 (0.0222)	0.0240 (0.042)	15.0 (240)	0.17 (711)	3.04 (0.536)
MinBd 1in R-3 (IN22)	1 in (2.5 cm), R-3.5	0.0833 (0.0254)	0.0240 (0.042)	15.0 (240)	0.17 (711)	3.47 (0.612)
MinBd 2in R-7 (IN23)	2 in (2.5 cm), R-7	0.1667 (0.0508)	0.0240 (0.042)	15.0 (240)	0.17 (711)	6.95 (1.225)
MinBd 3in R-10.4 (IN24)	3 in (7.6 cm), R-10.4	0.2500 (0.0762)	0.0240 (0.042)	15.0 (240)	0.17 (711)	10.42 (1.836)
<b>Polystyrene, Expanded</b>						
Polystyrene 1/2in (IN31)	1/2 in (1.3cm)	0.0417 (0.0127)	0.0200 (0.035)	1.8 (29)	0.29 (1213)	2.08 (0.367)
Polystyrene 3/4in (IN32)	3/4 in (1.9 cm)	0.0625 (0.0191)	0.0200 (0.035)	1.8 (29)	0.29 (1213)	3.12 (0.550)
Polystyrene 1in (IN33)	1 in (2.5 cm)	0.0833 (0.0254)	0.0200 (0.035)	1.8 (29)	0.29 (1213)	4.16 (0.733)

<b>Table 1 Insulating Materials</b>						
<b>Code-Word</b>	<b>Description</b>	<b>Thickness</b>	<b>Conductivity</b>	<b>Density</b>	<b>Specific Heat</b>	<b>Resistance</b>
		ft (m)	Btu/hr-ft <sup>2</sup> -F (W/m-K)	lb/ft <sup>3</sup> (kg/m <sup>3</sup> )	Btu/lb-F (kJ/kg-K)	hr-ft <sup>2</sup> -F/Btu (K-m <sup>2</sup> /W)
Polystyrene 1.25in (IN34)	1.25 in (3.2 cm)	0.1042 (0.0318)	0.0200 (0.035)	1.8 (29)	0.29 (1213)	5.21 (0.918)
Polystyrene 2in (IN35)	2 in (3.1 cm)	0.1667 (0.0508)	0.0200 (0.035)	1.8 (29)	0.29 (1213)	8.33 (1.468)
Polystyrene 3in (IN36)	3 in (7.6 cm)	0.2500 (0.0762)	0.0200 (0.035)	1.8 (29)	0.29 (1213)	12.50 (2.203)
Polystyrene 4in (IN37)	4 in (10.2 cm)	0.3333 (0.1016)	0.0200 (0.035)	1.8 (29)	0.29 (1213)	16.66 (2.936)
<b>Polyurethane, Expanded</b>						
Polyurethane 1/2in (IN41)	1/2 in (1.3cm)	0.0417 (0.0127)	0.0133 (0.023)	1.5 (24)	0.38 (1590)	3.14 (0.553)
Polyurethane 3/4in (IN42)	3/4 in (1.9 cm)	0.0625 (0.0191)	0.0133 (0.023)	1.5 (24)	0.38 (1590)	4.67 (0.823)
Polyurethane 1in (IN43)	1 in (2.5 cm)	0.0833 (0.0254)	0.0133 (0.023)	1.5 (24)	0.38 (1590)	6.26 (1.103)
Polyurethane 1.25in (IN44)	1.25 in (3.2 cm)	0.1042 (0.0318)	0.0133 (0.023)	1.5 (24)	0.38 (1590)	7.83 (1.380)
Polyurethane 2in (IN45)	2 in (3.1 cm)	0.1667 (0.0508)	0.0133 (0.023)	1.5 (24)	0.38 (1590)	12.53 (2.208)
Polyurethane 3in (IN46)	3 in (7.6 cm)	0.2500 (0.0762)	0.0133 (0.023)	1.5 (24)	0.38 (1590)	18.80 (3.313)
Polyurethane 4in (IN47)	4 in (10.2 cm)	0.3333 (0.1016)	0.0133 (0.023)	1.5 (24)	0.38 (1590)	25.06 (4.416)
* Nominal thickness is 2 to 2-3/4 in (3.1 to 7 cm). Resistance value is based on a thickness of 2.26 in (5.74 cm).						
<b>Urea Formaldehyde</b>						
Urea Formald 3.5in R19 (IN51)	3.5 in (8.9 cm), R-15	0.2910 (0.0887)	0.0200 (0.035)	0.7 (11)	0.3 (1255)	14.55 (2.564)
Urea Formald 5.5in R23 (IN52)	5.5 in (13.4 cm), R-23	0.4580 (0.1396)	0.0200 (0.035)	0.7 (11)	0.3 (1255)	22.90 (4.036)
<b>Insulation Board</b>						
Insul Bd 1/2in (IN61)	Sheathing, 1/2 in (1.3cm)	0.0417 (0.0127)	0.0316 (0.055)	18.0 (288)	0.31 (1297)	1.32 (0.232)
Insul Bd 3/4in (IN62)	Sheathing, 3/4 in (1.9 cm)	0.0625 (0.0191)	0.0316 (0.055)	18.0 (288)	0.31 (1297)	1.98 (0.348)
Insul Bd 3/8in (IN63)	Shingle Backer, 3/8 in (1 cm)	0.0313 (0.0096)	0.0331 (0.058)	18.0 (288)	0.31 (1297)	0.95 (0.167)
Insul Bd 1/2in (IN64)	Nail Base Sheathing, 1/2 in (1.3cm)	0.0417 (0.0127)	0.0366 (0.064)	25.0 (400)	0.31 (1297)	1.14 (0.200)
<b>Roof Insulation, Preformed</b>						
Roof Insul 1/2in (IN71)	1/2 in (1.3cm)	0.0417 (0.0127)	0.0300 (0.052)	16.0 (256)	0.2 (837)	1.39 (0.244)
Roof Insul 1in (IN72)	1 in (2.5 cm)	0.0833 (0.0254)	0.0300 (0.052)	16.0 (256)	0.2 (837)	2.78 (0.489)
Roof Insul 1.5in (IN73)	1.5 in (3.8 cm)	0.1250 (0.0381)	0.0300 (0.052)	16.0 (256)	0.2 (837)	4.17 (0.732)
Roof Insul 2in (IN74)	2 in (3.1 cm)	0.1667 (0.0508)	0.0300 (0.052)	16.0 (256)	0.2 (837)	5.56 (0.977)
Roof Insul 2.5in (IN75)	2.5 in (6.4 cm)	0.2083 (0.0635)	0.0300 (0.052)	16.0 (256)	0.2 (837)	6.94 (1.220)
Roof Insul 3in (IN76)	3 in (7.6 cm)	0.2500 (0.0762)	0.0300 (0.052)	16.0 (256)	0.2 (837)	8.33 (1.464)

**Air Spaces**

<b>Table 2 Air Spaces</b>						
<b>Code-Word</b>	<b>Description</b>	<b>Thickness</b>	<b>Conductivity</b>	<b>Density</b>	<b>Specific Heat</b>	<b>Resistance</b>
		ft (m)	Btu/hr-ft <sup>2</sup> -F (W/m-K)	lb/ft <sup>3</sup> (kg/m <sup>3</sup> )	Btu/lb-F (kJ/kg-K)	hr-ft <sup>2</sup> -F/Btu (K-m <sup>2</sup> /W)
<b>Air Layer, 3/4 in (1.9 cm) or less</b>						
Air Lay <3/4in Vert (AL11)	Vertical Walls					0.90 (0.158)
Air Lay <3/4in Slope (AL12)	Slope 45°					0.84 (0.148)
Air Lay <3/4in Horiz (AL13)	Horizontal Roofs					0.82 (0.144)
<b>Air Layer, 3/4 in to 4 in (1.9 cm to 10.2 cm)</b>						
Air Lay <4in Vert (AL21)	Vertical Walls					0.89 (0.156)
Air Lay <4in Slope (AL22)	Slope 45°					0.87 (0.152)
Air Lay <4in Horiz (AL23)	Horizontal Roofs					0.87 (0.152)
<b>Air Layer, 4 in (10.2 cm) or more</b>						
Air Lay >4in Vert (AL31)	Vertical Walls					0.92 (0.162)
Air Lay >4in Slope (AL32)	Slope 45°					0.89 (0.156)
Air Lay >4in Horiz (AL33)	Horizontal Roofs					0.92 (0.161)
* A more extensive list of data can be found in the 1993 ASHRAE Handbook of Fundamentals, Chap. 22, Table 2						

## CONSTRUCTION LAYERS LIBRARY

The following tables list the constructions in the Library. Three categories are given: (1) exterior walls, (2) roofs, and (3) interior walls.

The format of the tables is as follows. The first column gives the code-word that you use as the value of the LAYERS keyword in LAYERS keyword in a CONSTRUCTION command. The second column gives a description of the construction. The third column lists the materials that make up the construction. For example the construction "ASH Wall-1" contains the materials

HF-A2, HF-B3, HF-C2 and HF-E1, listed from outside to inside. These materials can be found in the "Materials Library" in this document. For example HF-A2 corresponds to the material with code-word "Face Brick 4in (HF-A2)." These materials can also be found in Table 11, Chapter 26 of *ASHRAE Handbook, 1989 Fundamentals*, American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc.

The constructions in the library are so-called "ASHRAE constructions." They are listed in Tables 13 and 18 of Chapter 26 of *ASHRAE Handbook, 1989 Fundamentals*.

Because the construction code-words contain blanks they must be enclosed in double quotes when used in your input. For example:

```
WALL-1 = CONSTRUCTION
      TYPE           = LAYERS
      LAYERS         = "ASH Wall-1"
      ..
```

## Exterior-Wall Constructions

**Table 3 Exterior-Wall Constructions**

LAYERS Code-word	Description	Materials (outside to inside)
ASH Wall-1	4 In. Face Brick, 2 In. Insulation, and 4 In. Light Wt. Concrete Block	HF-A2, HF-B3, HF-C2, HF-E1
ASH Wall-2	4 In. Light Weight Concrete	HF-C14, HF-E1
ASH Wall-3	4 In. Face Brick, Air Space and 8 In. Common Brick	HF-A2, HF-B1, HF-C9, HF-E1
ASH Wall-4	4 In. Face Brick, Air Space and 8 In. Heavy Wt. Concrete Block	HF-A2, HF-B1, HF-C8, HF-E1
ASH Wall-5	4 In. Face Brick, Air Space and 8 In. Light Weight Concrete Block	HF-A2, HF-B1, HF-C7, HF-E1
ASH Wall-6	4 In. Face Brick, Air Space and 8 In. Clay Tile	HF-A2, HF-B1, HF-C6, HF-E1
ASH Wall-7	4 In. Face Brick, Air Space and 2 In. Heavy Weight Concrete	HF-A2, HF-B1, HF-C12, HF-E1
ASH Wall-8	4 In. Face Brick, Air Space and 4 In. Common Brick	HF-A2, HF-B1, HF-C4, HF-E1
ASH Wall-9	4 In. Face Brick, Air Space and 4 In. Heavy Weight Concrete Block	HF-A2, HF-B1, HF-C3, HF-E1
ASH Wall-10	4 In. Face Brick, Air Space and 4 In. Light Weight Concrete Block	HF-A2, HF-B1, HF-C2, HF-E1
ASH Wall-11	12 In. Heavy Weight Concrete	HF-A1, HF-C11, HF-E1
ASH Wall-12	8 In. Heavy Weight Concrete with 2 In. Insulation	HF-A1, HF-C10, HF-B6, HF-E1
ASH Wall-13	8 In. Heavy Weight Concrete with 1 In. Insulation	HF-A1, HF-C10, HF-B5, HF-E1
ASH Wall-14	8 In. Heavy Weight Concrete with Air Space	HF-A1, HF-C10, HF-B1, HF-E1
ASH Wall-15	8 In. Heavy Weight Concrete	HF-A1, HF-C10, HF-E1
ASH Wall-16	4 In. Face Brick, 8 In. Common Brick with 1 In. Insulation	HF-A2, HF-C9, HF-B2, HF-E1
ASH Wall-17	4 In. Face Brick, 8 In. Common Brick with Air Space	HF-A2, HF-C9, HF-B1, HF-E1
ASH Wall-18	4 In. Face Brick, Air Space and 4 In. Light Weight Block	HF-A7, HF-B1, HF-C14
ASH Wall-19	Wall with 3 In. Fiberglass Insulation and Stucco Outside Finish	HF-A6, HF-B4, HF-A6
ASH Wall-20	Two-sided Brick Wall with Air Space	HF-A7, HF-B1, HF-A2
ASH Wall-21	Brick Wall, 8 In. Concrete Block and No Air Space	HF-A7, HF-C7, HF-A6
ASH Wall-22	Brick Wall with 4 In. Concrete Block	HF-A7, HF-B1, HF-C3, HF-A6
ASH Wall-23	Brick Wall with 8 In. Concrete Block	HF-A7, HF-B1, HF-C8, HF-A6
ASH Wall-24	Brick Wall with 6 In. Concrete	HF-A7, HF-B1, HF-C15, HF-A6
ASH Wall-25	Frame Wall with 2 In. Insulation and 4 In. Brick Veneer	HF-A7, HF-B6, HF-A6
ASH Wall-26	Frame Wall with 2 In. Insulation	HF-A6, HF-B6, HF-A6
ASH Wall-27	Metal Curtain Wall with 3 In. Insulation	HF-A3, HF-B12, HF-A3
ASH Wall-28	Metal Curtain Wall with 2 In. Insulation	HF-A3, HF-B6, HF-A3
ASH Wall-29	Metal Curtain Wall with 1 In. Insulation	HF-A3, HF-B5, HF-A3
ASH Wall-30	Wall 12 In. Concrete with 2 In. Insulation on the Outside	HF-A3, HF-B6, HF-C11, HF-A6
ASH Wall-31	Wall 8 In. Concrete with 2 In. Insulation on the Outside	HF-A3, HF-B6, HF-C10, HF-A6
ASH Wall-32	Wall 4 In. Concrete with 2 In. Insulation on the Outside	HF-A3, HF-B6, HF-C5, HF-A6
ASH Wall-33	Wall 12 In. Concrete with 2 In. Insulation on the Inside	HF-C11, HF-B6, HF-A6
ASH Wall-34	Wall 8 In. Concrete with 2 In. Insulation on the Inside	HF-C10, HF-B6, HF-A6
ASH Wall-35	Wall 4 In. Concrete with 2 In. Insulation on the Inside	HF-C5, HF-B6, HF-A6
ASH Wall-36	Frame Wall with 3 In. Insulation	HF-A1, HF-B1, HF-B4, HF-E1
ASH Wall-37	Frame Wall with 2 In. Insulation	HF-A1, HF-B1, HF-B3, HF-E1
ASH Wall-38	Frame Wall with 1 In. Insulation	HF-A1, HF-B1, HF-B2, HF-E1
ASH Wall-39	Frame Wall without Insulation	HF-A1, HF-B1, HF-E1
ASH Wall-40	2 In. Insulation with 12 In. Heavy Weight Concrete	HF-A1, HF-B3, HF-C11, HF-E1
ASH Wall-41	2 in. Insulation with 8 In. Heavy Weight Concrete	HF-A1, HF-B3, HF-C10, HF-E1
ASH Wall-42	2 In. Insulation with 8 In. Common Brick	HF-A1, HF-B3, HF-C9, HF-E1
ASH Wall-43	2 In. Insulation with 8 In. Heavy Weight Concrete Block	HF-A1, HF-B3, HF-C8, HF-E1
ASH Wall-44	2 In. Insulation with 8 In. Light Weight Concrete Block	HF-A1, HF-B3, HF-C7, HF-E1
ASH Wall-45	2 In. Insulation with 8 In. Clay Tile	HF-A1, HF-B3, HF-C6, HF-E1
ASH Wall-46	2 In. Insulation with 4 In. Heavy Weight Concrete	HF-A1, HF-B3, HF-C5, HF-E1
ASH Wall-47	2 In. Insulation with 4 In. Common Brick	HF-A1, HF-B3, HF-C4, HF-E1
ASH Wall-48	2 In. Insulation with 4 In. Heavy Weight Concrete Block	HF-A1, HF-B3, HF-C3, HF-E1
ASH Wall-49	2 In. Insulation with 4 In. Light Weight Concrete Block	HF-A1, HF-B3, HF-C2, HF-E1
ASH Wall-50	2 In. Insulation with 4 In. Clay Tile	HF-A1, HF-B3, HF-C1, HF-E1
ASH Wall-51	4 In. Face Brick, 2 In. Insulation and 12 In. Heavy Weight Concrete	HF-A2, HF-B3, HF-C11, HF-E1
ASH Wall-52	4 In. Face Brick, 2 In. Insulation and 8 In. Heavy Weight Concrete	HF-A2, HF-B3, HF-C10, HF-E1

**Table 3 Exterior-Wall Constructions**

<b>LAYERS Code-word</b>	<b>Description</b>	<b>Materials (outside to inside)</b>
ASH Wall-53	4 In. Face Brick, 2 In. Insulation and 8 In. Common Brick	HF-A2,HF-B3,HF-C9,HF-E1
ASH Wall-54	4 In. Face Brick, Air Space and 12 In. Heavy Weight Concrete	HF-A2,HF-B1,HF-C11,HF-E1
ASH Wall-55	4 In. Face Brick, Air Space and 8 In. Heavy Weight Concrete	HF-A2,HF-B1,HF-C10,HF-E1
ASH Wall-56	4 In. Face Brick, 2 In. Insulation and 8 In. Heavy Weight Concrete Block	HF-A2,HF-B3,HF-C8,HF-E1
ASH Wall-57	4 In. Face Brick, 2 In. Insulation and 8 In. Light Weight Concrete Block	HF-A2,HF-B3,HF-C7,HF-E1
ASH Wall-58	2 In. Face Brick, 2 In. Insulation and 8 In. Clay Tile	HF-A2,HF-B3,HF-C6,HF-E1
ASH Wall-59	4 In. Face Brick, 2 In. Insulation and 4 In. Heavy Weight Concrete	HF-A2,HF-B3,HF-C5,HF-E1
ASH Wall-60	4 In. Face Brick, 2 In. Insulation and 4 In. Common Brick	HF-A2,HF-B3,HF-C4,HF-E1
ASH Wall-61	4 In. Face Brick, 2 In. Insulation and 4 In. Heavy Weight Concrete Block	HF-A2,HF-B3,HF-C3,HF-E1
ASH Wall-62	4 In. Face Brick with 8 In. Common Brick	HF-A2,HF-C9,HF-E1
ASH Wall-63	8 In. Heavy Weight Concrete Block with 1 In. Insulation	HF-A1,HF-C8,HF-B2,HF-E1
ASH Wall-64	8 In. Heavy Weight Concrete Block	HF-A1,HF-C8,HF-E1
ASH Wall-65	8 In. Light Weight Concrete Block with Insulation	HF-A1,HF-C7,HF-B2,HF-E1
ASH Wall-66	8 In. Light Weight Concrete Block	HF-A1,HF-C7,HF-E1
ASH Wall-67	4 In. Face Brick, 8 In. Clay Tile and 1 In. Insulation	HF-A2,HF-C6,HF-B2,HF-E1
ASH Wall-68	4 In. Face Brick, 8 In. ClayTile and Air Space	HF-A2,HF-C6,HF-B1,HF-E1
ASH Wall-69	4 In. Face Brick with 8 In. Clay Tile	HF-A2,HF-C6,HF-E1
ASH Wall-70	8 In. Clay Tile with 1 In. Insulation	HF-A1,HF-C6,HF-B2,HF-E1
ASH Wall-71	8 In. Clay Tile with Air Space	HF-A1,HF-C6,HF-B1,HF-E1
ASH Wall-72	8 In. Clay Tile	HF-A1,HF-C6,HF-E1
ASH Wall-73	4 In. Heavy Weight Concrete with 2 In. Insulation	HF-A1,HF-C5,HF-B3,HF-E1
ASH Wall-74	4 In. Heavy Weight Concrete with 1 In. Insulation	HF-A1,HF-C5,HF-B2,HF-E1
ASH Wall-75	4 In. Heavy Weight Concrete with Air Space	HF-A1,HF-C5,HF-B1,HF-E1
ASH Wall-76	4 In. Heavy Weight Concrete	HF-A1,HF-C5,HF-E1
ASH Wall-77	4 In. Face Brick, 4 In. Common Brick and 1 In. Insulation	HF-A2,HF-C4,HF-B2,HF-E1
ASH Wall-78	4 In. Face Brick, 4 In. Common Brick and Air Space	HF-A2,HF-C4,HF-B1,HF-E1
ASH Wall-79	4 In. Face Brick with 4 In. Common Brick	HF-A2,HF-C4,HF-E1
ASH Wall-80	4 In. Common Brick	HF-A1,HF-C4,HF-E1
ASH Wall-81	4 In. Heavy Weight Concrete Block	HF-A1,HF-C3,HF-E1
ASH Wall-82	4 In. Face Brick, 4 In. Light Wt. Concrete Block and 1 In. Insulation	HF-A2,HF-C2,HF-B2,HF-E1
ASH Wall-83	4 In. Face Brick, 4 In. Light Wt. Concrete Block and Air Space	HF-A2,HF-C2,HF-B1,HF-E1
ASH Wall-84	4 In. Face Brick with 4 In. Light Weight Concrete Block	HF-A2,HF-C2,HF-E1
ASH Wall-85	4 In. Light Weight Concrete Block and 1 In. Insulation	HF-A1,HF-C2,HF-B2,HF-E1
ASH Wall-86	4 In. Light Weight Concrete Block and Air Space	HF-A1,HF-C2,HF-B1,HF-E1
ASH Wall-87	4 In. Light Weight ConcreteBlock	HF-A1,HF-C2,HF-E1
ASH Wall-88	4 In. Face Brick, 4 In. Clay Tile and 1 In. Insulation	HF-A2,HF-C1,HF-B2,HF-E1
ASH Wall-89	4 In. Face Brick, 4 In. Clay Tile and Air Space	HF-A2,HF-C1,HF-B1,HF-E1
ASH Wall-90	4 In. Face Brick and 4 In. Clay Tile	HF-A2,HF-C1,HF-E1
ASH Wall-91	4 In. Clay Tile and 1 In. Insulation	HF-A1,HF-C1,HF-B2,HF-E1
ASH Wall-92	4 In. Clay Tile and Air Space	HF-A1,HF-C1,HF-B1,HF-E1
ASH Wall-93	4 In. Clay Tile	HF-A1,HF-C1,HF-E1
ASH Wall-94	Sheet Metal with 1 In. Insulation	HF-A3,HF-B2,HF-B1,HF-A3
ASH Wall-95	Sheet Metal with 2 In. Insulation	HF-A3,HF-B3,HF-B1,HF-A3
ASH Wall-96	Sheet Metal with 3 In. Insulation	HF-A3,HF-B4,HF-B1,HF-A3

## Roof Constructions

**Table 4 Roof Constructions**

LAYERS Code-word	Description	Materials (outside to inside)
ASH Roof-1	Roof Terrace System	HF-C12, HF-B1, HF-B6, HF-E2, HF-E3, HF-C5, HF-E4, HF-E5
ASH Roof-2	4 In. Wood with 2 In. Insulation	HF-E2, HF-E3, HF-B6, HF-B9, HF-E4, HF-E5
ASH Roof-3	2.5 In. Wood with 2 In. Insulation	HF-E2, HF-E3, HF-B6, HF-B8, HF-E4, HF-E5
ASH Roof-4	4 In. Wood with 2 In. Insulation	HF-E2, HF-E3, HF-B6, HF-B7, HF-E4, HF-E5
ASH Roof-5	4 In. Wood with 1 In. Insulation	HF-E2, HF-E3, HF-B5, HF-B9, HF-E4, HF-E5
ASH Roof-6	2.5 In. Wood with 1 In. Insulation	HF-E2, HF-E3, HF-B5, HF-B8, HF-E4, HF-E5
ASH Roof-7	1 In. Wood with 1 In. Insulation	HF-E2, HF-E3, HF-B5, HF-B7, HF-E4, HF-E5
ASH Roof-8	8 In. Light Weight Concrete	HF-E2, HF-E3, HF-C16, HF-E4, HF-E5
ASH Roof-9	6 In. Light Weight Concrete	HF-E2, HF-E3, HF-C15, HF-E4, HF-E5
ASH Roof-10	4 In. Light Weight Concrete	HF-E2, HF-E3, HF-C14, HF-E4, HF-E5
ASH Roof-11	6 In. Heavy Weight Concrete with 2 In. Insulation	HF-E2, HF-E3, HF-B6, HF-C13, HF-E4, HF-E5
ASH Roof-12	4 In. Heavy Weight Concrete with 2 In. Insulation	HF-E2, HF-E3, HF-B6, HF-C5, HF-E4, HF-E5
ASH Roof-13	2 In. Heavy Weight Concrete with 2 In. Insulation	HF-E2, HF-E3, HF-B6, HF-C12, HF-E4, HF-E5
ASH Roof-14	6 In. Heavy Weight Concrete with 1 In. Insulation	HF-E2, HF-E3, HF-B5, HF-C13, HF-E4, HF-E5
ASH Roof-15	4 In. Heavy Weight Concrete with 1 In. Insulation	HF-E2, HF-E3, HF-B5, HF-C5, HF-E4, HF-E5
ASH Roof-16	2 In. Heavy Weight Concrete with 1 In. Insulation	HF-E2, HF-E3, HF-B5, HF-C12, HF-E4, HF-E5
ASH Roof-17	Steel Sheet with 2 In. Insulation	HF-E2, HF-E3, HF-B6, HF-A3, HF-E4, HF-E5
ASH Roof-18	Steel Sheet with 1 In. Insulation	HF-E2, HF-E3, HF-B5, HF-A3, HF-E4, HF-E5
ASH Roof-19	Roof Terrace System	HF-C12, HF-B1, HF-B6, HF-E2, HF-E3, HF-C5
ASH Roof-20	4 In. Wood with 2 In. Insulation	HF-E2, HF-E3, HF-B6, HF-B9
ASH Roof-21	2.5 In. Wood with 2 In. Insulation	HF-E2, HF-E3, HF-B6, HF-B8
ASH Roof-22	1 In. Wood with 2 In. Insulation	HF-E2, HF-E3, HF-B6, HF-B7
ASH Roof-23	4 In. Wood with 1 In. Insulation	HF-E2, HF-E3, HF-B5, HF-B9
ASH Roof-24	2.5 In. Wood with 1 In. Insulation	HF-E2, HF-E3, HF-B5, HF-B8
ASH Roof-25	1 In. Wood with 1 In. Insulation	HF-E2, HF-E3, HF-B5, HF-B7
ASH Roof-26	8 In. Light Weight Concrete	HF-E2, HF-E3, HF-C16
ASH Roof-27	6 In. Light Weight Concrete	HF-E2, HF-E3, HF-C15
ASH Roof-28	4 In. Light Weight Concrete	HF-E2, HF-E3, HF-C14
ASH Roof-29	6 In. Heavy Weight Concrete with 2 In. Insulation	HF-E2, HF-E3, HF-B6, HF-C13
ASH Roof-30	4 In. Heavy Weight Concrete with 2 In. Insulation	HF-E2, HF-E3, HF-B6, HF-C5
ASH Roof-31	2 In. Heavy Weight Concrete with 2 In. Insulation	HF-E2, HF-E3, HF-B6, HF-C12
ASH Roof-32	6 In. Heavy Weight Concrete with 1 In. Insulation	HF-E2, HF-E3, HF-B5, HF-C13
ASH Roof-33	4 In. Heavy Weight Concrete with 1 In. Insulation	HF-E2, HF-E3, HF-B5, HF-C5
ASH Roof-34	2 In. Heavy Weight Concrete with 1 In. Insulation	HF-E2, HF-E3, HF-B5, HF-C12
ASH Roof-35	Steel Sheet with 2 In. Insulation	HF-E2, HF-E3, HF-B6, HF-A3
ASH Roof-36	Steel Sheet with 1 In. Insulation	HF-E2, HF-E3, HF-B5, HF-A3

## Interior-Wall Constructions

**Table 5 Interior-Wall Constructions**

<b>LAYERS Code-word</b>	<b>Description</b>	<b>Materials (outside to inside)</b>
ASH Int Wall-1	4 In. Clay Tile with 0.75 In. Plaster	HF-E1, HF-C1, HF-E1
ASH Int Wall-2	4 In. Light Weight Concrete Block with 0.75 In. Plaster	HF-E1, HF-C2, HF-E1
ASH Int Wall-3	4 In. Heavy Weight Concrete Block with 0.75 In. Plaster	HF-E1, HF-C3, HF-E1
ASH Int Wall-4	4 In. Common Brick with 0.75 In. Plaster	HF-E1, HF-C4, HF-E1
ASH Int Wall-5	4 In. Heavy Weight Concrete with 0.75 In. Plaster	HF-E1, HF-C5, HF-E1
ASH Int Wall-6	5 In. Clay Tile with 0.75 In. Plaster	HF-E1, HF-C6, HF-E1
ASH Int Wall-7	8 In. Light Weight Concrete Block, Plastered Both Sides	HF-E1, HF-C7, HF-E1
ASH Int Wall-8	8 In. Heavy Weight Concrete Block, Plastered Both Sides	HF-E1, HF-C8, HF-E1
ASH Int Wall-9	8 In. Common Brick, Plastered Both Sides	HF-E1, HF-C9, HF-E1
ASH Int Wall-10	8 In. Heavy Concrete, Plastered Both Sides	HF-E1, HF-C10, HF-E1
ASH Int Wall-11	12 In. Heavy Concrete, Plastered Both Sides	HF-E1, HF-C11, HF-E1
ASH Int Wall-12	4 In. Clay Tile	HF-C1
ASH Int Wall-13	4 In. Light Weight Concrete Block	HF-C2
ASH Int Wall-14	4 In. Heavy Weight Concrete Block	HF-C3
ASH Int Wall-15	4 In. Common Brick	HF-C4
ASH Int Wall-16	4 In. Heavy Weight Concrete	HF-C5
ASH Int Wall-17	8 In. Clay Tile	HF-C6
ASH Int Wall-18	8 In. Light Weight Concrete Block	HF-C7
ASH Int Wall-19	8 In. Heavy Weight Concrete Block	HF-C8
ASH Int Wall-20	8 In. Common Brick	HF-C9
ASH Int Wall-21	8 In. Heavy Weight Concrete	HF-C10
ASH Int Wall-22	12 In. Heavy Weight Concrete	HF-C11
ASH Int Wall-23	Frame Partition with 0.75 In. Gypsum Board	HF-E1, HF-B1, HF-E1
ASH Int Wall-24	1 In. Wood	HF-B7
ASH Int Wall-25	2 In. Wood	HF-B10
ASH Int Wall-26	3 In. Wood	HF-B11
ASH Int Wall-27	4 In. Wood	HF-B9
ASH Int Wall-28	Frame Partition with 1 In. Wood	HF-B7, HF-B1, HF-B7
ASH Int Wall-29	2 In. Furniture	HF-B10, HF-B1, HF-B10
ASH Int Wall-30	3 In. Furniture	HF-B11, HF-B1, HF-B11
ASH Int Wall-31	2 In. Heavy Weight Concrete Floor Deck	HF-C12
ASH Int Wall-32	4 In. Heavy Weight Concrete Floor Deck	HF-C5
ASH Int Wall-33	2 In. Light Weight Concrete Floor Deck	HF-C5
ASH Int Wall-34	8 In. Heavy Weight Concrete Floor Deck	HF-C10
ASH Int Wall-35	8 In. Light Weight Concrete Floor Deck	HF-C7
ASH Int Wall-36	2 In. Wood Deck	HF-B10
ASH Int Wall-37	3 In. Wood Deck	HF-B11
ASH Int Wall-38	2 In. Heavy Weight Concrete Deck with False Ceiling	HF-C10, HF-E4, HF-E5
ASH Int Wall-39	4 In. Heavy Weight Concrete Deck with False Ceiling	HF-C5, HF-E4, HF-E5
ASH Int Wall-40	4 In. Light Weight Concrete Deck with False Ceiling	HF-C2, HF-E4, HF-E5
ASH Int Wall-41	8 In. Heavy Weight Concrete Deck with False Ceiling	HF-C10, HF-E4, HF-E5
ASH Int Wall-42	8 In. Light Weight Concrete Deck with False Ceiling	HF-C7, HF-E4, HF-E5
ASH Int Wall-43	2 In. Wood Deck with False Ceiling	HF-B10, HF-E4, HF-E5
ASH Int Wall-44	3 In. Wood Deck with False Ceiling	HF-B11, HF-E4, HF-E5
ASH Int Wall-45	12 In. Heavy Weight Concrete Deck with False Ceiling	HF-C11, HF-E4, HF-E5
ASH Int Wall-46	4 In. Wood Deck with False Ceiling	HF-B9, HF-E4, HF-E5
ASH Int Wall-47	Steel Deck with False Ceiling	HF-A3, HF-E4, HF-E5



## WINDOW LIBRARY

This section summarizes the available glazings in the window library. Single-pane entries are given first, followed by double-, triple-, and quadruple-pane. For a given number of panes, clear and low-iron glazings are given first, followed by tinted, reflective, low-E, and electrochromic options.

You can find the best GLASS-TYPE-CODE for a particular glazing product by matching the number of panes, glass thickness, gap width, tint, coating, and gas fill from the manufacturer's data sheet with the corresponding information in Table 6. Manufacturer's values for shading coefficient, transmittance, and reflectance can be used to check your selection. If you can't find a good match, you can create your own glazing layer-by-layer using the Window Layer Method.

The terminology used in the glazing descriptions is as follows:

**Table 7 Library Terminology**

Term	Description
Clear:	No impurities added to the glass mix.
Low Iron:	Clear glass with a low iron content, resulting in higher transmittance.
Tint:	Outer pane is tinted with inorganic materials to increase absorption in certain areas of the visible spectrum in order to produce a certain color.
Ref:	Reflective; i.e., a metallic coating is applied to one surface of a pane in order to increase solar reflection. Ref-A refers to stainless steel coatings, Ref-B to titanium, Ref-C to pewter, and Ref-D to tin-oxide. L, M, and H used with Clear and Tint refer to low, medium, and high transmittance coating, respectively.
Low-E:	A low emissivity metallic coating is applied in order to increase thermal IR reflectance. The coated surface is indicated by $en = v$ , where $n = 1$ is the outside of the outer pane, $n = 2$ is the inside of the outer pane, etc., and $v$ is the emissivity (see, for example, G-T-C = 2635, where $e2 = 0.1$ indicates a coating with an emissivity of 0.1 on surface #2).
Film:	A polyester film (with low-E coating) stretched between glass panes. The approximate visible transmittance of the film (in percent) is shown as (nn); see, for example, G-T-C = 3641.
Electrochromic:	A coating that makes the glazing more absorbing or more reflecting as the voltage applied to glazing changes.
Bleached:	The clearest state of electrochromic glass.
Colored:	The darkest state of electrochromic glass.

Table 8 Column Headings in Glazing Table

Heading	Description
G-T-C:	The GLASS-TYPE-CODE. The first digit is the number of panes. The second digit is 0 for clear or low-iron; 2 for tinted but no coating; 4 for reflective coating with clear or tinted glass; 6 for low-E coating on clear or tinted glass, and 8 for electrochromic glass.
U-SI:	Center-of-glass U-value in SI units (W/m <sup>2</sup> -K) for ASHRAE winter conditions [-17.8C (0F) outside temperature, 21.1C (70F) inside temperature, 6.71 m/s (15 mph) windspeed and zero incident solar radiation]. The program calculates the overall conductance of a window as the area-weighted average of the center-of-glass U-value, the edge-of-glass U-value and the frame U-value. The center-of-glass U-value includes a combined convective plus radiative outside air film conductance of 28.7 W/m <sup>2</sup> -K.
U-IP:	Center-of-glass U-value in inch-pound units (Btu/ft <sup>2</sup> -h-F) for ASHRAE winter conditions. Includes a combined convective plus radiative outside air film conductance of 5.0 Btu/ft <sup>2</sup> -h-F.
SC:	Center-of-glass ASHRAE shading coefficient for ASHRAE summer conditions [35C (95F) outside temperature, 24C (75F) inside temperature, 3.3 m/s (7.5 mph) windspeed, and near-normal incident solar radiation of 783 W/m <sup>2</sup> (248 Btu/h-ft <sup>2</sup> )].
SHGC:	Center-of-glass solar heat gain coefficient at near normal incidence for ASHRAE summer conditions.
Tsol:	Center-of-glass solar transmittance for all glazing layers, at normal incidence.
Rfsol:	Center-of-glass solar reflectance for all glazing layers for radiation incident from the front at normal incidence.
Tvis:	Center-of-glass visible transmittance for all glazing layers, at normal incidence.
Rfvis:	Center-of-glass visible reflectance for all glazing layers for radiation incident from the front at normal incidence.
Pane #n ID:	Identification number of the nth solid layer (pane) in the glazing assembly. The panes are numbered from the outdoor side of the window to the room side. (For windows in an interior wall between a sunspace and adjacent room, the "outdoor" side is the sunspace side.) The properties of this layer are given in the "Glass Layers Library" in this document. Although called the "Window Layer Library", some of the entries are for plastic films. (This library was used with WINDOW-4 to create the Window Library.)
Pane #n Wid:	Thickness of the nth pane (mm).
GAP #n Gas:	Type of gas (air, argon, etc.) in the nth gap. Gaps are numbered from the outdoor side of the window to the room side.
Gap #n Wid:	Thickness of the nth gap (mm).

## **Legacy DOE-2 Window Library**

The Following tables 9-15 contain the legacy version of the DOE-2 Window Library as it was previously published for DOE-2.1E and DOE-2.2 prior to version 44d.

Table 6 Windows - Single Glazing

G-T-C	U-SI	U-IP	SC	SHGC	Tsol	Rfsol	Tvis	Rfvis	Pane #1	
									Id	Wid
Single Clear										
1000	6.31	1.11	1.00	.86	.84	.08	.90	.08	2	3.0
1001	6.17	1.09	.95	.81	.77	.07	.88	.08	3	6.0
Single Low Iron										
1002	6.31	1.11	1.05	.90	.90	.08	.91	.08	14	3.0
1003	6.22	1.10	1.04	.90	.89	.08	.91	.08	16	5.0
Single Tint Bronze										
1200	6.31	1.11	.84	.73	.64	.06	.69	.06	5	3.0
1201	6.17	1.09	.71	.61	.48	.05	.53	.06	6	6.0
Single Tint Green										
1202	6.31	1.11	.83	.72	.63	.06	.82	.08	11	3.0
1203	6.17	1.09	.71	.61	.49	.06	.75	.07	12	6.0
Single Tint Grey										
1204	6.31	1.11	.83	.71	.63	.06	.61	.06	8	3.0
1205	6.17	1.09	.69	.59	.46	.05	.43	.05	9	6.0
Single Tint Blue										
1206	6.17	1.09	.71	.61	.48	.05	.57	.06	17	6.0
Single Ref-A Clear-L										
1400	4.90	.86	.23	.19	.07	.34	.08	.41	200	6.0
Single Ref-A Clear-L										
1401	5.11	.90	.29	.25	.11	.27	.14	.31	201	6.0
Single Ref-A Clear-L										
1402	5.41	.95	.36	.31	.16	.22	.20	.25	202	6.0
Single Ref-A Tint-L										
1403	4.93	.87	.26	.22	.04	.15	.05	.17	210	6.0
Single Ref-A Tint-M										
1404	5.11	.90	.29	.25	.06	.13	.09	.14	211	6.0
Single Ref-A Tint-H										
1405	5.29	.93	.34	.29	.10	.11	.10	.11	212	6.0
Single Ref-B Clear-L										
1406	5.44	.96	.35	.31	.15	.22	.20	.23	220	6.0
Single Ref-B Clear-H										
1407	5.50	.97	.45	.39	.24	.16	.30	.16	221	6.0
Single Ref-B Tint-L										
1408	4.93	.87	.26	.23	.04	.13	.05	.09	230	6.0
Single Ref-B Tint-M										
1409	5.05	.89	.33	.28	.10	.11	.13	.10	231	6.0
Single Ref-B Tint-H										
1410	5.50	.97	.40	.34	.15	.09	.18	.08	232	6.0
Single Ref-C Clear-L										
1411	4.99	.88	.29	.25	.11	.25	.13	.28	240	6.0
Single Ref-C Clear-M										
1412	5.23	.92	.37	.32	.17	.20	.19	.21	241	6.0
Single Ref-C Clear-H										
1413	5.35	.94	.41	.35	.20	.16	.22	.17	242	6.0
Single Ref-C Tint-L										
1414	4.99	.88	.29	.25	.07	.13	.08	.13	250	6.0
Single Ref-C Tint-M										
1415	5.23	.92	.34	.29	.10	.10	.11	.10	251	6.0
Single Ref-C Tint-H										
1416	5.35	.94	.37	.31	.12	.09	.13	.09	252	6.0
Single Ref-D Clear										
1417	6.12	1.08	.58	.50	.43	.31	.33	.45	260	6.0
Single Ref-D Tint										
1418	6.12	1.08	.53	.46	.30	.14	.25	.18	270	6.0
Single Low-E Clear (e2=.4)										
1600	4.99	.88	.91	.78	.75	.10	.85	.12	300	3.0
Single Low-E Clear (e2=.2)										

Pane #1										
G-T-C	U-SI	U-IP	SC	SHGC	Tsol	Rfsol	Tvis	Rfvis	Id	Wid
1601	4.34	.76	.89	.77	.74	.09	.82	.11	350	3.0
1602	4.27	.75	.84	.72	.68	.09	.81	.11	351	6.0
Single Electrochromic Absorbing Bleached/Colored										
1800	6.17	1.09	.98	.84	.81	.09	.85	.10	700	6.0
1801	6.17	1.09	.36	.31	.11	.18	.13	.08	701	6.0
Single Electrochromic Reflecting Bleached/Colored										
1802	6.17	1.09	.85	.73	.69	.17	.82	.11	702	6.0
1803	6.17	1.09	.34	.29	.10	.22	.16	.07	703	6.0

Table 7 Windows - Double Glazed

Pane #1											Gap #1		Pane #2	
G-T-C	U-SI	U-IP	SC	SHGC	Tsol	Rfsol	Tvis	Rfvis	Id	Wid	Gas	Wid	Id	Wid
Double Clear														
2000	3.23	.57	.88	.76	.70	.13	.81	.15	2	3.0	Air	6.3	2	3.0
2001	2.79	.49	.89	.76	.70	.13	.81	.15	2	3.0	Air	12.7	2	3.0
2002	2.61	.46	.89	.76	.70	.13	.81	.15	2	3.0	Arg	12.7	2	3.0
2003	3.16	.56	.81	.69	.60	.11	.78	.14	3	6.0	Air	6.3	3	6.0
2004	2.74	.48	.81	.70	.60	.11	.78	.14	3	6.0	Air	12.7	3	6.0
2005	2.56	.45	.81	.70	.60	.11	.78	.14	3	6.0	Arg	12.7	3	6.0
Double Low Iron														
2006	3.23	.57	.96	.83	.81	.14	.84	.15	14	3.0	Air	6.3	14	3.0
2007	2.79	.49	.96	.83	.81	.14	.84	.15	14	3.0	Air	12.7	14	3.0
2008	2.61	.46	.96	.83	.81	.14	.84	.15	14	3.0	Arg	12.7	14	3.0
2009	3.18	.56	.95	.82	.80	.14	.83	.15	16	5	Air	6.3	16	5.0
2010	2.76	.49	.95	.82	.80	.14	.83	.15	16	5	Air	12.7	16	5.0
2011	2.58	.45	.95	.82	.80	.14	.83	.15	16	5	Arg	12.7	16	5.0
Double Tint Bronze														
2200	3.23	.57	.72	.62	.54	.09	.62	.10	5	3.0	Air	6.3	2	3.0
2201	2.79	.49	.72	.62	.54	.09	.62	.10	5	3.0	Air	12.7	2	3.0
2202	2.61	.46	.72	.62	.54	.09	.62	.10	5	3.0	Arg	12.7	2	3.0
2203	3.16	.56	.57	.49	.38	.07	.47	.08	6	6.0	Air	6.3	3	6.0
2204	2.74	.48	.57	.49	.38	.07	.47	.08	6	6.0	Air	12.7	3	6.0
2205	2.56	.45	.56	.49	.38	.07	.47	.08	6	6.0	Arg	12.7	3	6.0
Double Tint Green														
2206	3.23	.57	.72	.62	.53	.09	.74	.13	11	3.0	Air	6.3	2	3.0
2207	2.79	.49	.71	.61	.53	.09	.74	.13	11	3.0	Air	12.7	2	3.0
2208	2.61	.46	.71	.61	.53	.09	.74	.13	11	3.0	Arg	12.7	2	3.0
2209	3.16	.56	.58	.50	.38	.07	.66	.12	12	6.0	Air	6.3	3	6.0
2210	2.74	.48	.57	.49	.38	.07	.66	.12	12	6.0	Air	12.7	3	6.0
2211	2.56	.45	.57	.49	.38	.07	.66	.12	12	6.0	Arg	12.7	3	6.0
Double Tint Grey														
2212	3.23	.57	.71	.61	.53	.09	.55	.09	8	3.0	Air	6.3	2	3.0
2213	2.79	.49	.71	.61	.53	.09	.55	.09	8	3.0	Air	12.7	2	3.0
2214	2.61	.46	.70	.61	.53	.09	.55	.09	8	3.0	Arg	12.7	2	3.0
2215	3.16	.56	.55	.47	.35	.07	.38	.07	9	6.0	Air	6.3	3	6.0
2216	2.74	.48	.54	.47	.35	.07	.38	.07	9	6.0	Air	12.7	3	6.0
2217	2.56	.45	.54	.47	.35	.07	.38	.07	9	6.0	Arg	12.7	3	6.0
Double Tint Blue														
2218	3.16	.56	.57	.49	.37	.07	.50	.09	17	6.0	Air	6.3	3	6.0
2219	2.74	.48	.57	.49	.37	.07	.50	.09	17	6.0	Air	12.7	3	6.0
2220	2.56	.45	.56	.49	.37	.07	.50	.09	17	6.0	Arg	12.7	3	6.0

Table 8 Windows - Reflective Glazing

G-T-C	U-SI	U-IP	SC	SHGC	Tsol	Rfsol	Tvis	Rfvis	Pane #1		Gap #1		Pane #2		
									Id	Wid	Gas	Wid	Id	Wid	
Double Ref-A Clear-L															
2400	2.79	.49	.17	.14	.05	.34	.07	.41	200	6.0	Air	6.3	3	6.0	
2401	2.26	.40	.15	.13	.05	.34	.07	.41	200	6.0	Air	12.7	3	6.0	
2402	2.02	.36	.14	.12	.05	.34	.07	.41	200	6.0	Arg	12.7	3	6.0	
Double Ref-A Clear-M															
2403	2.86	.50	.22	.19	.09	.27	.13	.31	201	6.0	Air	6.3	3	6.0	
2404	2.35	.41	.20	.17	.09	.27	.13	.31	201	6.0	Air	12.7	3	6.0	
2405	2.13	.38	.20	.17	.09	.27	.13	.31	201	6.0	Arg	12.7	3	6.0	
Double Ref-A Clear-H															
2406	2.95	.52	.27	.23	.13	.22	.18	.25	202	6.0	Air	6.3	3	6.0	
2407	2.47	.44	.26	.22	.13	.22	.18	.25	202	6.0	Air	12.7	3	6.0	
2408	2.26	.40	.25	.22	.13	.22	.18	.25	202	6.0	Arg	12.7	3	6.0	
Double Ref-A Tint-L															
2410	2.80	.49	.18	.15	.03	.15	.05	.17	210	6.0	Air	6.3	3	6.0	
2411	2.27	.40	.15	.13	.03	.15	.05	.17	210	6.0	Air	12.7	3	6.0	
2412	2.04	.36	.15	.13	.03	.15	.05	.17	210	6.0	Arg	12.7	3	6.0	
Double Ref-A Tint-M															
2413	2.86	.50	.20	.17	.05	.13	.08	.14	211	6.0	Air	6.3	3	6.0	
2414	2.35	.41	.18	.15	.05	.13	.08	.14	211	6.0	Air	12.7	3	6.0	
2415	2.13	.38	.17	.15	.05	.13	.08	.14	211	6.0	Arg	12.7	3	6.0	
Double Ref-A Tint-H															
2416	2.92	.51	.24	.21	.08	.11	.09	.11	212	6.0	Air	6.3	3	6.0	
2417	2.42	.43	.22	.19	.08	.11	.09	.11	212	6.0	Air	12.7	3	6.0	
2418	2.21	.39	.21	.19	.08	.11	.09	.11	212	6.0	Arg	12.7	3	6.0	
Double Ref-B Clear-L															
2420	2.96	.52	.27	.23	.12	.22	.18	.23	220	6.0	Air	6.3	3	6.0	
2421	2.48	.44	.25	.22	.12	.22	.18	.23	220	6.0	Air	12.7	3	6.0	
2422	2.27	.40	.25	.21	.12	.22	.18	.23	220	6.0	Arg	12.7	3	6.0	
Double Ref-B Clear-H															
2426	2.98	.53	.35	.30	.19	.16	.27	.17	221	6.0	Air	6.3	3	6.0	
2427	2.50	.44	.34	.29	.19	.16	.27	.17	221	6.0	Air	12.7	3	6.0	
2428	2.30	.41	.34	.29	.19	.16	.27	.17	221	6.0	Arg	12.7	3	6.0	
Double Ref-B Tint-L															
2430	2.80	.49	.18	.15	.03	.13	.05	.09	230	6.0	Air	6.3	3	6.0	
2431	2.27	.40	.16	.14	.03	.13	.05	.09	230	6.0	Air	12.7	3	6.0	
2432	2.04	.36	.15	.13	.03	.13	.05	.09	230	6.0	Arg	12.7	3	6.0	
Double Ref-B Tint-M															
2433	2.84	.50	.24	.20	.08	.11	.12	.10	231	6.0	Air	6.3	3	6.0	
2434	2.33	.41	.22	.19	.08	.11	.12	.10	231	6.0	Air	12.7	3	6.0	
2435	2.10	.37	.21	.18	.08	.11	.12	.10	231	6.0	Arg	12.7	3	6.0	
Double Ref-B Tint-H															
2436	2.98	.53	.29	.25	.12	.09	.16	.08	232	6.0	Air	6.3	3	6.0	
2437	2.50	.44	.27	.23	.12	.09	.16	.08	232	6.0	Air	12.7	3	6.0	
2438	2.30	.41	.27	.23	.12	.09	.16	.08	232	6.0	Arg	12.7	3	6.0	
Double Ref-C Clear-L															
2440	2.82	.50	.22	.19	.09	.25	.12	.28	240	6.0	Air	6.3	3	6.0	
2441	2.30	.41	.20	.18	.09	.25	.12	.28	240	6.0	Air	12.7	3	6.0	
2442	2.07	.36	.20	.17	.09	.25	.12	.28	240	6.0	Arg	12.7	3	6.0	
Double Ref-C Clear-M															
2443	2.90	.51	.28	.24	.14	.20	.17	.21	241	6.0	Air	6.3	3	6.0	
2444	2.40	.42	.27	.23	.14	.20	.17	.21	241	6.0	Air	12.7	3	6.0	
2445	2.18	.38	.26	.23	.14	.20	.17	.21	241	6.0	Arg	12.7	3	6.0	
Double Ref-C Clear-H															
2446	2.94	.52	.32	.27	.16	.16	.20	.17	242	6.0	Air	6.3	3	6.0	
2447	2.45	.43	.30	.26	.16	.16	.20	.17	242	6.0	Air	12.7	3	6.0	
2448	2.23	.39	.30	.26	.16	.16	.20	.17	242	6.0	Arg	12.7	3	6.0	
Double Ref-C Tint-L															
2450	2.82	.50	.21	.18	.06	.13	.07	.13	250	6.0	Air	6.3	3	6.0	
2451	2.30	.41	.19	.16	.06	.13	.07	.13	250	6.0	Air	12.7	3	6.0	

G-T-C	U-SI	U-IP	SC	SHGC	Tsol	Rfsol	Tvis	Rfvis	Pane #1 Gap #1		Pane #2		Id	Wid
									Id	Wid	Gas	Wid		
2452	2.07	.36	.18	.15	.06	.13	.07	.13	250	6.0	Arg	12.7	3	6.0
Double Ref-C Tint-M														
2453	2.90	.51	.24	.21	.08	.10	.10	.10	251	6.0	Air	6.3	3	6.0
2454	2.40	.42	.22	.19	.08	.10	.10	.10	251	6.0	Air	12.7	3	6.0
2455	2.18	.38	.21	.19	.08	.10	.10	.10	251	6.0	Arg	12.7	3	6.0
Double Ref-D Tint-H														
2456	2.94	.52	.26	.23	.10	.09	.12	.09	252	6.0	Air	6.3	3	6.0
2457	2.45	.43	.24	.21	.10	.09	.12	.09	252	6.0	Air	12.7	3	6.0
2458	2.23	.39	.24	.20	.10	.09	.12	.09	252	6.0	Arg	12.7	3	6.0
Double Ref-D Clear														
2460	3.15	.56	.49	.42	.34	.32	.31	.46	260	6.0	Air	6.3	3	6.0
2461	2.72	.48	.49	.42	.34	.32	.31	.46	260	6.0	Air	12.7	3	6.0
2462	2.54	.45	.49	.42	.34	.32	.31	.46	260	6.0	Arg	12.7	3	6.0
Double Ref-D Tint														
2470	3.15	.56	.41	.35	.24	.15	.23	.19	270	6.0	Air	6.3	3	6.0
2471	2.72	.48	.40	.35	.24	.15	.23	.19	270	6.0	Air	12.7	3	6.0
2472	2.54	.45	.40	.34	.24	.15	.23	.19	270	6.0	Arg	12.7	3	6.0

Table 9 Windows – Low-emissivity Glazings

G-T-C	U-SI	U-IP	SC	SHGC	Tsol	Rfsol	Tvis	Rfvis	Pane #1 Gap #1		Pane #2		Id	Wid
									Id	Wid	Gas	Wid		
Double Low-E (e3=.4) Clear														
2600	2.85	.50	.84	.72	.63	.15	.77	.18	2	3.0	Air	6.3	300	3.0
2601	2.30	.41	.85	.73	.63	.15	.77	.18	2	3.0	Air	12.7	300	3.0
2602	2.05	.36	.85	.73	.63	.15	.77	.18	2	3.0	Arg	12.7	300	3.0
Double Low-E (e3=.2) Clear														
2610	2.61	.46	.84	.72	.62	.15	.74	.18	2	3.0	Air	6.3	350	3.0
2611	1.99	.35	.85	.73	.62	.15	.74	.18	2	3.0	Air	12.7	350	3.0
2612	1.70	.30	.86	.74	.62	.15	.74	.18	2	3.0	Arg	12.7	350	3.0
2613	2.57	.45	.77	.66	.53	.13	.72	.17	3	6.0	Air	6.3	351	6.0
2614	1.96	.35	.78	.67	.53	.13	.72	.17	3	6.0	Air	12.7	351	6.0
2615	1.67	.29	.79	.68	.53	.13	.72	.17	3	6.0	Arg	12.7	351	6.0
Double Low-E (e2=.1) Clear														
2630	2.47	.44	.69	.60	.54	.22	.77	.14	400	3.0	Air	6.3	2	3.0
2631	1.81	.32	.69	.60	.54	.22	.77	.14	400	3.0	Air	12.7	2	3.0
2632	1.48	.26	.69	.59	.54	.22	.77	.14	400	3.0	Arg	12.7	2	3.0
2633	2.43	.43	.65	.56	.47	.20	.75	.11	401	6.0	Air	6.3	3	6.0
2634	1.78	.31	.65	.56	.47	.20	.75	.11	401	6.0	Air	12.7	3	6.0
2635	1.46	.26	.66	.56	.47	.20	.75	.11	401	6.0	Arg	12.7	3	6.0
Double Low-E (e2=.1) Tint														
2636	2.43	.43	.45	.39	.28	.10	.44	.05	451	6.0	Air	6.3	3	6.0
2637	1.78	.31	.43	.37	.28	.10	.44	.05	451	6.0	Air	12.7	3	6.0
2638	1.46	.26	.43	.37	.28	.10	.44	.05	451	6.0	Arg	12.7	3	6.0
Double Low-E (e3=.1) Clear														
2640	2.47	.44	.74	.63	.54	.23	.77	.13	2	3.0	Air	6.3	400	3.0
2641	1.81	.32	.75	.64	.54	.23	.77	.13	2	3.0	Air	12.7	400	3.0
2642	1.48	.26	.75	.65	.54	.23	.77	.13	2	3.0	Arg	12.7	400	3.0
Double Low-E (e2=.04) Clear														
2660	2.38	.42	.51	.44	.39	.36	.70	.12	500	3.0	Air	6.3	2	3.0
2661	1.68	.30	.51	.44	.39	.36	.70	.12	500	3.0	Air	12.7	2	3.0
2662	1.34	.24	.50	.43	.39	.36	.70	.12	500	3.0	Arg	12.7	2	3.0
Double Low-E (e3=.04) Clear														
2663	2.41	.42	.49	.42	.34	.31	.68	.12	501	6.0	Air	6.3	3	6.0
2664	1.67	.29	.48	.42	.34	.31	.68	.12	501	6.0	Air	12.7	3	6.0
2665	1.32	.23	.48	.42	.34	.31	.68	.12	501	6.0	Arg	12.7	3	6.0
Double Low-E (e2=.04) Tint														
2666	2.41	.42	.35	.31	.21	.14	.41	.08	550	6.0	Air	6.3	3	6.0
2667	1.67	.29	.33	.29	.21	.14	.41	.08	550	6.0	Air	12.7	3	6.0
2668	1.32	.23	.32	.28	.21	.14	.41	.08	550	6.0	Arg	12.7	3	6.0

Table 10 Windows – Electrochromic Glazings

G-T-C	U-SI	U-IP	SC	SHGC	Tsol	Rfsol	Tvis	Rfvis	Pane #1		Gap #1		Pane #2		
									Id	Wid	Gas	Wid	Id	Wid	
Double Electrochromic Absorbing Bleached/Colored, 6.3-mm Gap															
2800	2.43	0.43	.85	.73	.64	.14	.76	.16	704F	6.0	Air	6.3	709	6.0	
2801	2.43	0.43	.21	.18	.09	.18	.12	.08	705F	6.0	Air	6.3	709	6.0	
Double Electrochromic Absorbing Bleached/Colored, 12.7-mm Gap															
2802	1.78	0.31	.86	.74	.64	.14	.76	.16	704F	6.0	Air	12.7	709	6.0	
2803	1.78	0.31	.19	.20	.16	.18	.12	.08	705F	6.0	Air	12.7	709	6.0	
Double Electrochromic Absorbing Bleached/Colored, 12.7-mm Gap, Argon															
2804	1.49	0.26	.86	.74	.64	.14	.76	.16	704F	6.0	Arg	12.7	709	6.0	
2805	1.49	0.26	.18	.15	.09	.18	.12	.08	705F	6.0	Arg	12.7	709	6.0	
Double Electrochromic Reflecting Bleached/Colored, 6.3-mm Gap															
2820	2.43	0.43	.73	.63	.55	.21	.73	.17	706F	6.0	Air	6.3	709	6.0	
2821	2.43	0.43	.20	.17	.09	.22	.14	.08	707F	6.0	Air	6.3	709	6.0	
Double Electrochromic Reflecting Bleached/Colored, 12.7-mm Gap															
2822	1.78	0.31	.74	.64	.55	.21	.73	.17	706F	6.0	Air	12.7	709	6.0	
2823	1.78	0.31	.17	.15	.09	.22	.14	.08	707F	6.0	Air	12.7	709	6.0	
Double Electrochromic Reflecting Bleached/Colored, 12.7-mm Gap, Argon															
2824	1.49	0.26	.74	.64	.55	.21	.73	.17	706F	6.0	Arg	12.7	709	6.0	
2825	1.49	0.26	.16	.15	.09	.22	.14	.08	707F	6.0	Arg	12.7	709	6.0	
Double Low-E (e2=.029) Electrochromic Absorbing Bleached/Colored, 6.3-mm Gap															
2840	2.33	0.41	.51	.44	.34	.33	.66	.14	704F	6.0	Air	6.3	708F	5.7	
2841	2.33	0.41	.18	.16	.06	.19	.10	.08	705F	6.0	Air	6.3	708F	5.7	
Double Low-E (e2=.029) Electrochromic Absorbing Bleached/Colored, 12.7-mm Gap															
2842	1.64	0.29	.59	.51	.34	.33	.66	.14	704F	6.0	Air	12.7	708F	5.7	
2843	1.64	0.29	.15	.13	.06	.19	.10	.08	705F	6.0	Air	12.7	708F	5.7	
Double Low-E (e2=.029) Electrochromic Absorbing Bleached/Colored, 12.7-mm Gap, Argon															
2844	1.33	0.23	.60	.52	.34	.33	.66	.14	704F	6.0	Arg	12.7	708F	5.7	
2845	1.33	0.23	.14	.12	.06	.19	.10	.08	705F	6.0	Arg	12.7	708F	5.7	
Double Low-E (e2=.029) Electrochromic Reflecting Bleached/Colored, 6.3-mm Gap															
2860	2.33	0.41	.54	.46	.32	.32	.64	.14	706F	6.0	Air	6.3	708F	5.7	
2861	2.33	0.41	.18	.16	.07	.22	.12	.08	707F	6.0	Air	6.3	708F	5.7	
Double Low-E (e2=.029) Electrochromic Reflecting Bleached/Colored, 12.7-mm Gap															
2862	1.64	0.29	.55	.47	.32	.32	.64	.14	706F	6.0	Air	12.7	708F	5.7	
2863	1.64	0.29	.16	.14	.07	.22	.12	.08	707F	6.0	Air	12.7	708F	5.7	
Double Low-E (e2=.029) Electrochromic Reflecting Bleached/Colored, 12.7-mm Gap, Argon															
2864	1.33	0.23	.56	.48	.32	.32	.64	.14	706F	6.0	Arg	12.7	708F	5.7	
2865	1.33	0.23	.15	.13	.07	.22	.12	.08	707F	6.0	Arg	12.7	708F	5.7	

**Table 11 Windows – Triple Glazing**

G-T-C	U-SI	U-IP	SC	SHGC	Tsol	Rfsol	Tvis	Rfvis	Pane #1		Gap #1		Pane #2		Gap #2		Pane #3	
									Id	Wid	Gas	Wid	Id	Wid	Gas	Wid	Id	Wid
Triple Clear																		
3001	2.19	.39	.79	.68	.60	.17	.74	.20	2	3.0	Air	6.3	2	3.0	Air	6.3	2	3.0
3002	1.79	.32	.79	.68	.60	.17	.74	.20	2	3.0	Air	12.7	2	3.0	Air	12.7	2	3.0
3002	1.64	.29	.79	.68	.60	.17	.74	.20	2	3.0	Arg	12.7	2	3.0	Arg	12.7	2	3.0
Triple Low-E (e5=.1) Clear																		
3601	1.81	.32	.67	.57	.46	.24	.70	.18	2	3.0	Air	6.3	2	3.0	Air	6.3	400	3.0
3602	1.28	.23	.67	.58	.46	.24	.70	.18	2	3.0	Air	12.7	2	3.0	Air	12.7	400	3.0
3603	1.06	.19	.67	.58	.46	.24	.70	.18	2	3.0	Arg	12.7	2	3.0	Arg	12.7	400	3.0
Triple Low-E (e2=e5=.1) Clear																		
3621	1.55	.27	.54	.47	.36	.29	.66	.17	400	3.0	Air	6.3	2	3.0	Air	6.3	400	3.0
3622	.99	.17	.55	.47	.36	.29	.66	.17	400	3.0	Air	12.7	2	3.0	Air	12.7	400	3.0
3623	.77	.14	.55	.47	.36	.29	.66	.17	400	3.0	Arg	12.7	2	3.0	Arg	12.7	400	3.0
Triple Low-E Film (88) Clear																		
3641	1.83	.32	.66	.57	.48	.28	.71	.18	2	3.0	Air	6.3	600	0.1	Air	6.3	2	3.0
3642	1.32	.23	.67	.57	.48	.28	.71	.18	2	3.0	Air	12.7	600	0.1	Air	12.7	2	3.0
Triple Low-E Film (77) Clear																		
3651	1.79	.32	.53	.46	.38	.38	.64	.24	2	3.0	Air	6.3	601	0.1	Air	6.3	2	3.0
3652	1.26	.22	.54	.47	.38	.38	.64	.24	2	3.0	Air	12.7	601	0.1	Air	12.7	2	3.0
Triple Low-E Film (66) Clear																		
3661	1.75	.31	.41	.35	.26	.40	.54	.31	3	6.0	Air	6.3	602	0.1	Air	6.3	3	6.0
3662	1.23	.22	.42	.36	.26	.40	.54	.31	3	6.0	Air	12.7	602	0.1	Air	12.7	3	6.0
Triple Low-E Film (66) Tint																		
3663	1.75	.31	.30	.26	.16	.18	.32	.14	6	6.0	Air	6.3	602	0.1	Air	6.3	3	6.0
3664	1.23	.22	.29	.25	.16	.18	.32	.14	6	6.0	Air	12.7	602	0.1	Air	12.7	3	6.0
Triple Low-E Film (55) Clear																		
3671	1.74	.31	.35	.30	.21	.44	.45	.37	3	6.0	Air	6.3	603	0.1	Air	6.3	3	6.0
3672	1.22	.22	.36	.31	.21	.44	.45	.37	3	6.0	Air	12.7	603	0.1	Air	12.7	3	6.0
Triple Low-E Film (55) Tint																		
3673	1.74	.31	.26	.23	.13	.19	.27	.16	6	6.0	Air	6.3	603	0.1	Air	6.3	3	6.0
3674	1.22	.22	.25	.22	.13	.19	.27	.16	6	6.0	Air	12.7	603	0.1	Air	12.7	3	6.0
Triple Low-E Film (44) Tint																		
3681	1.74	.31	.23	.20	.10	.21	.22	.18	6	6.0	Air	6.3	604	0.1	Air	6.3	3	6.0
3682	1.21	.21	.22	.19	.10	.21	.22	.18	6	6.0	Air	12.7	604	0.1	Air	12.7	3	6.0
Triple Low-E Film (33) Tint																		
3691	1.74	.31	.19	.16	.07	.23	.17	.23	6	6.0	Air	6.3	605	0.1	Air	6.3	3	6.0
3692	1.20	.21	.17	.15	.07	.23	.17	.23	6	6.0	Air	12.7	605	0.1	Air	12.7	3	6.0

**Table 12 Windows – Quadruple Glazing**

G-T-C	U-SI	U-IP	SC	SHGC	Tsol	Rfsol	Tvis	Rfvis	Pane #1		Gap #1		Pane #2		Gap #2		Pane #3	
									Id	Wid	Gas	Wid	Id	Wid	Gas	Wid	Id	Wid
Quadruple, Two Low-E Glass, Two Low-E Film, Clear. Krypton																		
4651	.66	.12	.52	.45	.34	.34	.62	.21	2	3.0	Kry	7.9	600	0.1	Kry	3.2	600	0.1
														Gap #3		Pane #4		
														Gas	Wid	Id	Wid	
														Kry	7.9	2	3.0	

## **Window Manufacturers Window Library**

These window entries reflect actual products sold on the market as of mid-2006. Depending on whether the glazing system is single glazed, double glazed or triple glazed, the user can select a window with a glazing system from a specific glass manufacturer. The user needs to be familiar with the glass types offered by a manufacturer in order to select the corresponding window system from the library. A listing of the new window library follows this



discussion. The listing is set up the same way as the existing DOE-2 Window Library with the addition of the name for each pane of glass. If the user cannot find the window in the library, we recommend creating the window in WINDOW 5 and importing it to eQUEST.

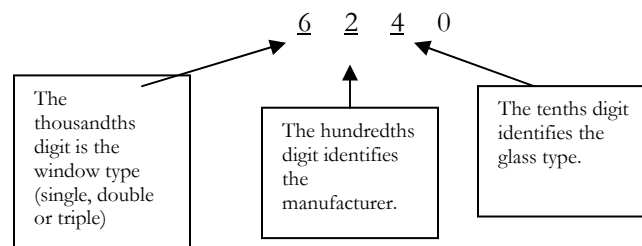
The new windows were created in WINDOW 5.2 using glass from release 14.4 of the International Glazing Database (IGDB 14.4). The International Glazing Database includes spectral data for glass manufactured by all glass manufacturers who have chosen to submit their data for peer review to Lawrence Berkeley National Laboratory. Use of these windows improves the accuracy of the calculations because the windows represent actual products and the simulations employ the angular properties of the glazing systems from WINDOW 5.2.

The new Glass Manufacturer Window Library is organized by type of window (single, double, triple), the manufacturer, and the glass type. The user selects single, double or triple-glazed units by manufacturer. The list of products offered by a manufacturer has a window name and a description. The window name gives an abbreviated name for each glazing layer separated by the gas fill type, e.g. Brz /Air/Clr 6. . The description of the glazing system indicates the window library identification number, U-Factor, SHGC and visible light transmittance for the glazing system.

In the window name, the first glazing listed represents the outboard lite. In units with multiple glazings, the gas fill is either air or argon (Arg). For air, two different widths were modeled. Air1 designates a 6.3 mm (0.25 in) gap in the double and triple glazed units. In the double glazed units, Air or Arg corresponds to a 12.7 mm (0.5 in) gap. In the triple glazed units with suspended films, Air corresponds to a 9.5 mm (0.375 in.) gap width.

The thickness of the glass in the glazing system is given at the end of the window name. There is 3mm (3) and 6mm (6) glass. Typically, 3mm glass is used on residential-scale projects and 6mm glass is used for commercial applications. All double-glazed units with 6mm glass have a gap that is air-filled and 12.7 mm (0.5 in) wide. It is rare to see the narrower gap widths on commercial projects; however, a user can use WINDOW 5.2 to create such a product.

The window ID number can be used to reference the window library documentation and see the details of the glazing system. In the window ID number, the first three digits have significance:



In this set of library entries all window ID's in the 5000 range are single glazed; those in the 6000 range are double glazed and those in the 7000 range are triple glazed. Within each of these window types, glass manufacturer have been assigned a range of ID's. Window ID numbers between 5000 and 5100, and 6000 and 6100 represent generic glazing. Clr/Tint glazings are those glass types that are produced by multiple manufacturers and have nearly the same performance, such as clear, bronze, grey and green. The range of ID's for AFG are in the 100's, so 5100 to 5199 and 6100 to 6199 are AFG products.

Because there are so many different types of glass, the library attempts to segregate the most common glass types. Windows with clear glass are assigned ID's between 0 and 10 within the window type and manufacturer categories. For example, a window ID of 6120 is a double-glazed window from AFG and has grey tinted glass. Coding by glass types falls apart with all the different kinds of coatings, so verify that you have selected the appropriate window. The table below shows the corresponding ID's for each manufacturer.

Guide to Glass Manufacturer Window Library ID's					
Window		Manufacturer		Glass Type	
ID	Type	ID	Name	ID	Type
5000	Single	<100	Clr/Tint	<10	Clear
6000	Double	100	AFG	10	Bronze
7000	Triple	200	Visteon	20	Grey
		300	Cardinal	30	Green
		400	Guardian	40	Blue
		500	PPG	45	Bluegreen
		600	Viracon	>50	Low-E on Clear
		700	Interpane (not included)		
		800	Pilkington		

G-T-C	Name	U-SI	U-IP	SC	SHGC	Tsol	Rfsol	Tvis	Rfvis	Pane #1		Pane #1 IGDB Glass Name
										Id	Wid	
<i>Single Clr/Tint</i>												
5000	Clr 3	5.88	1.04	0.99	0.86	0.83	0.08	0.90	0.08	102	3.0	Generic Clear Glass
5001	Clr 6	5.78	1.02	0.94	0.82	0.77	0.07	0.88	0.08	103	5.7	Generic Clear Glass
5002	Optiwhite 3	5.88	1.04	1.04	0.91	0.90	0.08	0.91	0.09	9811	2.9	Optiwhite
5003	Optiwhite 6	5.78	1.02	1.03	0.90	0.89	0.08	0.91	0.08	9814	5.8	Optiwhite
5004	Lexan XL 3	5.63	0.99	0.96	0.83	0.80	0.09	0.86	0.09	3501	3.0	Lexan XL
5005	Lexan XL 6	5.17	0.91	0.93	0.81	0.77	0.08	0.81	0.08	3503	6.0	Lexan XL
5006	Plexiglas MC 3	5.63	0.99	1.00	0.87	0.85	0.07	0.92	0.07	2601	3.0	Plexiglas MC
5007	Plexiglas MC 6	5.16	0.91	0.99	0.86	0.83	0.07	0.92	0.07	2604	6.0	Plexiglas MC
5010	Brz 3	5.87	1.03	0.84	0.73	0.65	0.06	0.68	0.07	100	3.1	Generic Bronze Glass
5011	Brz 6	5.78	1.02	0.71	0.62	0.49	0.05	0.53	0.06	101	5.7	Generic Bronze Glass
5020	Gry 3	5.87	1.03	0.81	0.70	0.61	0.06	0.62	0.06	104	3.1	Generic Grey Glass
5021	Gry 6	5.79	1.02	0.69	0.60	0.45	0.05	0.47	0.05	1334	5.7	Versalux Grey
5030	Grn Float 3	5.88	1.04	0.80	0.70	0.60	0.06	0.83	0.08	3023	3.0	Green Float Glass
5031	Grn Float 6	5.79	1.02	0.68	0.59	0.44	0.06	0.76	0.07	3026	5.6	Green Float Glass

G-T-C	Name	U-SI	U-IP	SC	SHGC	Pane #1				Pane #1 IGDB		
						Tsol	Rfsol	Tvis	Rfvis	Id	Wid	Glass Name
<i>Single Visteon</i>												
5212	Versalux Brz RC 6	5.79	1.02	0.47	0.41	0.28	0.28	0.21	0.35	1315	5.7	Versalux Bronze RC
5220	Versalux Gry 2000 6	5.79	1.02	0.38	0.33	0.07	0.04	0.08	0.04	1336	5.7	Versalux Grey 2000
5222	Versalux Gry RC 6	5.79	1.02	0.45	0.39	0.26	0.28	0.18	0.35	1338	5.7	Versalux Grey RC
5230	Versalux Grn 2000 3	5.87	1.03	0.70	0.61	0.48	0.05	0.76	0.07	1323	3.2	Versalux Green 2000
5231	Versalux Grn 2000 6	5.79	1.02	0.59	0.51	0.33	0.05	0.66	0.06	1326	5.7	Versalux Green 2000
5232	Versalux Grn RC 6	5.79	1.02	0.43	0.38	0.23	0.27	0.30	0.35	1330	5.7	Versalux Green RC
5233	Versalux Grn 2000 R 6	5.78	1.02	0.37	0.32	0.15	0.27	0.25	0.35	1328	5.9	Versalux Green 2000 R
5240	Versalux Blu 6	5.78	1.02	0.70	0.61	0.47	0.05	0.57	0.06	1305	5.9	Versalux Blue
5241	Versalux Blu 2000 6	5.78	1.02	0.57	0.50	0.31	0.05	0.43	0.05	1302	5.9	Versalux Blue 2000
5242	Versalux Blu RC 6	5.78	1.02	0.46	0.40	0.27	0.28	0.22	0.35	1307	5.9	Versalux Blue RC
5243	Versalux Blu2 RC 6	5.78	1.02	0.37	0.32	0.16	0.27	0.16	0.35	1309	5.9	Versalux Blue RC
<i>Single PPG</i>												
5501	Starphire 6	5.79	1.02	1.03	0.90	0.89	0.08	0.91	0.08	5004	5.7	Starphire
5511	Solarcool SolarBrz 6	5.79	1.02	0.45	0.40	0.27	0.30	0.21	0.36	5108	5.7	Solarcool Solarbronze
5521	Solargray 6	5.79	1.02	0.66	0.57	0.42	0.05	0.44	0.06	5052	5.7	Solargray
5522	Graylite 6	5.79	1.02	0.53	0.46	0.26	0.05	0.14	0.05	5057	5.7	Graylite
5523	Solarcool Solargray 6	5.79	1.02	0.42	0.36	0.23	0.30	0.17	0.36	5120	5.7	Solarcool Solargray
5524	Optigray 23 6	5.79	1.02	0.48	0.42	0.19	0.05	0.23	0.05	5294	5.7	Optigray 23
5531	SolarGrn 6	5.79	1.02	0.60	0.52	0.34	0.05	0.67	0.07	5028	5.7	Solargreen
5541	Azurlite 6	5.79	1.02	0.58	0.51	0.32	0.05	0.68	0.07	5036	5.7	Azurlite
5542	Caribia 6	5.79	1.02	0.58	0.51	0.32	0.05	0.68	0.07	5326	5.7	Caribia
5543	Solarcool Azurlite 6	5.79	1.02	0.35	0.30	0.14	0.30	0.26	0.36	5095	5.7	Solarcool Azurlite
5544	Solarcool Caribia 6	5.79	1.02	0.35	0.30	0.14	0.30	0.26	0.36	5336	5.7	Solarcool Caribia

G-T-C	Name	U-SI	U-IP	SC	SHGC	Pane #1				Pane #1 IGDB		
						Tsol	Rfsol	Tvis	Rfvis	Id	Wid	Glass Name
<i>Single Pilkington</i>												
5820	SuperGry 3	5.87	1.03	0.51	0.44	0.23	0.04	0.25	0.05	9891	3.2	SuperGrey
5821	SuperGry 6	5.79	1.02	0.39	0.34	0.08	0.04	0.09	0.04	9894	5.7	SuperGrey
5830	EverGrn 3	5.87	1.03	0.71	0.62	0.49	0.06	0.77	0.07	9881	3.2	EverGreen
5831	EverGrn 6	5.78	1.02	0.59	0.51	0.33	0.05	0.66	0.06	9889	5.9	EverGreen
5840	Arctic Blu 6	5.78	1.02	0.59	0.51	0.33	0.05	0.53	0.06	9989	5.9	Arctic Blue
5845	Optifloat Blu-Grn 6	5.78	1.02	0.71	0.62	0.48	0.06	0.75	0.07	9879	5.9	Optifloat Blue-Green
5850	Eclipse AdvClr 6	3.66	0.65	0.71	0.62	0.58	0.19	0.67	0.25	9909	5.9	Eclipse AdvantageClear
5851	Eclipse AdvBrz 6	3.66	0.65	0.51	0.45	0.35	0.10	0.38	0.11	9908	5.9	Eclipse AdvantageBronze
5852	Eclipse AdvGry 6	3.66	0.65	0.46	0.40	0.29	0.09	0.32	0.10	9911	5.9	Eclipse AdvantageGrey
5853	Eclipse Adv EverGrn 6	3.66	0.65	0.41	0.36	0.23	0.08	0.48	0.16	9910	5.9	Eclipse AdvantageEverGreen
5854	Eclipse Adv Arctic Blu 6	3.66	0.65	0.41	0.36	0.23	0.08	0.39	0.12	9906	5.9	Eclipse AdvantageArctic Blue
5855	Eclipse Adv Blu-Grn 6	3.66	0.65	0.51	0.45	0.35	0.11	0.56	0.19	9907	5.9	Eclipse AdvantageBlue-Green
5860	Energy Adv LowE 3	3.51	0.62	0.83	0.72	0.69	0.11	0.82	0.11	9921	3.0	Energy AdvantageLow-E
5861	Energy Adv LowE 6	3.48	0.61	0.80	0.70	0.66	0.10	0.82	0.10	9924	5.6	Energy AdvantageLow-E
5870	Solar E 3	3.49	0.62	0.63	0.55	0.48	0.08	0.60	0.08	9931	3.0	Solar E
5871	Solar E 6	3.49	0.62	0.61	0.53	0.46	0.07	0.61	0.07	9935	5.7	Solar E
5880	Activ Clr 3	5.88	1.04	0.95	0.82	0.80	0.12	0.84	0.15	9937	3.0	Activon Clear
5881	Activ Clr 6	5.79	1.02	0.90	0.78	0.75	0.12	0.83	0.15	9941	5.6	Activon Clear

G-T-C	Name	U-SI	U-IP	SC	SHGC	Tsol	Rfsol	Tvis	Rfvis	Pane #1		Pane #1 IGDB Glass Name	Gap #1		Pane #2		Pane #2 IGDB Glass Name	
										Id	Wid		Gas	Wid	Id	Wid		
<i>Double Clr/Tint New</i>																		
6000	Clr/Air1/Clr 3	3.12	0.55	0.87	0.76	0.70	0.13	0.81	0.15	102	3.0	Generic Clear Glass	Air	6.3	102	3.0	Generic Clear Glass	
6001	Clr/Air1/Clr 6	3.07	0.54	0.80	0.70	0.61	0.11	0.79	0.14	103	5.7	Generic Clear Glass	Air	6.3	103	5.7	Generic Clear Glass	
6002	Clr/Air/Clr 3	2.73	0.48	0.88	0.76	0.70	0.13	0.81	0.15	102	3.0	Generic Clear Glass	Air	12.7	102	3.0	Generic Clear Glass	
6003	Clr/Air/Clr 6	2.68	0.47	0.81	0.70	0.61	0.11	0.79	0.14	103	5.7	Generic Clear Glass	Air	12.7	103	5.7	Generic Clear Glass	
6010	Brz /Air1/Clr 3	3.12	0.55	0.72	0.63	0.55	0.09	0.61	0.10	100	3.1	Generic Bronze Glass	Air	6.3	102	3.0	Generic Clear Glass	
6011	Brz /Air1/Clr 6	3.09	0.54	0.59	0.52	0.41	0.07	0.48	0.08	101	5.7	Generic Bronze Glass	Air	6.3	102	3.0	Generic Clear Glass	
6012	Brz /Air/Clr 3	2.72	0.48	0.72	0.62	0.55	0.09	0.61	0.10	100	3.1	Generic Bronze Glass	Air	12.7	102	3.0	Generic Clear Glass	
6013	Brz /Air/Clr 6	2.71	0.48	0.59	0.51	0.41	0.07	0.48	0.08	101	5.7	Generic Bronze Glass	Air	12.7	102	3.0	Generic Clear Glass	
6020	Gry /Air1/Clr 3	3.12	0.55	0.69	0.60	0.51	0.09	0.56	0.09	104	3.1	Generic Grey Glass	Air	6.3	102	3.0	Generic Clear Glass	
6021	Versalux Gry/Air1/Clr 6	3.07	0.54	0.55	0.48	0.36	0.07	0.41	0.07	1334	5.7	Versalux Grey	Air	6.3	103	5.7	Generic Clear Glass	
6022	Gry /Air/Clr 3	2.72	0.48	0.69	0.60	0.51	0.09	0.56	0.09	104	3.1	Generic Grey Glass	Air	12.7	102	3.0	Generic Clear Glass	
6023	Versalux Gry/Air/Clr 6	2.69	0.47	0.55	0.48	0.36	0.07	0.41	0.07	1334	5.7	Versalux Grey	Air	12.7	103	5.7	Generic Clear Glass	
6030	Grn Float /Air1/Clr 3	3.12	0.55	0.69	0.60	0.51	0.09	0.75	0.13	3023	3.0	Green Float Glass	Air	6.3	102	3.0	Generic Clear Glass	
6031	Grn Float /Air1/Clr 6	3.07	0.54	0.55	0.48	0.37	0.07	0.67	0.12	3026	5.6	Green Float Glass	Air	6.3	103	5.7	Generic Clear Glass	
6032	Grn Float /Air/Clr 3	2.73	0.48	0.68	0.59	0.51	0.09	0.75	0.13	3023	3.0	Green Float Glass	Air	12.7	102	3.0	Generic Clear Glass	
6033	Grn Float /Air/Clr 6	2.69	0.47	0.55	0.47	0.37	0.07	0.67	0.12	3026	5.6	Green Float Glass	Air	12.7	103	5.7	Generic Clear Glass	

G-T-C	Name	U-SI	U-IP	SC	SHGC	Tsol	Rfsol	Tvis	Rfvis	Pane #1		Pane #1 IGDB Glass Name	Gap #1		Pane #2		Pane #2 IGDB Glass Name	
										Id	Wid		Gas	Wid	Id	Wid		
<i>Double AFG</i>																		
6170	Comfort E Clr/Air1/Clr 3	2.54	0.45	0.75	0.65	0.59	0.14	0.75	0.15	907	3.1	Comfort E on Clear	Air	6.3	102	3.0	Generic Clear Glass	
6171	Comfort E Clr/Air1/Clr 6	2.5	0.44	0.71	0.62	0.52	0.13	0.73	0.14	910	5.6	Comfort E on Clear	Air	6.3	103	5.7	Generic Clear Glass	
6172	Comfort E Clr/Air/Clr 3	1.98	0.35	0.75	0.65	0.59	0.14	0.75	0.15	907	3.1	Comfort E on Clear	Air	12.7	102	3.0	Generic Clear Glass	
6173	Comfort E Clr/Air/Clr 6	1.95	0.34	0.71	0.62	0.52	0.13	0.73	0.14	910	5.6	Comfort E on Clear	Air	12.7	103	5.7	Generic Clear Glass	
6174	Comfort E Clr/Arg/Clr 3	1.76	0.31	0.75	0.65	0.59	0.14	0.75	0.15	907	3.1	Comfort E on Clear	Arg	12.7	102	3.0	Generic Clear Glass	
6175	Comfort E Clr/Arg/Clr 6	1.73	0.30	0.71	0.62	0.52	0.13	0.73	0.14	910	5.6	Comfort E on Clear	Arg	12.7	103	5.7	Generic Clear Glass	
6176	Comfort Ti-AC LowE/Air1/Clr 3	2.31	0.41	0.46	0.40	0.36	0.41	0.61	0.29	917	3.1	Comfort Ti-AC LowE on Clear	Air	6.3	102	3.0	Generic Clear Glass	
6177	Comfort Ti-AC LowE/Air1/Clr 6	2.28	0.40	0.44	0.38	0.32	0.36	0.59	0.29	919	5.6	Comfort Ti-AC LowE on Clear	Air	6.3	103	5.7	Generic Clear Glass	
6178	Comfort Ti-AC LowE/Air/Clr 3	1.67	0.29	0.46	0.40	0.36	0.41	0.61	0.29	917	3.1	Comfort Ti-AC LowE on Clear	Air	12.7	102	3.0	Generic Clear Glass	
6179	Comfort Ti-AC LowE/Air/Clr 6	1.65	0.29	0.43	0.38	0.32	0.36	0.59	0.29	919	5.6	Comfort Ti-AC LowE on Clear	Air	12.7	103	5.7	Generic Clear Glass	
6180	Comfort Ti-AC LowE/Arg/Clr 3	1.41	0.25	0.46	0.40	0.36	0.41	0.61	0.29	917	3.1	Comfort Ti-AC LowE on Clear	Arg	12.7	102	3.0	Generic Clear Glass	
6181	Comfort Ti-AC LowE/Arg/Clr 6	1.39	0.25	0.43	0.37	0.32	0.36	0.59	0.29	919	5.6	Comfort Ti-AC LowE on Clear	Arg	12.7	103	5.7	Generic Clear Glass	

G-T-C	Name	U-SI	U-IP	SC	SHGC	Tsol	Rfsol	Tvis	Rfvis	Pane #1		Pane #1 IGDB Glass Name	Gap #1		Pane #2		Pane #2 IGDB Glass Name	
										Id	Wid		Gas	Wid	Id	Wid		
<i>Double AFG (cont.)</i>																		
6182	Comfort Ti-PS LowE/Air1/Clr 3	2.34	0.41	0.64	0.56	0.50	0.25	0.77	0.12	921	3.1	Comfort Ti - PS LowE on Clear	Air	6.3	102	3.0	Generic Clear Glass	
6183	Comfort Ti-PS LowE/Air1/Clr 6	2.32	0.41	0.61	0.53	0.45	0.21	0.75	0.12	923	5.7	Comfort Ti - PS LowE on Clear	Air	6.3	103	5.7	Generic Clear Glass	
6184	Comfort Ti-PS LowE/Air/Clr 3	1.72	0.30	0.63	0.55	0.50	0.25	0.77	0.12	921	3.1	Comfort Ti - PS LowE on Clear	Air	12.7	102	3.0	Generic Clear Glass	
6185	Comfort Ti-PS LowE/Air/Clr 6	1.71	0.30	0.61	0.53	0.45	0.21	0.75	0.12	923	5.7	Comfort Ti - PS LowE on Clear	Air	12.7	103	5.7	Generic Clear Glass	
6186	Comfort Ti-PS LowE/Arg/Clr 3	1.46	0.26	0.63	0.55	0.50	0.25	0.77	0.12	921	3.1	Comfort Ti - PS LowE on Clear	Arg	12.7	102	3.0	Generic Clear Glass	
6187	Comfort Ti -PS LowE/Arg/Clr 6	1.45	0.26	0.60	0.53	0.45	0.21	0.75	0.12	923	5.7	Comfort Ti - PS LowE on Clear	Arg	12.7	103	5.7	Generic Clear Glass	
6188	Comfort Ti-R LowE/Air1/Clr 3	2.3	0.41	0.55	0.48	0.43	0.36	0.71	0.21	925	3.2	Comfort Ti-R LowE on Clear	Air	6.3	102	3.0	Generic Clear Glass	
6189	Comfort Ti-R LowE/Air1/Clr 6	2.28	0.40	0.50	0.44	0.37	0.30	0.66	0.21	927	5.6	Comfort Ti-R LowE on Clear	Air	6.3	103	5.7	Generic Clear Glass	
6190	Comfort Ti-R LowE/Air/Clr 3	1.67	0.29	0.54	0.47	0.43	0.36	0.71	0.21	925	3.2	Comfort Ti-R LowE on Clear	Air	12.7	102	3.0	Generic Clear Glass	
6191	Comfort Ti-R LowE/Air/Clr 6	1.65	0.29	0.50	0.43	0.37	0.30	0.66	0.21	927	5.6	Comfort Ti-R LowE on Clear	Air	12.7	103	5.7	Generic Clear Glass	
6192	Comfort Ti-R LowE/Arg/Clr 3	1.4	0.25	0.54	0.47	0.43	0.36	0.71	0.21	925	3.2	Comfort Ti-R LowE on Clear	Arg	12.7	102	3.0	Generic Clear Glass	
6193	Comfort Ti-R LowE/Arg/Clr 6	1.39	0.25	0.49	0.43	0.37	0.30	0.66	0.21	927	5.6	Comfort Ti-R LowE on Clear	Arg	12.7	103	5.7	Generic Clear Glass	
6194	Radiance3.AFG/Air1/Clr 3	2.89	0.51	0.78	0.68	0.62	0.18	0.69	0.26	970	3.1	Radiance3.AFG	Air	6.3	102	3.0	Generic Clear Glass	
6195	Radiance3.AFG/Air/Clr 3	2.43	0.43	0.78	0.68	0.62	0.18	0.69	0.26	970	3.1	Radiance3.AFG	Air	12.7	102	3.0	Generic Clear Glass	
6196	Radiance3.AFG/Arg/Clr 3	2.26	0.40	0.78	0.68	0.62	0.18	0.69	0.26	970	3.1	Radiance3.AFG	Arg	12.7	102	3.0	Generic Clear Glass	

G-T-C	Name	U-SI	U-IP	SC	SHGC	Tsol	Rfsol	Tvis	Rfvis	Pane #1		Pane #1 IGDB Glass Name	Gap #1		Pane #2		Pane #2 IGDB Glass Name	
										Id	Wid		Gas	Wid	Id	Wid		
<i>Double Visteon</i>																		
6212	Versalux Brz RC/Air/Clr 6	2.69	0.47	0.36	0.31	0.21	0.28	0.19	0.35	1315	5.7	Versalux Bronze RC	Air	12.7	103	5.7	Generic Clear Glass	
6220	Versalux Gry 2000/Air/Clr 6	2.69	0.47	0.23	0.20	0.05	0.04	0.07	0.04	1336	5.7	Versalux Grey 2000	Air	12.7	103	5.7	Generic Clear Glass	
6221	Versalux Gry RC/Air/Clr 6	2.69	0.47	0.34	0.30	0.20	0.28	0.16	0.35	1338	5.7	Versalux Grey RC	Air	12.7	103	5.7	Generic Clear Glass	
6230	Versalux Grn 2000/Air1/Clr 3	2.72	0.48	0.58	0.51	0.41	0.08	0.69	0.12	1323	3.2	Versalux Green 2000	Air	12.7	102	3.0	Generic Clear Glass	
6231	Versalux Grn 2000/Air1/Clr 6	2.69	0.47	0.45	0.40	0.28	0.06	0.59	0.10	1326	5.7	Versalux Green 2000	Air	12.7	103	5.7	Generic Clear Glass	
6232	Versalux Grn RC/Air/Clr 6	2.69	0.47	0.33	0.28	0.19	0.28	0.27	0.36	1330	5.7	Versalux Green RC	Air	12.7	103	5.7	Generic Clear Glass	
6233	Versalux Grn 2000 R/Air/Clr 6	2.68	0.47	0.26	0.23	0.12	0.28	0.23	0.35	1328	5.9	Versalux Green 2000 R	Air	12.7	103	5.7	Generic Clear Glass	
6240	Versalux Blu/Air/Clr 6	2.68	0.47	0.56	0.49	0.37	0.07	0.51	0.08	1305	5.9	Versalux Blue	Air	12.7	103	5.7	Generic Clear Glass	
6241	Versalux Blu 2000/Air/Clr 6	2.68	0.47	0.43	0.37	0.25	0.06	0.38	0.07	1302	5.9	Versalux Blue 2000	Air	12.7	103	5.7	Generic Clear Glass	
6242	Versalux Blu RC/Air/Clr 6	2.68	0.47	0.35	0.31	0.21	0.28	0.19	0.35	1307	5.9	Versalux Blue RC	Air	12.7	103	5.7	Generic Clear Glass	
6243	Versalux Blu2 RC/Air/Clr 6	2.68	0.47	0.26	0.23	0.12	0.28	0.15	0.35	1309	5.9	Versalux Blue RC	Air	12.7	103	5.7	Generic Clear Glass	

G-T-C	Name	U-SI	U-IP	SC	SHGC	Tsol	Rfsol	Tvis	Rfvis	Pane #1		Pane #1 IGDB Glass Name	Gap #1		Pane #2		Pane #2 IGDB Glass Name	
										Id	Wid		Gas	Wid	Id	Wid		
<i>Double Cardinal</i>																		
6308	Brz /Air1/LoE 270 Clr 3	2.31	0.41	0.43	0.37	0.26	0.26	0.53	0.09	100	3.1	Generic Bronze Glass	Air	6.3	2026	3.0	LoE 270 on Clear	
6309	Brz /Air1/LoE 270 Clr 6	2.28	0.40	0.36	0.32	0.19	0.16	0.41	0.07	101	5.7	Generic Bronze Glass	Air	6.3	2029	6.0	LoE 270 on Clear	
6310	Brz /Air/LoE 270 Clr 3	1.67	0.29	0.42	0.37	0.26	0.26	0.53	0.09	100	3.1	Generic Bronze Glass	Air	12.7	2026	3.0	LoE 270 on Clear	
6311	Brz /Air/LoE 270 Clr 6	1.65	0.29	0.35	0.30	0.19	0.16	0.41	0.07	101	5.7	Generic Bronze Glass	Air	12.7	2029	6.0	LoE 270 on Clear	
6312	Gry /Air1/LoE 270 Clr 3	2.31	0.41	0.41	0.36	0.24	0.24	0.48	0.08	104	3.1	Generic Grey Glass	Air	6.3	2026	3.0	LoE 270 on Clear	
6313	Versalux Gry/Air1/LoE 270 Clr 6	2.28	0.40	0.34	0.30	0.17	0.15	0.35	0.06	1334	5.7	Versalux Grey	Air	6.3	2029	6.0	LoE 270 on Clear	
6314	Gry /Air/LoE 270 Clr 3	1.67	0.29	0.40	0.35	0.24	0.24	0.48	0.08	104	3.1	Generic Grey Glass	Air	12.7	2026	3.0	LoE 270 on Clear	
6315	Versalux Gry/Air/LoE 270 Clr 6	1.65	0.29	0.33	0.28	0.17	0.15	0.35	0.06	1334	5.7	Versalux Grey	Air	12.7	2029	6.0	LoE 270 on Clear	
6316	Grn Float /Air1/LoE 270 Clr 3	2.31	0.41	0.46	0.40	0.28	0.18	0.64	0.11	3023	3.0	Green Float Glass	Air	6.3	2026	3.0	LoE 270 on Clear	
6317	Grn Float /Air1/LoE 270 Clr 6	2.28	0.40	0.41	0.36	0.23	0.10	0.58	0.10	3026	5.6	Green Float Glass	Air	6.3	2029	6.0	LoE 270 on Clear	
6318	Grn Float /Air/LoE 270 Clr 3	1.67	0.29	0.45	0.39	0.28	0.18	0.64	0.11	3023	3.0	Green Float Glass	Air	12.7	2026	3.0	LoE 270 on Clear	
6319	Grn Float /Air/LoE 270 Clr 6	1.65	0.29	0.39	0.34	0.23	0.10	0.58	0.10	3026	5.6	Green Float Glass	Air	12.7	2029	6.0	LoE 270 on Clear	
6360	LoE 178 Clr/Air1/Clr 3	2.38	0.42	0.67	0.59	0.53	0.24	0.78	0.12	2006	3.0	LoE 178 on Clear	Air	6.3	102	3.0	Generic Clear Glass	
6361	LoE 178 Clr/Air1/Clr 6	2.35	0.41	0.63	0.55	0.47	0.20	0.76	0.11	2009	5.7	LoE 178 on Clear	Air	6.3	103	5.7	Generic Clear Glass	
6362	LoE 178 Clr/Air/Clr 3	1.77	0.31	0.67	0.58	0.53	0.24	0.78	0.12	2006	3.0	LoE 178 on Clear	Air	12.7	102	3.0	Generic Clear Glass	
6363	LoE 178 Clr/Air/Clr 6	1.75	0.31	0.63	0.55	0.47	0.20	0.76	0.11	2009	5.7	LoE 178 on Clear	Air	12.7	103	5.7	Generic Clear Glass	
6364	LoE 178 Clr/Arg/Clr 3	1.51	0.27	0.67	0.58	0.53	0.24	0.78	0.12	2006	3.0	LoE 178 on Clear	Arg	12.7	102	3.0	Generic Clear Glass	
6365	LoE 178 Clr/Arg/Clr 6	1.5	0.26	0.63	0.55	0.47	0.20	0.76	0.11	2009	5.7	LoE 178 on Clear	Arg	12.7	103	5.7	Generic Clear Glass	
6366	LoE-272 Clr/Air1/Clr 3	2.32	0.41	0.49	0.42	0.38	0.35	0.72	0.11	2011	3.0	LoE-272 on 3 mm Clear	Air	6.3	102	3.0	Generic Clear Glass	
6367	LoE-272 Clr/Air1/Clr 6	2.29	0.40	0.47	0.41	0.34	0.29	0.69	0.11	2014	5.7	LoE-272 on 6 mm Clear	Air	6.3	103	5.7	Generic Clear Glass	
6368	LoE-272 Clr/Air/Clr 3	1.68	0.30	0.48	0.42	0.38	0.35	0.72	0.11	2011	3.0	LoE-272 on 3 mm Clear	Air	12.7	102	3.0	Generic Clear Glass	
6369	LoE-272 Clr/Air/Clr 6	1.67	0.29	0.46	0.40	0.34	0.29	0.69	0.11	2014	5.7	LoE-272 on 6 mm Clear	Air	12.7	103	5.7	Generic Clear Glass	

G-T-C	Name	U-SI	U-IP	SC	SHGC	Tsol	Rfsol	Tvis	Rfvis	Pane #1		Pane #1 IGDB Glass Name	Gap #1		Pane #2		Pane #2 IGDB Glass Name	
										Id	Wid		Gas	Wid	Id	Wid		
<i>Double Cardinal (cont.)</i>																		
6370	LoE-272 Clr/Arg/Clr 3	1.42	0.25	0.47	0.41	0.38	0.35	0.72	0.11	2011	3.0	LoE-272 on 3 mm Clear	Arg	12.7	102	3.0	Generic Clear Glass	
6371	LoE-272 Clr/Arg/Clr 6	1.41	0.25	0.46	0.40	0.34	0.29	0.69	0.11	2014	5.7	LoE-272 on 6 mm Clear	Arg	12.7	103	5.7	Generic Clear Glass	
6375	LoE 270 Clr/Air1/Clr 3	2.31	0.41	0.43	0.38	0.34	0.39	0.70	0.12	2026	3.0	LoE 270 on Clear	Air	6.3	102	3.0	Generic Clear Glass	
6376	LoE 270 Clr/Air1/Clr 6	2.28	0.40	0.43	0.37	0.31	0.32	0.67	0.12	2029	6.0	LoE 270 on Clear	Air	6.3	103	5.7	Generic Clear Glass	
6377	LoE 270 Clr/Air/Clr 3	1.68	0.30	0.48	0.42	0.38	0.35	0.72	0.11	2011	3.0	LoE-272 on 3 mm Clear	Air	12.7	102	3.0	Generic Clear Glass	
6378	LoE 270 Clr/Air/Clr 6	1.65	0.29	0.41	0.36	0.31	0.32	0.67	0.12	2029	6.0	LoE 270 on Clear	Air	12.7	103	5.7	Generic Clear Glass	
6379	LoE 270 Clr/Arg/Clr 3	1.41	0.25	0.42	0.37	0.34	0.39	0.70	0.12	2026	3.0	LoE 270 on Clear	Arg	12.7	102	3.0	Generic Clear Glass	
6380	LoE 270 Clr/Arg/Clr 6	1.39	0.25	0.41	0.36	0.31	0.32	0.67	0.12	2029	6.0	LoE 270 on Clear	Arg	12.7	103	5.7	Generic Clear Glass	
6381	LoE 240 Clr/Air1/Clr 3	2.34	0.41	0.32	0.27	0.21	0.31	0.40	0.14	2044	3.0	LoE 240 on Clear	Air	6.3	102	3.0	Generic Clear Glass	
6382	LoE 240 Clr/Air1/Clr 6	2.31	0.41	0.30	0.27	0.19	0.27	0.37	0.13	2047	5.7	LoE 240 on Clear	Air	6.3	103	5.7	Generic Clear Glass	
6383	LoE 240 Clr/Air/Clr 3	1.71	0.30	0.30	0.26	0.21	0.31	0.40	0.14	2044	3.0	LoE 240 on Clear	Air	12.7	102	3.0	Generic Clear Glass	
6384	LoE 240 Clr/Air/Clr 6	1.69	0.30	0.28	0.25	0.19	0.27	0.37	0.13	2047	5.7	LoE 240 on Clear	Air	12.7	103	5.7	Generic Clear Glass	
6385	LoE 240 Clr/Arg/Clr 3	1.45	0.26	0.29	0.25	0.21	0.31	0.40	0.14	2044	3.0	LoE 240 on Clear	Arg	12.7	102	3.0	Generic Clear Glass	
6386	LoE 240 Clr/Arg/Clr 6	1.44	0.25	0.28	0.24	0.19	0.27	0.37	0.13	2047	5.7	LoE 240 on Clear	Arg	12.7	103	5.7	Generic Clear Glass	
6390	LoE2-138 Clr/Air1/Clr 3	2.33	0.41	0.30	0.26	0.20	0.31	0.38	0.13	2092	3.0	LoE2-138 on 3 mm clear	Air	6.3	102	3.0	Generic Clear Glass	
6391	LoE2-138 Clr/Air1/Clr 6	2.3	0.41	0.30	0.26	0.18	0.26	0.37	0.12	2095	5.7	LoE2-138 on 6 mm clear	Air	6.3	103	5.7	Generic Clear Glass	
6392	LoE2-138 Clr/Air/Clr 3	1.7	0.30	0.28	0.24	0.20	0.31	0.38	0.13	2092	3.0	LoE2-138 on 3 mm clear	Air	12.7	102	3.0	Generic Clear Glass	
6393	LoE2-138 Clr/Air/Clr 6	1.68	0.30	0.28	0.24	0.18	0.26	0.37	0.12	2095	5.7	LoE2-138 on 6 mm clear	Air	12.7	103	5.7	Generic Clear Glass	
6394	LoE2-138 Clr/Arg/Clr 3	1.44	0.25	0.27	0.24	0.20	0.31	0.38	0.13	2092	3.0	LoE2-138 on 3 mm clear	Arg	12.7	102	3.0	Generic Clear Glass	
6395	LoE2-138 Clr/Arg/Clr 6	1.42	0.25	0.27	0.23	0.18	0.26	0.37	0.12	2095	5.7	LoE2-138 on 6 mm clear	Arg	12.7	103	5.7	Generic Clear Glass	

G-T-C	Name	U-SI	U-IP	SC	SHGC	Tsol	Rfsol	Tvis	Rfvis	Pane #1		Pane #1 IGDB	Gap #1		Pane #2		Pane #2 IGDB	
										Id	Wid	Glass Name	Gas	Wid	Id	Wid	Glass Name	
<i>Double Guardian</i>																		
6450	Sun-Guard SN-68 Clr/Air/Clr 6	1.66	0.29	0.43	0.37	0.32	0.30	0.67	0.10	3110	5.6	Sun-Guard SN-68 on Clear	Air	12.7	103	5.7	Generic Clear Glass	
6451	Sun-Guard LE63 Clr/Air/Clr 6	1.97	0.35	0.58	0.51	0.42	0.14	0.62	0.13	3122	5.6	Sun-Guard LE63 on Clear	Air	12.7	103	5.7	Generic Clear Glass	
6452	Sun-Guard LE63/Air/Clr 6	1.97	0.35	0.39	0.34	0.25	0.08	0.52	0.11	3123	5.6	Sun-Guard LE63 on Green	Air	12.7	103	5.7	Generic Clear Glass	
6453	Sun-Guard NP-61 Clr/Air/Clr 6	1.74	0.31	0.46	0.40	0.34	0.29	0.60	0.21	3124	5.6	Sun-Guard NP-61 on Clear	Air	12.7	103	5.7	Generic Clear Glass	
6454	Sun-Guard LE-50 Clr/Air/Clr 6	1.9	0.33	0.45	0.39	0.31	0.19	0.50	0.15	3128	5.6	Sun-Guard LE-50 on Clear	Air	12.7	103	5.7	Generic Clear Glass	
6455	Sun-Guard LE-50/Air/Clr 6	1.9	0.33	0.33	0.29	0.20	0.09	0.42	0.12	3129	5.6	Sun-Guard LE-50 on Green	Air	12.7	103	5.7	Generic Clear Glass	
6456	Sun-Guard AG-43 Clr/Air/Clr 6	1.72	0.30	0.34	0.30	0.24	0.35	0.43	0.31	3130	5.6	Sun-Guard AG-43 on Clear	Air	12.7	103	5.7	Generic Clear Glass	
6457	Sun-Guard AG-43/Air/Clr 6	1.72	0.30	0.27	0.23	0.16	0.15	0.37	0.24	3131	5.6	Sun-Guard AG-43 on Green	Air	12.7	103	5.7	Generic Clear Glass	
6458	Sun-Guard LE-40 Clr/Air/Clr 6	1.88	0.33	0.36	0.32	0.24	0.22	0.40	0.18	3132	5.6	Sun-Guard LE-40 on Clear	Air	12.7	103	5.7	Generic Clear Glass	
6459	Sun-Guard LE-40/Air/Clr 6	1.88	0.33	0.28	0.24	0.16	0.10	0.34	0.15	3133	5.6	Sun-Guard LE-40 on Green	Air	12.7	103	5.7	Generic Clear Glass	
6460	Sun-Guard Silver-32/Air/Clr 6	2.4	0.42	0.34	0.30	0.19	0.18	0.28	0.22	3136	5.6	Sun-Guard Silver-32 on Clear	Air	12.7	103	5.7	Generic Clear Glass	
6461	Sun-Guard Silver-20/Air/Clr 6	2.26	0.40	0.24	0.21	0.12	0.28	0.18	0.32	3138	5.6	Sun-Guard Silver-20 on Clear	Air	12.7	103	5.7	Generic Clear Glass	
6470	Perf Plus II Clr/Air1/Clr 3	2.32	0.41	0.48	0.42	0.37	0.39	0.69	0.19	3213	3.0	Performance Plus II on Clear	Air	6.3	102	3.0	Generic Clear Glass	
6471	Perf Plus II Clr/Air1/Clr 6	2.29	0.40	0.46	0.40	0.34	0.33	0.67	0.18	3216	5.6	Performance Plus II on Clear	Air	6.3	103	5.7	Generic Clear Glass	
6472	Perf Plus II Clr/Air/Clr 3	1.69	0.30	0.47	0.41	0.37	0.39	0.69	0.19	3213	3.0	Performance Plus II on Clear	Air	12.7	102	3.0	Generic Clear Glass	
6473	Perf Plus II Clr/Air/Clr 6	1.67	0.29	0.45	0.40	0.34	0.33	0.67	0.18	3216	5.6	Performance Plus II on Clear	Air	12.7	103	5.7	Generic Clear Glass	
6474	Perf Plus II Clr/Arg/Clr 3	1.42	0.25	0.47	0.41	0.37	0.39	0.69	0.19	3213	3.0	Performance Plus II on Clear	Arg	12.7	102	3.0	Generic Clear Glass	
6475	Perf Plus II Clr/Arg/Clr 6	1.41	0.25	0.45	0.39	0.34	0.33	0.67	0.18	3216	5.6	Performance Plus II on Clear	Arg	12.7	103	5.7	Generic Clear Glass	
6480	Perf Plus II Grn/Air1/Clr 3	2.32	0.41	0.42	0.36	0.29	0.19	0.63	0.16	3223	3.0	Performance Plus II Green	Air	6.3	102	3.0	Generic Clear Glass	
6481	Perf Plus II Grn/Air1/Clr 6	2.29	0.40	0.37	0.32	0.23	0.12	0.56	0.14	3226	5.6	Performance Plus II Green	Air	6.3	103	5.7	Generic Clear Glass	
6482	Perf Plus II Grn/Air/Clr 3	1.69	0.30	0.40	0.35	0.29	0.19	0.63	0.16	3223	3.0	Performance Plus II Green	Air	12.7	102	3.0	Generic Clear Glass	
6483	Perf Plus II Grn/Air/Clr 6	1.67	0.29	0.34	0.30	0.23	0.12	0.56	0.14	3226	5.6	Performance Plus II Green	Air	12.7	103	5.7	Generic Clear Glass	
6484	Perf Plus II Grn/Arg/Clr 3	1.42	0.25	0.39	0.34	0.29	0.19	0.63	0.16	3223	3.0	Performance Plus II Green	Arg	12.7	102	3.0	Generic Clear Glass	
6485	Perf Plus II Grn/Arg/Clr 6	1.41	0.25	0.33	0.29	0.23	0.12	0.56	0.14	3226	5.6	Performance Plus II Green	Arg	12.7	103	5.7	Generic Clear Glass	



G-T-C	Name	U-SI	U-IP	SC	SHGC	Tsol	Rfsol	Tvis	Rfvis	Pane #1		Pane #1 IGDB Glass Name	Gap #1		Pane #2		Pane #2 IGDB Glass Name	
										Id	Wid		Gas	Wid	Id	Wid		
<i>Double PPG</i>																		
6501	Starphire/Air/Clr 6	2.69	0.47	0.90	0.78	0.69	0.14	0.81	0.15	5004	5.7	Starphire	Air	12.7	103	5.7	Generic Clear Glass	
6502	SB 60 on Starphire/Air/Clr 6	1.65	0.29	0.45	0.40	0.35	0.43	0.72	0.11	5349	5.7	Solarban 60 on Starphire Solarban 70XL on Starphire	Air	12.7	103	5.7	Generic Clear Glass	
6503	SB 70XL on Starphire/Air/Clr 6	1.64	0.29	0.32	0.28	0.24	0.51	0.64	0.11	5000	5.7	Starphire	Air	12.7	103	5.7	Generic Clear Glass	
6511	Solarcool SolarBrz/Air/Clr 6	2.69	0.47	0.35	0.30	0.21	0.31	0.18	0.37	5108	5.7	Solarcool Solarbronze	Air	12.7	103	5.7	Generic Clear Glass	
6521	Solargray/Air/Clr 6	2.69	0.47	0.52	0.45	0.33	0.07	0.40	0.07	5052	5.7	Solargray	Air	12.7	103	5.7	Generic Clear Glass	
6522	Graylite/Air/Clr 6	2.69	0.47	0.39	0.34	0.19	0.05	0.12	0.05	5057	5.7	Graylite	Air	12.7	103	5.7	Generic Clear Glass	
6523	Solarcool Solargray/Air/Clr 6	2.69	0.47	0.31	0.27	0.17	0.30	0.15	0.37	5120	5.7	Solarcool Solargray	Air	12.7	103	5.7	Generic Clear Glass	
6524	Optigray/Air/Clr 6	2.69	0.47	0.34	0.29	0.15	0.05	0.21	0.05	5294	5.7	Optigray 23	Air	12.7	103	5.7	Generic Clear Glass	
6525	SB 60 on Solargray/Air/Clr 3	1.66	0.29	0.34	0.30	0.23	0.20	0.48	0.08	5286	3.3	Solarban 60 on Solargray	Air	12.7	103	5.7	Generic Clear Glass	
6531	SolarGrn/Air/Clr 6	2.69	0.47	0.46	0.40	0.29	0.06	0.60	0.11	5028	5.7	Solargreen	Air	12.7	103	5.7	Generic Clear Glass	
6541	Azurlite/Air/Clr 6	2.69	0.47	0.41	0.36	0.19	0.06	0.48	0.10	5036	5.7	Azurlite	Air	12.7	5036	5.7	Azurlite	
6542	Caribia/Air/Clr 6	2.69	0.47	0.41	0.36	0.18	0.06	0.47	0.10	5326	5.7	Caribia	Air	12.7	5036	5.7	Azurlite	
6544	Solarcool Caribia/Air/Clr 6	2.69	0.47	0.25	0.21	0.12	0.30	0.23	0.37	5336	5.7	Solarcool Caribia	Air	12.7	103	5.7	Generic Clear Glass	
6560	Sungate 100 Clr/Air1/Clr 3	3.09	0.54	0.64	0.55	0.49	0.29	0.75	0.10	5142	3.3	Sungate 100 on Clear	Air	6.3	102	3.0	Generic Clear Glass	
6561	Sungate 100 Clr/Air1/Clr 6	3.04	0.54	0.60	0.52	0.44	0.29	0.73	0.10	5148	5.7	Sungate 100 on Clear	Air	6.3	103	5.7	Generic Clear Glass	
6562	Sungate 100 Clr/Air/Clr 3	2.7	0.48	0.63	0.55	0.49	0.29	0.75	0.10	5142	3.3	Sungate 100 on Clear	Air	12.7	102	3.0	Generic Clear Glass	
6563	Sungate 100 Clr/Air/Clr 6	2.67	0.47	0.60	0.52	0.44	0.29	0.73	0.10	5148	5.7	Sungate 100 on Clear	Air	12.7	103	5.7	Generic Clear Glass	
6564	Sungate 100 Clr/Arg/Clr 3	2.56	0.45	0.63	0.55	0.49	0.29	0.75	0.10	5142	3.3	Sungate 100 on Clear	Arg	12.7	102	3.0	Generic Clear Glass	
6565	Sungate 100 Clr/Arg/Clr 6	2.53	0.45	0.60	0.52	0.44	0.29	0.73	0.10	5148	5.7	Sungate 100 on Clear	Arg	12.7	103	5.7	Generic Clear Glass	

G-T-C	Name	U-SI	U-IP	SC	SHGC	Tsol	Rfsol	Tvis	Rfvis	Pane #1		Pane #1 IGDB Glass Name	Gap #1		Pane #2		Pane #2 IGDB Glass Name	
										Id	Wid		Gas	Wid	Id	Wid		
<i>Double PPG (cont.)</i>																		
6570	Sungate 500 Clr/Air1/Clr 3	2.55	0.45	0.76	0.66	0.60	0.15	0.76	0.17	5242	3.3	Sungate 500 on Clear	Air	6.3	102	3.0	Generic Clear Glass	
6571	Sungate 500 Clr/Air1/Clr 6	2.52	0.44	0.71	0.62	0.52	0.13	0.73	0.16	5248	5.7	Sungate 500 on Clear	Air	6.3	103	5.7	Generic Clear Glass	
6572	Sungate 500 Clr/Air/Clr 3	1.99	0.35	0.76	0.66	0.60	0.15	0.76	0.17	5242	3.3	Sungate 500 on Clear	Air	12.7	102	3.0	Generic Clear Glass	
6573	Sungate 500 Clr/Air/Clr 6	1.97	0.35	0.71	0.62	0.52	0.13	0.73	0.16	5248	5.7	Sungate 500 on Clear	Air	12.7	103	5.7	Generic Clear Glass	
6574	Sungate 500 Clr/Arg/Clr 3	1.77	0.31	0.76	0.66	0.60	0.15	0.76	0.17	5242	3.3	Sungate 500 on Clear	Arg	12.7	102	3.0	Generic Clear Glass	
6575	Sungate 500 Clr/Arg/Clr 6	1.76	0.31	0.71	0.62	0.52	0.13	0.73	0.16	5248	5.7	Sungate 500 on Clear	Arg	12.7	103	5.7	Generic Clear Glass	
6576	Clr/Air/Sungate 500 Clr 3	1.99	0.35	0.81	0.71	0.60	0.17	0.76	0.18	102	3.0	Generic Clear Glass	Air	12.7	5242	3.3	Sungate 500 on Clear	
6577	Clr/Air/Sungate 500 Clr 6	1.97	0.35	0.75	0.66	0.52	0.15	0.73	0.17	103	5.7	Generic Clear Glass	Air	12.7	5248	5.7	Sungate 500 on Clear	
6578	Clr/Arg/Sungate 500 Clr 3	1.77	0.31	0.82	0.71	0.60	0.17	0.76	0.18	102	3.0	Generic Clear Glass	Arg	12.7	5242	3.3	Sungate 500 on Clear	
6579	Clr/Arg/Sungate 500 Clr 6	1.76	0.31	0.76	0.66	0.52	0.15	0.73	0.17	103	5.7	Generic Clear Glass	Arg	12.7	5248	5.7	Sungate 500 on Clear	
6580	Solarban 60 Clr/Air1/Clr 3	2.3	0.41	0.46	0.40	0.35	0.35	0.72	0.11	5281	3.3	Solarban 60 on Clear	Air	6.3	102	3.0	Generic Clear Glass	
6581	Solarban 60 Clr/Air1/Clr 6	2.28	0.40	0.45	0.39	0.33	0.29	0.70	0.11	5284	5.7	Solarban 60 on Clear	Air	6.3	103	5.7	Generic Clear Glass	
6582	Solarban 60 Clr/Air/Clr 3	1.67	0.29	0.45	0.39	0.35	0.35	0.72	0.11	5281	3.3	Solarban 60 on Clear	Air	12.7	102	3.0	Generic Clear Glass	
6583	Solarban 60 Clr/Air/Clr 6	1.65	0.29	0.44	0.38	0.33	0.29	0.70	0.11	5284	5.7	Solarban 60 on Clear	Air	12.7	103	5.7	Generic Clear Glass	
6584	Solarban 60 Clr/Arg/Clr 3	1.4	0.25	0.44	0.39	0.35	0.35	0.72	0.11	5281	3.3	Solarban 60 on Clear	Arg	12.7	102	3.0	Generic Clear Glass	
6585	Solarban 60 Clr/Arg/Clr 6	1.39	0.25	0.43	0.38	0.33	0.29	0.70	0.11	5284	5.7	Solarban 60 on Clear	Arg	12.7	103	5.7	Generic Clear Glass	
6590	Solarban 80 Clr/Air1/Clr 3	2.29	0.40	0.29	0.25	0.21	0.44	0.49	0.33	5313	3.3	SOLARBAN 80 on clear	Air	6.3	102	3.0	Generic Clear Glass	
6591	Solarban 80 Clr/Air1/Clr 6	2.26	0.40	0.29	0.25	0.19	0.38	0.47	0.33	5316	5.7	SOLARBAN 80 on clear	Air	6.3	103	5.7	Generic Clear Glass	
6592	Solarban 80 Clr/Air/Clr 3	1.65	0.29	0.28	0.24	0.21	0.44	0.49	0.33	5313	3.3	SOLARBAN 80 on clear	Air	12.7	102	3.0	Generic Clear Glass	
6593	Solarban 80 Clr/Air/Clr 6	1.63	0.29	0.27	0.24	0.19	0.38	0.47	0.33	5316	5.7	SOLARBAN 80 on clear	Air	12.7	103	5.7	Generic Clear Glass	
6594	Solarban 80 Clr/Arg/Clr 3	1.38	0.24	0.27	0.23	0.21	0.44	0.49	0.33	5313	3.3	SOLARBAN 80 on clear	Arg	12.7	102	3.0	Generic Clear Glass	
6595	Solarban 80 Clr/Arg/Clr 6	1.37	0.24	0.27	0.23	0.19	0.38	0.47	0.33	5316	5.7	SOLARBAN 80 on clear	Arg	12.7	103	5.7	Generic Clear Glass	

G-T-C	Name	U-SI	U-IP	SC	SHGC	Tsol	Rfsol	Tvis	Rfvis	Pane #1		Pane #1 IGDB Glass Name	Gap #1		Pane #2		Pane #2 IGDB Glass Name	
										Id	Wid		Gas	Wid	Id	Wid		
<i>Double Viracon</i>																		
6600	VE12M Clr/Air/Clr 6	1.66	0.29	0.43	0.38	0.33	0.31	0.70	0.11	6046	5.7	LowE on Clear	Air	12.7	103	5.7	Generic Clear Glass	
6601	VE140 Clr/Air/Clr 6	1.76	0.31	0.32	0.28	0.21	0.25	0.36	0.15	6047	5.7	LowE on Clear	Air	12.7	103	5.7	Generic Clear Glass	
6602	VE152/Air/Clr 6	1.78	0.31	0.46	0.40	0.32	0.20	0.50	0.16	6048	5.7	LowE on Clear	Air	12.7	103	5.7	Generic Clear Glass	
6603	VE155 Clr/Air/Clr 6	1.76	0.31	0.40	0.35	0.28	0.22	0.47	0.11	6049	5.7	LowE on Clear	Air	12.7	103	5.7	Generic Clear Glass	
6604	VE185 Clr/Air/Clr 6	1.75	0.31	0.62	0.54	0.47	0.21	0.76	0.12	6050	5.7	LowE on Clear	Air	12.7	103	5.7	Generic Clear Glass	
6610	VE42M Brz/Air/Clr 6	1.66	0.29	0.30	0.27	0.20	0.15	0.41	0.07	6061	5.7	LowE on Bronze	Air	12.7	103	5.7	Generic Clear Glass	
6611	VE440 Brz/Air/Clr 6	1.76	0.31	0.24	0.21	0.13	0.13	0.22	0.08	6062	5.7	LowE on Bronze	Air	12.7	103	5.7	Generic Clear Glass	
6612	VE452 Brz/Air/Clr 6	1.78	0.31	0.32	0.28	0.20	0.11	0.30	0.08	6063	5.7	LowE on Bronze	Air	12.7	103	5.7	Generic Clear Glass	
6613	VE455 Brz/Air/Clr 6	1.76	0.31	0.29	0.25	0.17	0.12	0.27	0.07	6064	5.7	LowE on Bronze	Air	12.7	103	5.7	Generic Clear Glass	
6614	VE485 Brz/Air/Clr 6	1.75	0.31	0.43	0.37	0.28	0.11	0.45	0.07	6065	5.7	LowE on Bronze	Air	12.7	103	5.7	Generic Clear Glass	
6620	VE32M Gry/Air/Clr 6	1.66	0.29	0.28	0.24	0.17	0.12	0.35	0.06	6056	5.7	LowE on Gray	Air	12.7	103	5.7	Generic Clear Glass	
6621	VE340 Gry/Air/Clr 6	1.76	0.31	0.22	0.19	0.11	0.11	0.18	0.07	6057	5.7	LowE on Gray	Air	12.7	103	5.7	Generic Clear Glass	
6622	VE352 Gry/Air/Clr 6	1.78	0.31	0.29	0.26	0.17	0.09	0.25	0.07	6058	5.7	LowE on Gray	Air	12.7	103	5.7	Generic Clear Glass	
6623	VE355 Gry/Air/Clr 6	1.76	0.31	0.26	0.23	0.14	0.10	0.23	0.06	6059	5.7	LowE on Gray	Air	12.7	103	5.7	Generic Clear Glass	
6624	VE385 Gry/Air/Clr 6	1.75	0.31	0.38	0.33	0.25	0.10	0.38	0.07	6060	5.7	LowE on Gray	Air	12.7	103	5.7	Generic Clear Glass	
6630	VE22M Grn/Air/Clr 6	1.66	0.29	0.36	0.31	0.24	0.10	0.60	0.09	6051	5.7	LowE on Green	Air	12.7	103	5.7	Generic Clear Glass	
6631	VE240 Grn/Air/Clr 6	1.76	0.31	0.26	0.22	0.14	0.10	0.32	0.12	6052	5.7	LowE on Green	Air	12.7	103	5.7	Generic Clear Glass	
6632	VE252 Grn/Air/Clr 6	1.78	0.31	0.34	0.29	0.21	0.09	0.43	0.12	6053	5.7	LowE on Green	Air	12.7	103	5.7	Generic Clear Glass	
6633	VE255 Grn/Air/Clr 6	1.76	0.31	0.30	0.26	0.18	0.09	0.40	0.10	6054	5.7	LowE on Green	Air	12.7	103	5.7	Generic Clear Glass	
6634	VE285 Grn/Air/Clr 6	1.75	0.31	0.45	0.39	0.31	0.09	0.65	0.10	6055	5.7	LowE on Green	Air	12.7	103	5.7	Generic Clear Glass	

G-T-C	Name	U-SI	U-IP	SC	SHGC	Tsol	Rfsol	Tvis	Rfvis	Pane #1		Pane #1 IGDB Glass Name	Gap #1		Pane #2		Pane #2 IGDB Glass Name	
										Id	Wid		Gas	Wid	Id	Wid		
<i>Double Pilkington</i>																		
6820	SuperGry/Air1/Clr 3	3.12	0.55	0.38	0.33	0.19	0.05	0.23	0.05	9891	3.2	SuperGrey	Air	6.3	102	3.0	Generic Clear Glass	
6821	SuperGry/Air1/Clr 6	3.07	0.54	0.26	0.22	0.06	0.04	0.08	0.04	9894	5.7	SuperGrey	Air	6.3	103	5.7	Generic Clear Glass	
6822	SuperGry/Air/Clr 3	2.72	0.48	0.37	0.32	0.19	0.05	0.23	0.05	9891	3.2	SuperGrey	Air	12.7	102	3.0	Generic Clear Glass	
6823	SuperGry/Air/Clr 6	2.69	0.47	0.24	0.21	0.06	0.04	0.08	0.04	9894	5.7	SuperGrey	Air	12.7	103	5.7	Generic Clear Glass	
6824	SuperGry/Air1/Energy Adv LowE 3	2.48	0.44	0.33	0.28	0.16	0.05	0.21	0.05	9891	3.2	SuperGrey	Air	6.3	9921	3.0	Energy AdvantageLow-E	
6825	SuperGry/Air1/Energy Adv LowE 6	2.45	0.43	0.21	0.18	0.05	0.04	0.07	0.04	9894	5.7	SuperGrey	Air	6.3	9924	5.6	Energy AdvantageLow-E	
6826	SuperGry/Air/Energy Adv LowE 3	1.9	0.33	0.30	0.26	0.16	0.05	0.21	0.05	9891	3.2	SuperGrey	Air	12.7	9921	3.0	Energy AdvantageLow-E	
6827	SuperGry/Air/Energy Adv LowE 6	1.88	0.33	0.18	0.15	0.05	0.04	0.07	0.04	9894	5.7	SuperGrey	Air	12.7	9924	5.6	Energy AdvantageLow-E	
6828	SuperGry/Arg/Energy Adv LowE 3	1.66	0.29	0.29	0.25	0.16	0.05	0.21	0.05	9891	3.2	SuperGrey	Arg	12.7	9921	3.0	Energy AdvantageLow-E	
6829	SuperGry/Arg/Energy Adv LowE 6	1.65	0.29	0.16	0.14	0.05	0.04	0.07	0.04	9894	5.7	SuperGrey	Arg	12.7	9924	5.6	Energy AdvantageLow-E	
6830	EverGrn/Air1/Clr 3	3.12	0.55	0.59	0.52	0.42	0.08	0.69	0.12	9881	3.2	EverGreen	Air	6.3	102	3.0	Generic Clear Glass	
6831	EverGrn/Air1/Clr 6	3.06	0.54	0.47	0.41	0.28	0.06	0.58	0.10	9889	5.9	EverGreen	Air	6.3	103	5.7	Generic Clear Glass	
6832	EverGrn/Air/Clr 3	2.72	0.48	0.59	0.51	0.42	0.08	0.69	0.12	9881	3.2	EverGreen	Air	12.7	102	3.0	Generic Clear Glass	
6833	EverGrn/Air/Clr 6	2.68	0.47	0.46	0.40	0.28	0.06	0.58	0.10	9889	5.9	EverGreen	Air	12.7	103	5.7	Generic Clear Glass	
6834	EverGrn/Air1/Energy Adv LowE 3	2.48	0.44	0.53	0.47	0.35	0.09	0.64	0.14	9881	3.2	EverGreen	Air	6.3	9921	3.0	Energy AdvantageLow-E	
6835	EverGrn/Air1/Energy Adv LowE 6	2.45	0.43	0.42	0.36	0.24	0.07	0.54	0.11	9889	5.9	EverGreen	Air	6.3	9924	5.6	Energy AdvantageLow-E	
6836	EverGrn/Air/Energy Adv LowE 3	1.9	0.33	0.52	0.46	0.35	0.09	0.64	0.14	9881	3.2	EverGreen	Air	12.7	9921	3.0	Energy AdvantageLow-E	
6837	EverGrn/Air/Energy Adv LowE 6	1.88	0.33	0.40	0.35	0.24	0.07	0.54	0.11	9889	5.9	EverGreen	Air	12.7	9924	5.6	Energy AdvantageLow-E	
6838	EverGrn/Arg/Energy Adv LowE 3	1.66	0.29	0.52	0.45	0.35	0.09	0.64	0.14	9881	3.2	EverGreen	Arg	12.7	9921	3.0	Energy AdvantageLow-E	
6839	EverGrn/Arg/Energy Adv LowE 6	1.65	0.29	0.39	0.34	0.24	0.07	0.54	0.11	9889	5.9	EverGreen	Arg	12.7	9924	5.6	Energy AdvantageLow-E	

G-T-C	Name	U-SI	U-IP	SC	SHGC	Tsol	Rfsol	Tvis	Rfvis	Pane #1		Pane #1 IGDB	Gap #1		Pane #2		Pane #2 IGDB	
										Id	Wid	Class Name	Gas	Wid	Id	Wid	Class Name	
<i>Double Pilkington (cont.)</i>																		
6840	Arctic Blu/Air1/Clr 6	3.06	0.54	0.46	0.40	0.27	0.06	0.47	0.08	9989	5.9	Arctic Blue	Air	6.3	103	5.7	Generic Clear Glass	
6841	Arctic Blu/Air/Clr 6	2.68	0.47	0.45	0.39	0.27	0.06	0.47	0.08	9989	5.9	Arctic Blue	Air	12.7	103	5.7	Generic Clear Glass	
6842	Arctic Blu/Air1/Energy Adv LoE 6	2.45	0.43	0.41	0.36	0.23	0.07	0.43	0.09	9989	5.9	Arctic Blue	Air	6.3	9924	5.6	Energy AdvantageLow-E	
6843	Arctic Blu/Air/Energy Adv LowE 6	1.88	0.33	0.39	0.34	0.23	0.07	0.43	0.09	9989	5.9	Arctic Blue	Air	12.7	9924	5.6	Energy AdvantageLow-E	
6844	Arctic Blu/Arg/Energy Adv LowE 6	1.65	0.29	0.38	0.33	0.23	0.07	0.43	0.09	9989	5.9	Arctic Blue	Arg	12.7	9924	5.6	Energy AdvantageLow-E	
6845	Optifloat Blu-Grn/Air1/Clr 6	3.06	0.54	0.58	0.51	0.39	0.08	0.67	0.12	9879	5.9	Optifloat Blue-Green	Air	6.3	103	5.7	Generic Clear Glass	
6846	Optifloat Blu-Grn/Air/Clr 6	2.68	0.47	0.58	0.50	0.39	0.08	0.67	0.12	9879	5.9	Optifloat Blue-Green	Air	12.7	103	5.7	Generic Clear Glass	
6847	Opti BluGrn/Air1/EnergyAdv LoE 6	2.45	0.43	0.53	0.46	0.34	0.09	0.62	0.13	9879	5.9	Optifloat Blue-Green	Air	6.3	9924	5.6	Energy AdvantageLow-E	
6848	Opti BluGrn/Air/EnergyAdv LowE 6	1.88	0.33	0.52	0.45	0.34	0.09	0.62	0.13	9879	5.9	Optifloat Blue-Green	Air	12.7	9924	5.6	Energy AdvantageLow-E	
6849	Opti BluGrn/Arg/EnergyAdv LowE 6	1.65	0.29	0.52	0.45	0.34	0.09	0.62	0.13	9879	5.9	Optifloat Blue-Green	Arg	12.7	9924	5.6	Energy AdvantageLow-E	
6850	Eclipse AdvClr/Air/Clr 6	1.96	0.35	0.63	0.55	0.46	0.21	0.60	0.29	9909	5.9	Eclipse AdvantageClear	Air	12.7	103	5.7	Generic Clear Glass	
6851	Eclipse AdvBrz/Air/Clr 6	1.96	0.35	0.43	0.38	0.28	0.11	0.34	0.13	9908	5.9	Eclipse AdvantageBronze	Air	12.7	103	5.7	Generic Clear Glass	
6852	Eclipse AdvGry/Air/Clr 6	1.96	0.35	0.38	0.33	0.23	0.09	0.29	0.11	9911	5.9	Eclipse AdvantageGrey Eclipse	Air	12.7	103	5.7	Generic Clear Glass	
6853	Eclipse AdvEverGrn/Air/Clr 6	1.96	0.35	0.33	0.29	0.20	0.09	0.43	0.17	9910	5.9	AdvantageEverGreen Eclipse Advantagerctic	Air	12.7	103	5.7	Generic Clear Glass	
6854	Eclipse AdvArctic Blu/Air/Clr 6	1.96	0.35	0.33	0.29	0.19	0.09	0.35	0.13	9906	5.9	Blue Eclipse AdvantageBlue-	Air	12.7	103	5.7	Generic Clear Glass	
6855	Eclipse AdvBlu-Grn/Air/Clr 6	1.96	0.35	0.44	0.38	0.29	0.12	0.51	0.21	9907	5.9	Green	Air	12.7	103	5.7	Generic Clear Glass	

G-T-C	Name	U-SI	U-IP	SC	SHGC	Tsol	Rfsol	Tvis	Rfvis	Pane #1		Pane #1 IGDB	Gap #1		Pane #2		Pane #2 IGDB	
										Id	Wid	Glass Name	Gas	Wid	Id	Wid	Glass Name	
<i>Double Pilkington (cont.)</i>																		
6860	Energy Adv Low-E/Air1/Clr 3	2.48	0.44	0.75	0.65	0.59	0.15	0.75	0.17	9921	3.0	Energy AdvantageLow-E	Air	6.3	102	3.0	Generic Clear Glass	
6861	Energy Adv Low-E/Air1/Clr 6	2.45	0.43	0.71	0.62	0.52	0.13	0.73	0.16	9924	5.6	Energy AdvantageLow-E	Air	6.3	103	5.7	Generic Clear Glass	
6862	Energy Adv Low-E/Air/Clr 3	1.9	0.33	0.75	0.65	0.59	0.15	0.75	0.17	9921	3.0	Energy AdvantageLow-E	Air	12.7	102	3.0	Generic Clear Glass	
6863	Energy Adv Low-E/Air/Clr 6	1.88	0.33	0.71	0.62	0.52	0.13	0.73	0.16	9924	5.6	Energy AdvantageLow-E	Air	12.7	103	5.7	Generic Clear Glass	
6864	Energy Adv Low-E/Arg/Clr 3	1.66	0.29	0.75	0.65	0.59	0.15	0.75	0.17	9921	3.0	Energy AdvantageLow-E	Arg	12.7	102	3.0	Generic Clear Glass	
6865	Energy Adv Low-E/Arg/Clr 6	1.65	0.29	0.71	0.62	0.52	0.13	0.73	0.16	9924	5.6	Energy AdvantageLow-E	Arg	12.7	103	5.7	Generic Clear Glass	
6866	Clr/Air1/Energy Adv LowE 3	2.48	0.44	0.80	0.70	0.59	0.16	0.75	0.18	102	3.0	Generic Clear Glass	Air	6.3	9921	3.0	Energy AdvantageLow-E	
6867	Clr/Air1/Energy Adv LowE 6	2.45	0.43	0.75	0.65	0.52	0.14	0.73	0.17	103	5.7	Generic Clear Glass	Air	6.3	9924	5.6	Energy AdvantageLow-E	
6868	Clr/Air/Energy Adv LowE 3	1.9	0.33	0.81	0.71	0.59	0.16	0.75	0.18	102	3.0	Generic Clear Glass	Air	12.7	9921	3.0	Energy AdvantageLow-E	
6869	Clr/Air/Energy Adv LowE 6	1.88	0.33	0.76	0.66	0.52	0.14	0.73	0.17	103	5.7	Generic Clear Glass	Air	12.7	9924	5.6	Energy AdvantageLow-E	
6870	Clr/Arg/Energy Adv LowE 3	1.66	0.29	0.82	0.71	0.59	0.16	0.75	0.18	102	3.0	Generic Clear Glass	Arg	12.7	9921	3.0	Energy AdvantageLow-E	
6871	Clr/Arg/Energy Adv LowE 6	1.65	0.29	0.77	0.67	0.52	0.14	0.73	0.17	103	5.7	Generic Clear Glass	Arg	12.7	9924	5.6	Energy AdvantageLow-E	
6875	Solar E/Air1/Clr 3	2.47	0.44	0.57	0.49	0.41	0.10	0.54	0.11	9931	3.0	Solar E	Air	6.3	102	3.0	Generic Clear Glass	
6876	Solar E/Air1/Clr 6	2.45	0.43	0.54	0.47	0.36	0.09	0.54	0.10	9935	5.7	Solar E	Air	6.3	103	5.7	Generic Clear Glass	
6877	Solar E/Air/Clr 3	1.89	0.33	0.55	0.48	0.41	0.10	0.54	0.11	9931	3.0	Solar E	Air	12.7	102	3.0	Generic Clear Glass	
6878	Solar E/Air/Clr 6	1.88	0.33	0.53	0.46	0.36	0.09	0.54	0.10	9935	5.7	Solar E	Air	12.7	103	5.7	Generic Clear Glass	
6879	Solar E/Arg/Clr 3	1.66	0.29	0.55	0.48	0.41	0.10	0.54	0.11	9931	3.0	Solar E	Arg	12.7	102	3.0	Generic Clear Glass	
6880	Solar E/Arg/Clr 6	1.66	0.29	0.52	0.45	0.36	0.09	0.54	0.10	9935	5.7	Solar E	Arg	12.7	103	5.7	Generic Clear Glass	
6890	Activ Clr/Air/Clr 3	2.73	0.48	0.84	0.73	0.68	0.17	0.76	0.21	9937	3.0	Activon Clear	Air	12.7	102	3.0	Generic Clear Glass	
6891	Activ Clr/Air/Clr 6	2.69	0.47	0.78	0.68	0.59	0.16	0.74	0.21	9941	5.6	Activon Clear	Air	12.7	103	5.7	Generic Clear Glass	

G-T-C	Name	U-SI	U-IP	SC	SHGC	Tsol	Rfsol	Tvis	Rfvis	Pane #1		Pane #1 IGDB Glass Name	Gap #1		Pane #2		Pane #2 IGDB Glass Name	Gap #2		Pane #3		Pane #3 IGDB Glass Name
										Id	Wid		Gas	Wid	Id	Wid		Gas	Wid	Id	Wid	
<i>Triple Clr/Tint New</i>																						
7000	Clr/Air1/Clr /Air1/Clr 3	2.14	0.38	0.78	0.68	0.60	0.17	0.74	0.21	102	3.0	Generic Clear Glass	Air	6.3	102	3.0	Generic Clear Glass	Air	6.3	102	3.0	Generic Clear Glass
7001	Clr/Air/Clr /Air/Clr 3	1.77	0.31	0.78	0.68	0.60	0.17	0.74	0.21	102	3.0	Generic Clear Glass	Air	12.7	102	3.0	Generic Clear Glass	Air	12.7	102	3.0	Generic Clear Glass
7002	Clr/Arg/Clr /Arg/Clr 3	1.64	0.29	0.79	0.68	0.60	0.17	0.74	0.21	102	3.0	Generic Clear Glass	Arg	-0.1	102	3.0	Generic Clear Glass	Arg	-0.1	102	3.0	Generic Clear Glass

G-T-C	Name	Pane #1										Pane #1 IGDB Glass Name	Gap #1		Pane #2		Pane #2 IGDB Glass Name	Gap #2		Pane #3		Pane #3 IGDB Glass Name
		U-SI	U-IP	SC	SHGC	Tsol	Rfsol	Tvis	Rfvis	Id	Wid		Gas	Wid	Id	Wid		Gas	Wid	Id	Wid	
<i>Triple Southwall</i>																						
7054	Clr/Air1/HM44 Susp/Air1/Clr 6	1.71	0.30	0.28	0.24	0.17	0.50	0.37	0.48	103	5.7	Generic Clear Glass	Air	6.3	1502	0.1	Heat Mirror44 Susp Film	Air	6.3	103	5.7	Generic Clear Glass
7055	Clr/Air/HM44 Susp/Air/Clr 6	1.36	0.24	0.28	0.24	0.17	0.50	0.37	0.48	103	5.7	Generic Clear Glass	Air	9.5	1502	0.1	Heat Mirror44 Susp Film	Air	9.5	103	5.7	Generic Clear Glass
7056	Clr/Air1/HM55 Susp/Air1/Clr 6	1.71	0.30	0.34	0.29	0.21	0.45	0.45	0.39	103	5.7	Generic Clear Glass	Air	6.3	1503	0.1	Heat Mirror55 Susp Film	Air	6.3	103	5.7	Generic Clear Glass
7057	Clr/Air/HM55 Susp/Air/Clr 6	1.37	0.24	0.34	0.29	0.21	0.45	0.45	0.39	103	5.7	Generic Clear Glass	Air	9.5	1503	0.1	Heat Mirror55 Susp Film	Air	9.5	103	5.7	Generic Clear Glass
7058	Clr/Air1/HM66 Susp/Air1/Clr 6	1.72	0.30	0.39	0.34	0.26	0.40	0.53	0.32	103	5.7	Generic Clear Glass	Air	6.3	1504	0.1	Heat Mirror66 Susp Film	Air	6.3	103	5.7	Generic Clear Glass
7059	Clr/Air/HM66 Susp/Air/Clr 6	1.38	0.24	0.39	0.34	0.26	0.40	0.53	0.32	103	5.7	Generic Clear Glass	Air	9.5	1504	0.1	Heat Mirror66 Susp Film	Air	9.5	103	5.7	Generic Clear Glass
7060	Clr/Air1/HM77 Susp/Air1/Clr 6	1.74	0.31	0.49	0.43	0.33	0.32	0.63	0.22	103	5.7	Generic Clear Glass	Air	6.3	1505	0.1	Heat Mirror77 Susp Film	Air	6.3	103	5.7	Generic Clear Glass
7061	Clr/Air/HM77 Susp/Air/Clr 6	1.41	0.25	0.50	0.43	0.33	0.32	0.63	0.22	103	5.7	Generic Clear Glass	Air	9.5	1505	0.1	Heat Mirror77 Susp Film	Air	9.5	103	5.7	Generic Clear Glass
7062	Clr/Air1/HM88 Susp/Air1/Clr 6	1.78	0.31	0.62	0.54	0.43	0.22	0.70	0.18	103	5.7	Generic Clear Glass	Air	6.3	1506	0.1	Heat Mirror88 Susp Film	Air	6.3	103	5.7	Generic Clear Glass
7063	Clr/Air/HM88 Susp/Air/Clr 6	1.46	0.26	0.62	0.54	0.43	0.22	0.70	0.18	103	5.7	Generic Clear Glass	Air	9.5	1506	0.1	Heat Mirror88 Susp Film	Air	9.5	103	5.7	Generic Clear Glass
7064	Clr/Air1/SC75 Susp/Air1/Clr 6	1.7	0.30	0.41	0.36	0.28	0.34	0.60	0.22	103	5.7	Generic Clear Glass	Air	6.3	1510	0.1	MirrorSingle Coat 75 Susp Heat	Air	6.3	103	5.7	Generic Clear Glass
7065	Clr/Air/SC75 Susp/Air/Clr 6	1.36	0.24	0.40	0.35	0.28	0.34	0.60	0.22	103	5.7	Generic Clear Glass	Air	9.5	1510	0.1	MirrorSingle Coat 75 Susp Heat	Air	9.5	103	5.7	Generic Clear Glass
7066	Clr/Air1/TC88 Susp/Air1/Clr 6	1.53	0.27	0.55	0.48	0.35	0.22	0.63	0.13	103	5.7	Generic Clear Glass	Air	6.3	1511	0.1	MirrorTwin Coat 88 Susp Heat	Air	6.3	103	5.7	Generic Clear Glass
7067	Clr/Air/TC88 Susp/Air/Clr 6	1.19	0.21	0.55	0.48	0.35	0.22	0.63	0.13	103	5.7	Generic Clear Glass	Air	9.5	1511	0.1	MirrorTwin Coat 88 Susp	Air	9.5	103	5.7	Generic Clear Glass



## WINDOW-LAYER LIBRARY

The following is a list of the window layers in the Library. The meaning of each entry is as follows.

The bold-faced text is the U-name of the window layer to be used as value of the keyword WINDOW-LAYERS in the WINDOW command. For example, to construct a double-pane window with both panes equal to the first glass layer in the library (which has U-name Clear-3mm) and with the gap between the glass layers equal to the first gap in the library (which has U-name Air-6.3) your input would look like:

```

WIN-1 = WINDOW
      WIN-SPEC-METHOD = LAYERS-INPUT
      WINDOW-LAYERS    = (Clear-3mm,Air-6.3,Clear-3mm)
      . . . .

```

On the far right, on the same line as the U-name, is the layer category. There are four categories: glass layer, gap layer, blind layer and pull-down shade. Note that the pull-down shades are actually blind layers with the slats closed.

The next one or two lines, beginning with \$, give a brief description of the layer. The glass and gap layers in this library were used with the WINDOW 4 program to produce the windows in the “Window Library” in this document. For glass layers, the ID number shown in the description corresponds to values labeled “Id” in the Window Library.

The remaining lines give the value of keywords (in English units) for this layer. The program will use these values in the window calculation. For a description of these keywords, see “WINDOW-LAYER Command” in the *Command/Keyword Dictionary*.

Table 13 Window Layers Library

<b>Clear-3mm</b>		Glass Layer	
\$Clear, 3mm			
\$ID=2			
TYPE = GLASS	THICKNESS = 0.00984	CONDUCTIVITY = 0.52	
TRANS-SOL-BB = 0.837	REFL-SOL-BB = 0.075	BACKREFL-SOL-BB = 0.075	
TRANS-VIS-BB = 0.898	REFL-VIS-BB = 0.081	BACKREFL-VIS-BB = 0.081	
TRANS-IR = 0.0	EMIS-IR = 0.84	BACKEMIS-IR = 0.84	..
<b>Clear-6mm</b>		Glass Layer	
\$Clear, 6mm			
\$ID=3			
TYPE = GLASS	THICKNESS = 0.01969	CONDUCTIVITY = 0.52	
TRANS-SOL-BB = 0.775	REFL-SOL-BB = 0.071	BACKREFL-SOL-BB = 0.071	
TRANS-VIS-BB = 0.881	REFL-VIS-BB = 0.080	BACKREFL-VIS-BB = 0.080	
TRANS-IR = 0.0	EMIS-IR = 0.84	BACKEMIS-IR = 0.84	..
<b>Clear-12mm</b>		Glass Layer	
\$Clear, 12mm			
\$ID=4			
TYPE = GLASS	THICKNESS = 0.03937	CONDUCTIVITY = 0.52	
TRANS-SOL-BB = 0.653	REFL-SOL-BB = 0.064	BACKREFL-SOL-BB = 0.064	
TRANS-VIS-BB = 0.841	REFL-VIS-BB = 0.077	BACKREFL-VIS-BB = 0.077	
TRANS-IR = 0.0	EMIS-IR = 0.84	BACKEMIS-IR = 0.84	..
<b>Bronze-3mm</b>		Glass Layer	
\$Bronze, 3mm			
\$ID=5			
TYPE = GLASS	THICKNESS = 0.00984	CONDUCTIVITY = 0.52	
TRANS-SOL-BB = 0.645	REFL-SOL-BB = 0.062	BACKREFL-SOL-BB = 0.062	
TRANS-VIS-BB = 0.685	REFL-VIS-BB = 0.065	BACKREFL-VIS-BB = 0.065	
TRANS-IR = 0.0	EMIS-IR = 0.84	BACKEMIS-IR = 0.84	..
<b>Bronze-6mm</b>		Glass Layer	
\$Bronze, 6mm			
\$ID=6			
TYPE = GLASS	THICKNESS = 0.01969	CONDUCTIVITY = 0.52	
TRANS-SOL-BB = 0.482	REFL-SOL-BB = 0.054	BACKREFL-SOL-BB = 0.054	
TRANS-VIS-BB = 0.534	REFL-VIS-BB = 0.057	BACKREFL-VIS-BB = 0.057	
TRANS-IR = 0.0	EMIS-IR = 0.84	BACKEMIS-IR = 0.84	..
<b>Bronze-10mm</b>		Glass Layer	
\$Bronze, 10mm			
\$ID=7			
TYPE = GLASS	THICKNESS = 0.03282	CONDUCTIVITY = 0.52	
TRANS-SOL-BB = 0.326	REFL-SOL-BB = 0.048	BACKREFL-SOL-BB = 0.048	
TRANS-VIS-BB = 0.379	REFL-VIS-BB = 0.050	BACKREFL-VIS-BB = 0.050	
TRANS-IR = 0.0	EMIS-IR = 0.84	BACKEMIS-IR = 0.84	..
<b>Grey-3mm</b>		Glass Layer	
\$Grey, 3mm			
\$ID=8			
TYPE = GLASS	THICKNESS = 0.00984	CONDUCTIVITY = 0.52	
TRANS-SOL-BB = 0.626	REFL-SOL-BB = 0.061	BACKREFL-SOL-BB = 0.061	
TRANS-VIS-BB = 0.611	REFL-VIS-BB = 0.061	BACKREFL-VIS-BB = 0.061	
TRANS-IR = 0.0	EMIS-IR = 0.84	BACKEMIS-IR = 0.84	..
<b>Grey-6mm</b>		Glass Layer	
\$Grey, 6mm			
\$ID=9			
TYPE = GLASS	THICKNESS = 0.01969	CONDUCTIVITY = 0.52	
TRANS-SOL-BB = 0.455	REFL-SOL-BB = 0.053	BACKREFL-SOL-BB = 0.053	
TRANS-VIS-BB = 0.431	REFL-VIS-BB = 0.052	BACKREFL-VIS-BB = 0.052	
TRANS-IR = 0.0	EMIS-IR = 0.84	BACKEMIS-IR = 0.84	..
<b>Grey-12mm</b>		Glass Layer	
\$Grey, 12mm			
\$ID=10			
TYPE = GLASS	THICKNESS = 0.03937	CONDUCTIVITY = 0.52	

TRANS-SOL-BB = 0.217	REFL-SOL-BB = 0.044	BACKREFL-SOL-BB = 0.044
TRANS-VIS-BB = 0.187	REFL-VIS-BB = 0.045	BACKREFL-VIS-BB = 0.045
TRANS-IR = 0.0	EMIS-IR = 0.84	BACKEMIS-IR = 0.84 ..

**Green-3mm**

Glass Layer

\$Green, 3mm

\$ID=11

TYPE = GLASS	THICKNESS = 0.00984	CONDUCTIVITY = 0.52
TRANS-SOL-BB = 0.635	REFL-SOL-BB = 0.063	BACKREFL-SOL-BB = 0.063
TRANS-VIS-BB = 0.822	REFL-VIS-BB = 0.075	BACKREFL-VIS-BB = 0.075
TRANS-IR = 0.0	EMIS-IR = 0.84	BACKEMIS-IR = 0.84 ..

**Green-6mm**

Glass Layer

\$Green, 6mm

\$ID=12

TYPE = GLASS	THICKNESS = 0.01969	CONDUCTIVITY = 0.52
TRANS-SOL-BB = 0.487	REFL-SOL-BB = 0.056	BACKREFL-SOL-BB = 0.056
TRANS-VIS-BB = 0.749	REFL-VIS-BB = 0.070	BACKREFL-VIS-BB = 0.070
TRANS-IR = 0.0	EMIS-IR = 0.84	BACKEMIS-IR = 0.84 ..

**Low-Iron-2.5mm**

Glass Layer

\$Low Iron, 2.5mm

\$ID=13

TYPE = GLASS	THICKNESS = 0.00820	CONDUCTIVITY = 0.52
TRANS-SOL-BB = 0.904	REFL-SOL-BB = 0.080	BACKREFL-SOL-BB = 0.080
TRANS-VIS-BB = 0.914	REFL-VIS-BB = 0.083	BACKREFL-VIS-BB = 0.083
TRANS-IR = 0.0	EMIS-IR = 0.84	BACKEMIS-IR = 0.84 ..

**Low-Iron-3mm**

Glass Layer

\$Low Iron, 3mm

\$ID=14

TYPE = GLASS	THICKNESS = 0.00984	CONDUCTIVITY = 0.52
TRANS-SOL-BB = 0.899	REFL-SOL-BB = 0.079	BACKREFL-SOL-BB = 0.079
TRANS-VIS-BB = 0.913	REFL-VIS-BB = 0.082	BACKREFL-VIS-BB = 0.082
TRANS-IR = 0.0	EMIS-IR = 0.84	BACKEMIS-IR = 0.84 ..

**Low-Iron-4mm**

Glass Layer

\$Low Iron, 4mm

\$ID=15

TYPE = GLASS	THICKNESS = 0.01312	CONDUCTIVITY = 0.52
TRANS-SOL-BB = 0.894	REFL-SOL-BB = 0.079	BACKREFL-SOL-BB = 0.079
TRANS-VIS-BB = 0.911	REFL-VIS-BB = 0.082	BACKREFL-VIS-BB = 0.082
TRANS-IR = 0.0	EMIS-IR = 0.84	BACKEMIS-IR = 0.84 ..

**Low-Iron-5mm**

Glass Layer

\$Low Iron, 5mm

\$ID=16

TYPE = GLASS	THICKNESS = 0.01640	CONDUCTIVITY = 0.52
TRANS-SOL-BB = 0.889	REFL-SOL-BB = 0.079	BACKREFL-SOL-BB = 0.079
TRANS-VIS-BB = 0.910	REFL-VIS-BB = 0.082	BACKREFL-VIS-BB = 0.082
TRANS-IR = 0.0	EMIS-IR = 0.84	BACKEMIS-IR = 0.84 ..

**Blue-6mm**

Glass Layer

\$Blue, 6mm

\$ID=17

TYPE = GLASS	THICKNESS = 0.01969	CONDUCTIVITY = 0.52
TRANS-SOL-BB = 0.480	REFL-SOL-BB = 0.050	BACKREFL-SOL-BB = 0.050
TRANS-VIS-BB = 0.570	REFL-VIS-BB = 0.060	BACKREFL-VIS-BB = 0.060
TRANS-IR = 0.0	EMIS-IR = 0.84	BACKEMIS-IR = 0.84 ..

**Ref-Steel-Clear-Lo-6mm**

Glass Layer

\$Reflective low-trans steel coating

\$Clear glass, 6mm, ID=200

TYPE = GLASS	THICKNESS = 0.01969	CONDUCTIVITY = 0.52
TRANS-SOL-BB = 0.066	REFL-SOL-BB = 0.341	BACKREFL-SOL-BB = 0.493
TRANS-VIS-BB = 0.080	REFL-VIS-BB = 0.410	BACKREFL-VIS-BB = 0.370
TRANS-IR = 0.0	EMIS-IR = 0.84	BACKEMIS-IR = 0.40 ..

**Ref-Steel-Clear-Mid-6mm**

Glass Layer

\$Reflective mid-trans steel coating

\$Clear glass, 6mm, ID=201

TYPE = GLASS            THICKNESS = 0.01969    CONDUCTIVITY = 0.52  
 TRANS-SOL-BB = 0.110    REFL-SOL-BB = 0.270    BACKREFL-SOL-BB = 0.430  
 TRANS-VIS-BB = 0.140    REFL-VIS-BB = 0.310    BACKREFL-VIS-BB = 0.350  
 TRANS-IR = 0.0        EMIS-IR = 0.84        BACKEMIS-IR = 0.47 ..

**Ref-Steel-Clear-Hi-6mm**

Glass Layer

\$Reflective hi-trans steel coating  
 \$Clear glass, 6mm, ID=202

TYPE = GLASS            THICKNESS = 0.01969    CONDUCTIVITY = 0.52  
 TRANS-SOL-BB = 0.159    REFL-SOL-BB = 0.220    BACKREFL-SOL-BB = 0.370  
 TRANS-VIS-BB = 0.200    REFL-VIS-BB = 0.250    BACKREFL-VIS-BB = 0.320  
 TRANS-IR = 0.0        EMIS-IR = 0.84        BACKEMIS-IR = 0.57 ..

**Ref-Steel-Tint-Lo-6mm**

Glass Layer

\$Refl low-trans steel coating  
 \$Tinted glass, 6mm, ID=210

TYPE = GLASS            THICKNESS = 0.01969    CONDUCTIVITY = 0.52  
 TRANS-SOL-BB = 0.040    REFL-SOL-BB = 0.150    BACKREFL-SOL-BB = 0.470  
 TRANS-VIS-BB = 0.050    REFL-VIS-BB = 0.170    BACKREFL-VIS-BB = 0.370  
 TRANS-IR = 0.0        EMIS-IR = 0.84        BACKEMIS-IR = 0.41 ..

**Ref-Steel-Tint-Mid-6mm**

Glass Layer

\$Refl mid-trans steel coating  
 \$Tinted glass, 6mm, ID=211

TYPE = GLASS            THICKNESS = 0.01969    CONDUCTIVITY = 0.52  
 TRANS-SOL-BB = 0.060    REFL-SOL-BB = 0.130    BACKREFL-SOL-BB = 0.420  
 TRANS-VIS-BB = 0.090    REFL-VIS-BB = 0.140    BACKREFL-VIS-BB = 0.350  
 TRANS-IR = 0.0        EMIS-IR = 0.84        BACKEMIS-IR = 0.47 ..

**Ref-Steel-Tint-Hi-6mm**

Glass Layer

\$Refl hi-trans steel coating  
 \$Tinted glass, 6mm, ID=212

TYPE = GLASS            THICKNESS = 0.01969    CONDUCTIVITY = 0.52  
 TRANS-SOL-BB = 0.100    REFL-SOL-BB = 0.110    BACKREFL-SOL-BB = 0.380  
 TRANS-VIS-BB = 0.100    REFL-VIS-BB = 0.110    BACKREFL-VIS-BB = 0.320  
 TRANS-IR = 0.0        EMIS-IR = 0.84        BACKEMIS-IR = 0.53 ..

**Ref-Titanium-Clear-Lo-6mm**

Glass Layer

\$Reflective low-trans titanium coating  
 \$Clear glass, 6mm, ID=220

TYPE = GLASS            THICKNESS = 0.01969    CONDUCTIVITY = 0.52  
 TRANS-SOL-BB = 0.150    REFL-SOL-BB = 0.220    BACKREFL-SOL-BB = 0.380  
 TRANS-VIS-BB = 0.200    REFL-VIS-BB = 0.230    BACKREFL-VIS-BB = 0.330  
 TRANS-IR = 0.0        EMIS-IR = 0.84        BACKEMIS-IR = 0.58 ..

**Ref-Titanium-Clear-Hi-6mm**

Glass Layer

\$Reflective hi-trans titanium coating  
 \$Clear glass, 6mm, ID=221

TYPE = GLASS            THICKNESS = 0.01969    CONDUCTIVITY = 0.52  
 TRANS-SOL-BB = 0.240    REFL-SOL-BB = 0.160    BACKREFL-SOL-BB = 0.290  
 TRANS-VIS-BB = 0.300    REFL-VIS-BB = 0.160    BACKREFL-VIS-BB = 0.290  
 TRANS-IR = 0.0        EMIS-IR = 0.84        BACKEMIS-IR = 0.60 ..

**Ref-Titanium-Tint-Lo-6mm**

Glass Layer

\$Reflective lo-trans titanium coating  
 \$Tinted glass, 6mm, ID=230

TYPE = GLASS            THICKNESS = 0.01969    CONDUCTIVITY = 0.52  
 TRANS-SOL-BB = 0.040    REFL-SOL-BB = 0.130    BACKREFL-SOL-BB = 0.420  
 TRANS-VIS-BB = 0.050    REFL-VIS-BB = 0.090    BACKREFL-VIS-BB = 0.280  
 TRANS-IR = 0.0        EMIS-IR = 0.84        BACKEMIS-IR = 0.41 ..

**Ref-Titanium-Tint-Mid-6mm**

Glass Layer

\$Reflective mid-trans titanium coating  
 \$Tinted glass, 6mm, ID=231

TYPE = GLASS            THICKNESS = 0.01969    CONDUCTIVITY = 0.52  
 TRANS-SOL-BB = 0.100    REFL-SOL-BB = 0.110    BACKREFL-SOL-BB = 0.410  
 TRANS-VIS-BB = 0.130    REFL-VIS-BB = 0.100    BACKREFL-VIS-BB = 0.320  
 TRANS-IR = 0.0        EMIS-IR = 0.84        BACKEMIS-IR = 0.45 ..

**Ref-Titanium-Tint-Hi-6mm**

Glass Layer

\$Reflective hi-trans titanium coating

\$Tinted glass, 6mm, ID=232  
 TYPE = GLASS THICKNESS = 0.01969 CONDUCTIVITY = 0.52  
 TRANS-SOL-BB = 0.150 REFL-SOL-BB = 0.090 BACKREFL-SOL-BB = 0.330  
 TRANS-VIS-BB = 0.180 REFL-VIS-BB = 0.080 BACKREFL-VIS-BB = 0.280  
 TRANS-IR = 0.0 EMIS-IR = 0.84 BACKEMIS-IR = 0.60 ..

**Ref-Pewter-Clear-Lo-6mm** Glass Layer  
 \$Reflective low-trans pewter coating  
 \$Clear glass, 6mm, ID=240  
 TYPE = GLASS THICKNESS = 0.01969 CONDUCTIVITY = 0.52  
 TRANS-SOL-BB = 0.110 REFL-SOL-BB = 0.250 BACKREFL-SOL-BB = 0.490  
 TRANS-VIS-BB = 0.130 REFL-VIS-BB = 0.280 BACKREFL-VIS-BB = 0.420  
 TRANS-IR = 0.0 EMIS-IR = 0.84 BACKEMIS-IR = 0.43 ..

**Ref-Pewter-Clear-Mid-6mm** Glass Layer  
 \$Reflective mid-trans pewter coating  
 \$Clear glass, 6mm, ID=241  
 TYPE = GLASS THICKNESS = 0.01969 CONDUCTIVITY = 0.52  
 TRANS-SOL-BB = 0.170 REFL-SOL-BB = 0.200 BACKREFL-SOL-BB = 0.420  
 TRANS-VIS-BB = 0.190 REFL-VIS-BB = 0.210 BACKREFL-VIS-BB = 0.380  
 TRANS-IR = 0.0 EMIS-IR = 0.84 BACKEMIS-IR = 0.51 ..

**Ref-Pewter-Clear-Hi-6mm** Glass Layer  
 \$Reflective hi-trans pewter coating  
 \$Clear glass, 6mm, ID=242  
 TYPE = GLASS THICKNESS = 0.01969 CONDUCTIVITY = 0.52  
 TRANS-SOL-BB = 0.200 REFL-SOL-BB = 0.160 BACKREFL-SOL-BB = 0.390  
 TRANS-VIS-BB = 0.220 REFL-VIS-BB = 0.170 BACKREFL-VIS-BB = 0.350  
 TRANS-IR = 0.0 EMIS-IR = 0.84 BACKEMIS-IR = 0.55 ..

**Ref-Pewter-Tint-Lo-6mm** Glass Layer  
 \$Reflective lo-trans pewter coating  
 \$Tinted glass, 6mm, ID=250  
 TYPE = GLASS THICKNESS = 0.01969 CONDUCTIVITY = 0.52  
 TRANS-SOL-BB = 0.070 REFL-SOL-BB = 0.130 BACKREFL-SOL-BB = 0.490  
 TRANS-VIS-BB = 0.080 REFL-VIS-BB = 0.130 BACKREFL-VIS-BB = 0.420  
 TRANS-IR = 0.0 EMIS-IR = 0.84 BACKEMIS-IR = 0.43 ..

**Ref-Pewter-Tint-Mid-6mm** Glass Layer  
 \$Reflective mid-trans pewter coating  
 \$Tinted glass, 6mm, ID=251  
 TYPE = GLASS THICKNESS = 0.01969 CONDUCTIVITY = 0.52  
 TRANS-SOL-BB = 0.100 REFL-SOL-BB = 0.100 BACKREFL-SOL-BB = 0.420  
 TRANS-VIS-BB = 0.110 REFL-VIS-BB = 0.100 BACKREFL-VIS-BB = 0.380  
 TRANS-IR = 0.0 EMIS-IR = 0.84 BACKEMIS-IR = 0.51 ..

**Ref-Pewter-Tint-Hi-6mm** Glass Layer  
 \$Reflective hi-trans pewter coating  
 \$Tinted glass, 6mm, ID=252  
 TYPE = GLASS THICKNESS = 0.01969 CONDUCTIVITY = 0.52  
 TRANS-SOL-BB = 0.120 REFL-SOL-BB = 0.090 BACKREFL-SOL-BB = 0.390  
 TRANS-VIS-BB = 0.130 REFL-VIS-BB = 0.090 BACKREFL-VIS-BB = 0.350  
 TRANS-IR = 0.0 EMIS-IR = 0.84 BACKEMIS-IR = 0.55 ..

**Ref-Tin-Oxide-Clear-6mm** Glass Layer  
 \$Reflective tin-oxide coating  
 \$Clear glass, 6mm, ID=260  
 TYPE = GLASS THICKNESS = 0.01969 CONDUCTIVITY = 0.52  
 TRANS-SOL-BB = 0.429 REFL-SOL-BB = 0.308 BACKREFL-SOL-BB = 0.379  
 TRANS-VIS-BB = 0.334 REFL-VIS-BB = 0.453 BACKREFL-VIS-BB = 0.505  
 TRANS-IR = 0.0 EMIS-IR = 0.84 BACKEMIS-IR = 0.82 ..

**Ref-Tin-Oxide-Tint-6mm** Glass Layer  
 \$Reflective tin-oxide coating  
 \$Tinted glass, 6mm, ID=270  
 TYPE = GLASS THICKNESS = 0.01969 CONDUCTIVITY = 0.52  
 TRANS-SOL-BB = 0.300 REFL-SOL-BB = 0.140 BACKREFL-SOL-BB = 0.360  
 TRANS-VIS-BB = 0.250 REFL-VIS-BB = 0.180 BACKREFL-VIS-BB = 0.450  
 TRANS-IR = 0.0 EMIS-IR = 0.84 BACKEMIS-IR = 0.82 ..

**Pyrolytic-A-Clear-3mm** Glass Layer

\$Pyrolytic A coating  
 \$Clear glass, 3mm, ID=300  
 TYPE = GLASS THICKNESS = 0.00984 CONDUCTIVITY = 0.52  
 TRANS-SOL-BB = 0.750 REFL-SOL-BB = 0.100 BACKREFL-SOL-BB = 0.100  
 TRANS-VIS-BB = 0.850 REFL-VIS-BB = 0.120 BACKREFL-VIS-BB = 0.120  
 TRANS-IR = 0.0 EMIS-IR = 0.84 BACKEMIS-IR = 0.40 ..

**Pyrolytic-B-Clear-3mm** Glass Layer

\$Pyrolytic B coating  
 \$Clear glass, 3mm, ID=350  
 TYPE = GLASS THICKNESS = 0.00984 CONDUCTIVITY = 0.52  
 TRANS-SOL-BB = 0.740 REFL-SOL-BB = 0.090 BACKREFL-SOL-BB = 0.100  
 TRANS-VIS-BB = 0.820 REFL-VIS-BB = 0.110 BACKREFL-VIS-BB = 0.120  
 TRANS-IR = 0.0 EMIS-IR = 0.84 BACKEMIS-IR = 0.20 ..

**Pyrolytic-B-Clear-6mm** Glass Layer

\$Pyrolytic B coating  
 \$Clear glass, 6mm, ID=351  
 TYPE = GLASS THICKNESS = 0.01969 CONDUCTIVITY = 0.52  
 TRANS-SOL-BB = 0.680 REFL-SOL-BB = 0.090 BACKREFL-SOL-BB = 0.100  
 \$TRANS-VIS-BB = 0.810 REFL-VIS-BB = 0.110 BACKREFL-VIS-BB = 0.120  
 TRANS-IR = 0.0 EMIS-IR = 0.84 BACKEMIS-IR = 0.20 ..

**Pyrolytic-Low-E-Clear-3mm** Glass Layer

\$Pyrolytic Low-E coating  
 \$Clear glass, 3mm, ID=400  
 TYPE = GLASS THICKNESS = 0.00984 CONDUCTIVITY = 0.52  
 TRANS-SOL-BB = 0.630 REFL-SOL-BB = 0.190 BACKREFL-SOL-BB = 0.220  
 TRANS-VIS-BB = 0.850 REFL-VIS-BB = 0.079 BACKREFL-VIS-BB = 0.056  
 TRANS-IR = 0.0 EMIS-IR = 0.84 BACKEMIS-IR = 0.10 ..

**Pyrolytic-Low-E-Clear-6mm** Glass Layer

\$Pyrolytic Low-E coating  
 \$Clear glass, 6mm, ID=401  
 TYPE = GLASS THICKNESS = 0.01969 CONDUCTIVITY = 0.52  
 TRANS-SOL-BB = 0.600 REFL-SOL-BB = 0.170 BACKREFL-SOL-BB = 0.220  
 TRANS-VIS-BB = 0.840 REFL-VIS-BB = 0.055 BACKREFL-VIS-BB = 0.078  
 TRANS-IR = 0.0 EMIS-IR = 0.84 BACKEMIS-IR = 0.10 ..

**Pyrolytic-Low-E-Tint-6mm** Glass Layer

\$Pyrolytic Low-E coating  
 \$Tinted glass, 6mm, ID=451  
 TYPE = GLASS THICKNESS = 0.01969 CONDUCTIVITY = 0.52  
 TRANS-SOL-BB = 0.360 REFL-SOL-BB = 0.093 BACKREFL-SOL-BB = 0.200  
 TRANS-VIS-BB = 0.500 REFL-VIS-BB = 0.035 BACKREFL-VIS-BB = 0.054  
 TRANS-IR = 0.0 EMIS-IR = 0.84 BACKEMIS-IR = 0.10 ..

**Spectral-Selective-Clear-3mm** Glass Layer

\$Spectrally selective coating  
 \$Clear glass, 3mm, ID=500  
 TYPE = GLASS THICKNESS = 0.00984 CONDUCTIVITY = 0.52  
 TRANS-SOL-BB = 0.450 REFL-SOL-BB = 0.340 BACKREFL-SOL-BB = 0.370  
 TRANS-VIS-BB = 0.780 REFL-VIS-BB = 0.070 BACKREFL-VIS-BB = 0.050  
 TRANS-IR = 0.0 EMIS-IR = 0.84 BACKEMIS-IR = 0.04 ..

**Spectral-Selective-Clear-6mm** Glass Layer

\$Spectrally selective coating  
 \$Clear glass, 6mm, ID=501  
 TYPE = GLASS THICKNESS = 0.01969 CONDUCTIVITY = 0.52  
 TRANS-SOL-BB = 0.430 REFL-SOL-BB = 0.300 BACKREFL-SOL-BB = 0.420  
 TRANS-VIS-BB = 0.770 REFL-VIS-BB = 0.070 BACKREFL-VIS-BB = 0.060  
 TRANS-IR = 0.0 EMIS-IR = 0.84 BACKEMIS-IR = 0.03 ..

**Spectral-Selective-Tint-6mm** Glass Layer

\$Spectrally selective coating  
 \$Tinted glass, 6mm, ID=550  
 TYPE = GLASS THICKNESS = 0.01969 CONDUCTIVITY = 0.52  
 TRANS-SOL-BB = 0.260 REFL-SOL-BB = 0.140 BACKREFL-SOL-BB = 0.410  
 TRANS-VIS-BB = 0.460 REFL-VIS-BB = 0.060 BACKREFL-VIS-BB = 0.040  
 TRANS-IR = 0.0 EMIS-IR = 0.84 BACKEMIS-IR = 0.03 ..

**Spectral-Selective-Low-E-6mm** Glass Layer  
 \$Spectrally selective  
 \$Low-E coating, 6mm, ID=708  
 TYPE = GLASS THICKNESS = 0.01969 CONDUCTIVITY = 0.52  
 TRANS-SOL-BB = 0.406 REFL-SOL-BB = 0.288 BACKREFL-SOL-BB = 0.353  
 TRANS-VIS-BB = 0.780 REFL-VIS-BB = 0.060 BACKREFL-VIS-BB = 0.050  
 TRANS-IR = 0.0 EMIS-IR = 0.84 BACKEMIS-IR = 0.04 ..

**Heat-Mirror-Film-88** Glass Layer  
 \$Heat mirror 88  
 \$Low-E film, ID=600  
 TYPE = GLASS THICKNESS = 0.00017 CONDUCTIVITY = 0.081  
 TRANS-SOL-BB = 0.656 REFL-SOL-BB = 0.249 BACKREFL-SOL-BB = 0.227  
 TRANS-VIS-BB = 0.868 REFL-VIS-BB = 0.064 BACKREFL-VIS-BB = 0.060  
 TRANS-IR = 0.0 EMIS-IR = 0.136 BACKEMIS-IR = 0.720 ..

**Heat-Mirror-Film-77** Glass Layer  
 \$Heat mirror 77  
 \$Low-E film, ID=601  
 TYPE = GLASS THICKNESS = 0.00017 CONDUCTIVITY = 0.081  
 TRANS-SOL-BB = 0.504 REFL-SOL-BB = 0.402 BACKREFL-SOL-BB = 0.398  
 TRANS-VIS-BB = 0.766 REFL-VIS-BB = 0.147 BACKREFL-VIS-BB = 0.167  
 TRANS-IR = 0.0 EMIS-IR = 0.075 BACKEMIS-IR = 0.720 ..

**Heat-Mirror-Film-66** Glass Layer  
 \$Heat mirror 66  
 \$Low-E film, ID=602  
 TYPE = GLASS THICKNESS = 0.00017 CONDUCTIVITY = 0.081  
 TRANS-SOL-BB = 0.403 REFL-SOL-BB = 0.514 BACKREFL-SOL-BB = 0.515  
 TRANS-VIS-BB = 0.658 REFL-VIS-BB = 0.256 BACKREFL-VIS-BB = 0.279  
 TRANS-IR = 0.0 EMIS-IR = 0.057 BACKEMIS-IR = 0.720 ..

**Heat-Mirror-Film-55** Glass Layer  
 \$Heat mirror 55  
 \$Low-E film, ID=603  
 TYPE = GLASS THICKNESS = 0.00017 CONDUCTIVITY = 0.081  
 TRANS-SOL-BB = 0.320 REFL-SOL-BB = 0.582 BACKREFL-SOL-BB = 0.593  
 TRANS-VIS-BB = 0.551 REFL-VIS-BB = 0.336 BACKREFL-VIS-BB = 0.375  
 TRANS-IR = 0.0 EMIS-IR = 0.046 BACKEMIS-IR = 0.720 ..

**Heat-Mirror-Film-44** Glass Layer  
 \$Heat mirror 44  
 \$Low-E film, ID=604  
 TYPE = GLASS THICKNESS = 0.00017 CONDUCTIVITY = 0.081  
 TRANS-SOL-BB = 0.245 REFL-SOL-BB = 0.626 BACKREFL-SOL-BB = 0.641  
 TRANS-VIS-BB = 0.439 REFL-VIS-BB = 0.397 BACKREFL-VIS-BB = 0.453  
 TRANS-IR = 0.0 EMIS-IR = 0.037 BACKEMIS-IR = 0.720 ..

**Air-6.3mm** Gap  
 \$Air, 6.3mm (1/4-in)  
 TYPE = GAP THICKNESS = 0.02067  
 CONDUCTIVITY = 0.013934 D-CONDUCTIVITY = 2.43954  
 VISCOSITY = 1.16251 D-VISCOSITY = 3.7332  
 DENSITY = 0.08053 D-DENSITY = -.0001526  
 PRANDTL-NUMB = 0.72 D-PRANDTL-NUMB = 0.001 ..

**Air-12.7mm** Gap  
 \$Air, 12.7mm (1/2-in)  
 TYPE = GAP THICKNESS = 0.04167  
 CONDUCTIVITY = 0.013934 D-CONDUCTIVITY = 2.43954  
 VISCOSITY = 1.16251 D-VISCOSITY = 3.7332  
 DENSITY = 0.08053 D-DENSITY = -.0001526  
 PRANDTL-NUMB = 0.72 D-PRANDTL-NUMB = 0.001 ..

**Argon-6.3mm** Gap  
 \$Argon, 6.3mm (1/4-in)  
 TYPE = GAP THICKNESS = 0.02067  
 CONDUCTIVITY = 0.00936 D-CONDUCTIVITY = 1.6049  
 VISCOSITY = 1.41786 D-VISCOSITY = 2.35189  
 DENSITY = 0.10612 D-DENSITY = -.000208  
 PRANDTL-NUMB = 0.68 D-PRANDTL-NUMB = 0.0003667 ..

**Argon-12.7mm**

Gap

\$Argon, 12.7mm (1/2-in)  
 TYPE = GAP THICKNESS = 0.04167  
 CONDUCTIVITY = 0.00936 D-CONDUCTIVITY = 1.6049  
 VISCOSITY = 1.41786 D-VISCOSITY = 2.35189  
 DENSITY = 0.10612 D-DENSITY = -.000208  
 PRANDTL-NUMB = 0.68 D-PRANDTL-NUMB = 0.0003667 ..

**Krypton-6.3mm**

Gap

\$Krypton, 6.3mm (1/4-in)  
 TYPE = GAP THICKNESS = 0.02067  
 CONDUCTIVITY = 0.0497 D-CONDUCTIVITY = 0.89874  
 VISCOSITY = 1.53209 D-VISCOSITY = 2.7999  
 DENSITY = 0.23345 D-DENSITY = -.00047  
 PRANDTL-NUMB = 0.66 D-PRANDTL-NUMB = 0.000011 ..

**Krypton-12.7mm**

Gap

\$Krypton, 12.7mm (1/2-in)  
 TYPE = GAP THICKNESS = 0.04167  
 CONDUCTIVITY = 0.0497 D-CONDUCTIVITY = 0.89874  
 VISCOSITY = 1.53209 D-VISCOSITY = 2.7999  
 DENSITY = 0.23345 D-DENSITY = -.00047  
 PRANDTL-NUMB = 0.66 D-PRANDTL-NUMB = 0.000011 ..

**Metal-1in-Lt**

Blind

\$Metal, 1.0in, light color  
 \$Horizontal  
 TYPE = BLIND THICKNESS = 0.00066 CONDUCTIVITY = 0.52  
 SLAT-ANGLE = 45 SLAT-ORIENTATION = HORIZONTAL  
 SLAT-WIDTH = 0.0833 SLAT-SEPARATION = 0.0625  
 TRANS-SOL-BB = 0.0 TRANS-SOL-BH = 0.0 TRANS-SOL-HH = 0.0  
 TRANS-VIS-BB = 0.0 TRANS-VIS-BH = 0.0 TRANS-VIS-HH = 0.0  
 REFL-SOL-BH = 0.7 REFL-SOL-HH = 0.7 BACKREFL-SOL-BH = 0.7  
 REFL-VIS-BH = 0.7 REFL-VIS-HH = 0.7 BACKREFL-VIS-BH = 0.7  
 BACKREFL-SOL-HH = 0.7 BACKREFL-VIS-HH = 0.7  
 TRANS-IR = 0.0 EMIS-IR = 0.9 BACKEMIS-IR = 0.9 ..

**Metal-1in-Med**

Blind

\$Metal, 1.0in, medium color  
 \$Horizontal  
 TYPE = BLIND THICKNESS = 0.00066 CONDUCTIVITY = 0.52  
 SLAT-ANGLE = 45 SLAT-ORIENTATION = HORIZONTAL  
 SLAT-WIDTH = 0.0833 SLAT-SEPARATION = 0.0625  
 TRANS-SOL-BB = 0.0 TRANS-SOL-BH = 0.0 TRANS-SOL-HH = 0.0  
 TRANS-VIS-BB = 0.0 TRANS-VIS-BH = 0.0 TRANS-VIS-HH = 0.0  
 REFL-SOL-BH = 0.5 REFL-SOL-HH = 0.5 BACKREFL-SOL-BH = 0.5  
 REFL-VIS-BH = 0.5 REFL-VIS-HH = 0.5 BACKREFL-VIS-BH = 0.5  
 BACKREFL-SOL-HH = 0.5 BACKREFL-VIS-HH = 0.5  
 TRANS-IR = 0.0 EMIS-IR = 0.9 BACKEMIS-IR = 0.9 ..

**Metal-1in-Dark**

Blind

\$Metal, 1.0in, dark color  
 \$Horizontal  
 TYPE = BLIND THICKNESS = 0.00066 CONDUCTIVITY = 0.52  
 SLAT-ANGLE = 45 SLAT-ORIENTATION = HORIZONTAL  
 SLAT-WIDTH = 0.0833 SLAT-SEPARATION = 0.0625  
 TRANS-SOL-BB = 0.0 TRANS-SOL-BH = 0.0 TRANS-SOL-HH = 0.0  
 TRANS-VIS-BB = 0.0 TRANS-VIS-BH = 0.0 TRANS-VIS-HH = 0.0  
 REFL-SOL-BH = 0.3 REFL-SOL-HH = 0.3 BACKREFL-SOL-BH = 0.3  
 REFL-VIS-BH = 0.3 REFL-VIS-HH = 0.3 BACKREFL-VIS-BH = 0.3  
 BACKREFL-SOL-HH = 0.3 BACKREFL-VIS-HH = 0.3  
 TRANS-IR = 0.0 EMIS-IR = 0.9 BACKEMIS-IR = 0.9 ..

**Shade-Thin-T05-R10**

Pull-down shade

\$Pull-down shade, thin, fabric  
 \$5% transmittance, 10% reflectance  
 TYPE = BLIND THICKNESS = 0.00066 CONDUCTIVITY = 0.0667  
 SLAT-ANGLE = 89.95 SLAT-ORIENTATION = HORIZONTAL  
 SLAT-WIDTH = 0.0840 SLAT-SEPARATION = 0.0833 SLAT-ANGLE-MAX = 90  
 TRANS-SOL-BB = 0.0 TRANS-SOL-BH = 0.05 TRANS-SOL-HH = 0.05



TRANS-VIS-BB = 0.0      TRANS-VIS-BH = 0.05      TRANS-VIS-HH = 0.05  
 REFL-SOL-BH = 0.10      REFL-SOL-HH = 0.10      BACKREFL-SOL-BH = 0.10  
 REFL-VIS-BH = 0.10      REFL-VIS-HH = 0.10      BACKREFL-VIS-BH = 0.10  
 BACKREFL-SOL-HH = 0.10      BACKREFL-VIS-HH = 0.10  
 TRANS-IR = 0.0      EMIS-IR = 0.9      BACKEMIS-IR = 0.9 ..

**Shade-Thin-T05-R30** Pull-down shade

\$Pull-down shade, thin, fabric  
 \$5% transmittance, 30% reflectance  
 TYPE = BLIND      THICKNESS = 0.00066      CONDUCTIVITY = 0.0667  
 SLAT-ANGLE = 89.95      SLAT-ORIENTATION = HORIZONTAL  
 SLAT-WIDTH = 0.0840      SLAT-SEPARATION = 0.0833      SLAT-ANGLE-MAX = 90  
 TRANS-SOL-BB = 0.0      TRANS-SOL-BH = 0.05      TRANS-SOL-HH = 0.05  
 TRANS-VIS-BB = 0.0      TRANS-VIS-BH = 0.05      TRANS-VIS-HH = 0.05  
 REFL-SOL-BH = 0.30      REFL-SOL-HH = 0.30      BACKREFL-SOL-BH = 0.30  
 REFL-VIS-BH = 0.30      REFL-VIS-HH = 0.30      BACKREFL-VIS-BH = 0.30  
 BACKREFL-SOL-HH = 0.30      BACKREFL-VIS-HH = 0.30  
 TRANS-IR = 0.0      EMIS-IR = 0.9      BACKEMIS-IR = 0.9 ..

**Shade-Thin-T05-R50** Pull-down shade

\$Pull-down shade, thin, fabric  
 \$5% transmittance, 50% reflectance  
 TYPE = BLIND      THICKNESS = 0.00066      CONDUCTIVITY = 0.0667  
 SLAT-ANGLE = 89.95      SLAT-ORIENTATION = HORIZONTAL  
 SLAT-WIDTH = 0.0840      SLAT-SEPARATION = 0.0833      SLAT-ANGLE-MAX = 90  
 TRANS-SOL-BB = 0.0      TRANS-SOL-BH = 0.05      TRANS-SOL-HH = 0.05  
 TRANS-VIS-BB = 0.0      TRANS-VIS-BH = 0.05      TRANS-VIS-HH = 0.05  
 REFL-SOL-BH = 0.50      REFL-SOL-HH = 0.50      BACKREFL-SOL-BH = 0.50  
 REFL-VIS-BH = 0.50      REFL-VIS-HH = 0.50      BACKREFL-VIS-BH = 0.50  
 BACKREFL-SOL-HH = 0.50      BACKREFL-VIS-HH = 0.50  
 TRANS-IR = 0.0      EMIS-IR = 0.9      BACKEMIS-IR = 0.9 ..

**Shade-Thin-T05-R70** Pull-down shade

\$Pull-down shade, thin, fabric  
 \$5% transmittance, 70% reflectance  
 TYPE = BLIND      THICKNESS = 0.00066      CONDUCTIVITY = 0.0667  
 SLAT-ANGLE = 89.95      SLAT-ORIENTATION = HORIZONTAL  
 SLAT-WIDTH = 0.0840      SLAT-SEPARATION = 0.0833      SLAT-ANGLE-MAX = 90  
 TRANS-SOL-BB = 0.0      TRANS-SOL-BH = 0.05      TRANS-SOL-HH = 0.05  
 TRANS-VIS-BB = 0.0      TRANS-VIS-BH = 0.05      TRANS-VIS-HH = 0.05  
 REFL-SOL-BH = 0.70      REFL-SOL-HH = 0.70      BACKREFL-SOL-BH = 0.70  
 REFL-VIS-BH = 0.70      REFL-VIS-HH = 0.70      BACKREFL-VIS-BH = 0.70  
 BACKREFL-SOL-HH = 0.70      BACKREFL-VIS-HH = 0.70  
 TRANS-IR = 0.0      EMIS-IR = 0.9      BACKEMIS-IR = 0.9 ..

**Shade-Thin-T05-R90** Pull-down shade

\$Pull-down shade, thin, fabric  
 \$5% transmittance, 90% reflectance  
 TYPE = BLIND      THICKNESS = 0.00066      CONDUCTIVITY = 0.0667  
 SLAT-ANGLE = 89.95      SLAT-ORIENTATION = HORIZONTAL  
 SLAT-WIDTH = 0.0840      SLAT-SEPARATION = 0.0833      SLAT-ANGLE-MAX = 90  
 TRANS-SOL-BB = 0.0      TRANS-SOL-BH = 0.05      TRANS-SOL-HH = 0.05  
 TRANS-VIS-BB = 0.0      TRANS-VIS-BH = 0.05      TRANS-VIS-HH = 0.05  
 REFL-SOL-BH = 0.90      REFL-SOL-HH = 0.90      BACKREFL-SOL-BH = 0.90  
 REFL-VIS-BH = 0.90      REFL-VIS-HH = 0.90      BACKREFL-VIS-BH = 0.90  
 BACKREFL-SOL-HH = 0.90      BACKREFL-VIS-HH = 0.90  
 TRANS-IR = 0.0      EMIS-IR = 0.9      BACKEMIS-IR = 0.9 ..

**Shade-Thin-T10-R10** Pull-down shade

\$Pull-down shade, thin, fabric  
 \$10% transmittance, 10% reflectance  
 TYPE = BLIND      THICKNESS = 0.00066      CONDUCTIVITY = 0.0667  
 SLAT-ANGLE = 89.95      SLAT-ORIENTATION = HORIZONTAL  
 SLAT-WIDTH = 0.0840      SLAT-SEPARATION = 0.0833      SLAT-ANGLE-MAX = 90  
 TRANS-SOL-BB = 0.0      TRANS-SOL-BH = 0.10      TRANS-SOL-HH = 0.10  
 TRANS-VIS-BB = 0.0      TRANS-VIS-BH = 0.10      TRANS-VIS-HH = 0.10  
 REFL-SOL-BH = 0.10      REFL-SOL-HH = 0.10      BACKREFL-SOL-BH = 0.10  
 REFL-VIS-BH = 0.10      REFL-VIS-HH = 0.10      BACKREFL-VIS-BH = 0.10  
 BACKREFL-SOL-HH = 0.10      BACKREFL-VIS-HH = 0.10  
 TRANS-IR = 0.0      EMIS-IR = 0.9      BACKEMIS-IR = 0.9 ..

**Shade-Thin-T10-R30** Pull-down shade  
 \$Pull-down shade, thin, fabric  
 \$10% transmittance, 30% reflectance  
 TYPE = BLIND THICKNESS = 0.00066 CONDUCTIVITY = 0.0667  
 SLAT-ANGLE = 89.95 SLAT-ORIENTATION = HORIZONTAL  
 SLAT-WIDTH = 0.0840 SLAT-SEPARATION = 0.0833 SLAT-ANGLE-MAX = 90  
 TRANS-SOL-BB = 0.0 TRANS-SOL-BH = 0.10 TRANS-SOL-HH = 0.10  
 TRANS-VIS-BB = 0.0 TRANS-VIS-BH = 0.10 TRANS-VIS-HH = 0.10  
 REFL-SOL-BH = 0.30 REFL-SOL-HH = 0.30 BACKREFL-SOL-BH = 0.30  
 REFL-VIS-BH = 0.30 REFL-VIS-HH = 0.30 BACKREFL-VIS-BH = 0.30  
 BACKREFL-SOL-HH = 0.30 BACKREFL-VIS-HH = 0.30  
 TRANS-IR = 0.0 EMIS-IR = 0.9 BACKEMIS-IR = 0.9 ..

**Shade-Thin-T10-R50** Pull-down shade  
 \$Pull-down shade, thin, fabric  
 \$10% transmittance, 50% reflectance  
 TYPE = BLIND THICKNESS = 0.00066 CONDUCTIVITY = 0.0667  
 SLAT-ANGLE = 89.95 SLAT-ORIENTATION = HORIZONTAL  
 SLAT-WIDTH = 0.0840 SLAT-SEPARATION = 0.0833 SLAT-ANGLE-MAX = 90  
 TRANS-SOL-BB = 0.0 TRANS-SOL-BH = 0.10 TRANS-SOL-HH = 0.10  
 TRANS-VIS-BB = 0.0 TRANS-VIS-BH = 0.10 TRANS-VIS-HH = 0.10  
 REFL-SOL-BH = 0.50 REFL-SOL-HH = 0.50 BACKREFL-SOL-BH = 0.50  
 REFL-VIS-BH = 0.50 REFL-VIS-HH = 0.50 BACKREFL-VIS-BH = 0.50  
 BACKREFL-SOL-HH = 0.50 BACKREFL-VIS-HH = 0.50  
 TRANS-IR = 0.0 EMIS-IR = 0.9 BACKEMIS-IR = 0.9 ..

**Shade-Thin-T10-R70** Pull-down shade  
 \$Pull-down shade, thin, fabric  
 \$10% transmittance, 70% reflectance  
 TYPE = BLIND THICKNESS = 0.00066 CONDUCTIVITY = 0.0667  
 SLAT-ANGLE = 89.95 SLAT-ORIENTATION = HORIZONTAL  
 SLAT-WIDTH = 0.0840 SLAT-SEPARATION = 0.0833 SLAT-ANGLE-MAX = 90  
 TRANS-SOL-BB = 0.0 TRANS-SOL-BH = 0.10 TRANS-SOL-HH = 0.10  
 TRANS-VIS-BB = 0.0 TRANS-VIS-BH = 0.10 TRANS-VIS-HH = 0.10  
 REFL-SOL-BH = 0.70 REFL-SOL-HH = 0.70 BACKREFL-SOL-BH = 0.70  
 REFL-VIS-BH = 0.70 REFL-VIS-HH = 0.70 BACKREFL-VIS-BH = 0.70  
 BACKREFL-SOL-HH = 0.70 BACKREFL-VIS-HH = 0.70  
 TRANS-IR = 0.0 EMIS-IR = 0.9 BACKEMIS-IR = 0.9 ..

**Shade-Thin-T10-R80** Pull-down shade  
 \$Pull-down shade, thin, fabric  
 \$10% transmittance, 80% reflectance  
 TYPE = BLIND THICKNESS = 0.00066 CONDUCTIVITY = 0.0667  
 SLAT-ANGLE = 89.95 SLAT-ORIENTATION = HORIZONTAL  
 SLAT-WIDTH = 0.0840 SLAT-SEPARATION = 0.0833 SLAT-ANGLE-MAX = 90  
 TRANS-SOL-BB = 0.0 TRANS-SOL-BH = 0.10 TRANS-SOL-HH = 0.10  
 TRANS-VIS-BB = 0.0 TRANS-VIS-BH = 0.10 TRANS-VIS-HH = 0.10  
 REFL-SOL-BH = 0.80 REFL-SOL-HH = 0.80 BACKREFL-SOL-BH = 0.80  
 REFL-VIS-BH = 0.80 REFL-VIS-HH = 0.80 BACKREFL-VIS-BH = 0.80  
 BACKREFL-SOL-HH = 0.80 BACKREFL-VIS-HH = 0.80  
 TRANS-IR = 0.0 EMIS-IR = 0.9 BACKEMIS-IR = 0.9 ..

**Shade-Thin-T20-R10** Pull-down shade  
 \$Pull-down shade, thin, fabric  
 \$20% transmittance, 10% reflectance  
 TYPE = BLIND THICKNESS = 0.00066 CONDUCTIVITY = 0.0667  
 SLAT-ANGLE = 89.95 SLAT-ORIENTATION = HORIZONTAL  
 SLAT-WIDTH = 0.0840 SLAT-SEPARATION = 0.0833 SLAT-ANGLE-MAX = 90  
 TRANS-SOL-BB = 0.0 TRANS-SOL-BH = 0.20 TRANS-SOL-HH = 0.20  
 TRANS-VIS-BB = 0.0 TRANS-VIS-BH = 0.20 TRANS-VIS-HH = 0.20  
 REFL-SOL-BH = 0.10 REFL-SOL-HH = 0.10 BACKREFL-SOL-BH = 0.10  
 REFL-VIS-BH = 0.10 REFL-VIS-HH = 0.10 BACKREFL-VIS-BH = 0.10  
 BACKREFL-SOL-HH = 0.10 BACKREFL-VIS-HH = 0.10  
 TRANS-IR = 0.0 EMIS-IR = 0.9 BACKEMIS-IR = 0.9 ..

**Shade-Thin-T20-R30** Pull-down shade  
 \$Pull-down shade, thin, fabric  
 \$20% transmittance, 30% reflectance  
 TYPE = BLIND THICKNESS = 0.00066 CONDUCTIVITY = 0.0667  
 SLAT-ANGLE = 89.95 SLAT-ORIENTATION = HORIZONTAL  
 SLAT-WIDTH = 0.0840 SLAT-SEPARATION = 0.0833 SLAT-ANGLE-MAX = 90

TRANS-SOL-BB = 0.0      TRANS-SOL-BH = 0.20      TRANS-SOL-HH      = 0.20  
 TRANS-VIS-BB = 0.0      TRANS-VIS-BH = 0.20      TRANS-VIS-HH      = 0.20  
 REFL-SOL-BH = 0.30      REFL-SOL-HH = 0.30      BACKREFL-SOL-BH = 0.30  
 REFL-VIS-BH = 0.30      REFL-VIS-HH = 0.30      BACKREFL-VIS-BH = 0.30  
 BACKREFL-SOL-HH = 0.30      BACKREFL-VIS-HH = 0.30  
 TRANS-IR      = 0.0      EMIS-IR      = 0.9      BACKEMIS-IR      = 0.9 ..

**Shade-Thin-T20-R50**

Pull-down shade

\$Pull-down shade, thin, fabric  
 \$20% transmittance, 50% reflectance  
 TYPE = BLIND      THICKNESS      = 0.00066      CONDUCTIVITY      = 0.0667  
 SLAT-ANGLE = 89.95      SLAT-ORIENTATION = HORIZONTAL  
 SLAT-WIDTH = 0.0840      SLAT-SEPARATION = 0.0833      SLAT-ANGLE-MAX = 90  
 TRANS-SOL-BB = 0.0      TRANS-SOL-BH = 0.20      TRANS-SOL-HH      = 0.20  
 TRANS-VIS-BB = 0.0      TRANS-VIS-BH = 0.20      TRANS-VIS-HH      = 0.20  
 REFL-SOL-BH = 0.50      REFL-SOL-HH = 0.50      BACKREFL-SOL-BH = 0.50  
 REFL-VIS-BH = 0.50      REFL-VIS-HH = 0.50      BACKREFL-VIS-BH = 0.50  
 BACKREFL-SOL-HH = 0.50      BACKREFL-VIS-HH = 0.50  
 TRANS-IR      = 0.0      EMIS-IR      = 0.9      BACKEMIS-IR      = 0.9 ..

**Shade-Thin-T20-R70**

Pull-down shade

\$Pull-down shade, thin, fabric  
 \$20% transmittance, 70% reflectance  
 TYPE = BLIND      THICKNESS      = 0.00066      CONDUCTIVITY      = 0.0667  
 SLAT-ANGLE = 89.95      SLAT-ORIENTATION = HORIZONTAL  
 SLAT-WIDTH = 0.0840      SLAT-SEPARATION = 0.0833      SLAT-ANGLE-MAX = 90  
 TRANS-SOL-BB = 0.0      TRANS-SOL-BH = 0.20      TRANS-SOL-HH      = 0.20  
 TRANS-VIS-BB = 0.0      TRANS-VIS-BH = 0.20      TRANS-VIS-HH      = 0.20  
 REFL-SOL-BH = 0.70      REFL-SOL-HH = 0.70      BACKREFL-SOL-BH = 0.70  
 REFL-VIS-BH = 0.70      REFL-VIS-HH = 0.70      BACKREFL-VIS-BH = 0.70  
 BACKREFL-SOL-HH = 0.70      BACKREFL-VIS-HH = 0.70  
 TRANS-IR      = 0.0      EMIS-IR      = 0.9      BACKEMIS-IR      = 0.9 ..

**Shade-Thin-T30-R10**

Pull-down shade

\$Pull-down shade, thin, fabric  
 \$30% transmittance, 10% reflectance  
 TYPE = BLIND      THICKNESS      = 0.00066      CONDUCTIVITY      = 0.0667  
 SLAT-ANGLE = 89.95      SLAT-ORIENTATION = HORIZONTAL  
 SLAT-WIDTH = 0.0840      SLAT-SEPARATION = 0.0833      SLAT-ANGLE-MAX = 90  
 TRANS-SOL-BB = 0.0      TRANS-SOL-BH = 0.30      TRANS-SOL-HH      = 0.30  
 TRANS-VIS-BB = 0.0      TRANS-VIS-BH = 0.30      TRANS-VIS-HH      = 0.30  
 REFL-SOL-BH = 0.10      REFL-SOL-HH = 0.10      BACKREFL-SOL-BH = 0.10  
 REFL-VIS-BH = 0.10      REFL-VIS-HH = 0.10      BACKREFL-VIS-BH = 0.10  
 BACKREFL-SOL-HH = 0.10      BACKREFL-VIS-HH = 0.10  
 TRANS-IR      = 0.0      EMIS-IR      = 0.9      BACKEMIS-IR      = 0.9 ..

**Shade-Thin-T30-R30**

Pull-down shade

\$Pull-down shade, thin, fabric  
 \$30% transmittance, 30% reflectance  
 TYPE = BLIND      THICKNESS      = 0.00066      CONDUCTIVITY      = 0.0667  
 SLAT-ANGLE = 89.95      SLAT-ORIENTATION = HORIZONTAL  
 SLAT-WIDTH = 0.0840      SLAT-SEPARATION = 0.0833      SLAT-ANGLE-MAX = 90  
 TRANS-SOL-BB = 0.0      TRANS-SOL-BH = 0.30      TRANS-SOL-HH      = 0.30  
 TRANS-VIS-BB = 0.0      TRANS-VIS-BH = 0.30      TRANS-VIS-HH      = 0.30  
 REFL-SOL-BH = 0.30      REFL-SOL-HH = 0.30      BACKREFL-SOL-BH = 0.30  
 REFL-VIS-BH = 0.30      REFL-VIS-HH = 0.30      BACKREFL-VIS-BH = 0.30  
 BACKREFL-SOL-HH = 0.30      BACKREFL-VIS-HH = 0.30  
 TRANS-IR      = 0.0      EMIS-IR      = 0.9      BACKEMIS-IR      = 0.9 ..

**Shade-Thin-T30-R50**

Pull-down shade

\$Pull-down shade, thin, fabric  
 \$30% transmittance, 50% reflectance  
 TYPE = BLIND      THICKNESS      = 0.00066      CONDUCTIVITY      = 0.0667  
 SLAT-ANGLE = 89.95      SLAT-ORIENTATION = HORIZONTAL  
 SLAT-WIDTH = 0.0840      SLAT-SEPARATION = 0.0833      SLAT-ANGLE-MAX = 90  
 TRANS-SOL-BB = 0.0      TRANS-SOL-BH = 0.30      TRANS-SOL-HH      = 0.30  
 TRANS-VIS-BB = 0.0      TRANS-VIS-BH = 0.30      TRANS-VIS-HH      = 0.30  
 REFL-SOL-BH = 0.50      REFL-SOL-HH = 0.50      BACKREFL-SOL-BH = 0.50  
 REFL-VIS-BH = 0.50      REFL-VIS-HH = 0.50      BACKREFL-VIS-BH = 0.50  
 BACKREFL-SOL-HH = 0.50      BACKREFL-VIS-HH = 0.50  
 TRANS-IR      = 0.0      EMIS-IR      = 0.9      BACKEMIS-IR      = 0.9 ..

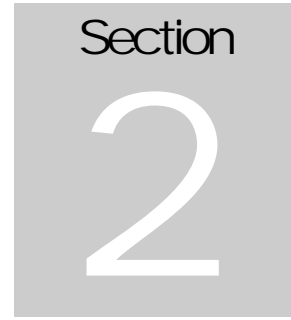
**Shade-Thin-T30-R60**

Pull-down shade

\$Pull-down shade, thin, fabric

\$30% transmittance, 60% reflectance

```
TYPE = BLIND          THICKNESS = 0.00066  CONDUCTIVITY = 0.0667
SLAT-ANGLE = 89.95    SLAT-ORIENTATION = HORIZONTAL
SLAT-WIDTH = 0.0840   SLAT-SEPARATION = 0.0833  SLAT-ANGLE-MAX = 90
TRANS-SOL-BB = 0.0    TRANS-SOL-BH = 0.30      TRANS-SOL-HH = 0.30
TRANS-VIS-BB = 0.0    TRANS-VIS-BH = 0.30      TRANS-VIS-HH = 0.30
REFL-SOL-BH = 0.60    REFL-SOL-HH = 0.60      BACKREFL-SOL-BH = 0.60
REFL-VIS-BH = 0.60    REFL-VIS-HH = 0.60      BACKREFL-VIS-BH = 0.60
BACKREFL-SOL-HH = 0.60 BACKREFL-VIS-HH = 0.60
TRANS-IR = 0.0        EMIS-IR = 0.9           BACKEMIS-IR = 0.9 ..
```



# Lighting Libraries

This section contains libraries for lamps and luminaires

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## LIGHTING-SYSTEM LAMP-TYPE LIBRARY

The following is a list of the lamp types in the Library. The meaning of each entry is as follows. The bold-faced text is the U-name of the lamp type to be used as the value of the keyword LAMP-TYPE in the LIGHTING-SYSTEM command. For example, to choose the first lamp in the library, which has the U-name **F17T8/ES-Rap**, your input would look like:

```
LS-1 = LIGHTING-SYSTEM
      LIGHTING-CALC-METHOD = LUMINAIRE-LAMP
      LAMP-TYPE              = F17T8/ES-Rap
      . . . . .
```

Following the U-name is the lamp classification, such as “T8 ES Fluor.” Here, the following abbreviations are used: Tn = tube diameter in eighths of an inch, ES = energy saving, Fluor = fluorescent, CFL = compact fluorescent lamp, Incand = incandescent, and Press = pressure.

The second line of an entry gives a description of the lamp type. The remaining lines give the value of the CATEGORY through LUMEN-DEPREC keywords for this lamp type. The program will use the indicated keyword values in the lighting system calculation. For a description of these keywords, see “LAMP-TYPE Command” in the *Command/Keyword Dictionary*.

Table 14 Lamp Library

<b>F17T8/ES-Rap</b>	T8 ES Fluor	
*24" Fluor, Energy Saving, Rapid Start, 78 lum/watt		*
CATEGORY = FULL-SIZE-FLUOR SIZE = T-24-IN		
POWER-INPUT = 17 INIT-LUMEN-OUT = 1325 LUMEN-DEPREC = .77		
<b>F25T8/ES-Rap</b>	T8 ES Fluor	
*36" Fluor, Energy Saving, Rapid Start, 85 lum/watt		*
CATEGORY = FULL-SIZE-FLUOR SIZE = T-36-IN		
POWER-INPUT = 25 INIT-LUMEN-OUT = 2125 LUMEN-DEPREC = .81		
<b>F32T8/ES-Rap</b>	T8 ES Fluor	
*48" Fluor, Energy Saving, Rapid Start, 89 lum/watt		*
CATEGORY = FULL-SIZE-FLUOR SIZE = T-48-IN		
POWER-INPUT = 32 INIT-LUMEN-OUT = 2850 LUMEN-DEPREC = .84		
<b>F40T12/ES-Rap</b>	T12 ES Fluor	
*48" Fluor, Energy Saving, Rapid Start, 76 lum/watt		*
CATEGORY = FULL-SIZE-FLUOR SIZE = T-48-IN		
POWER-INPUT = 34 INIT-LUMEN-OUT = 2670 LUMEN-DEPREC = .82		
<b>F48T12/ES-HO-Rap</b>	T12 ES Fluor	
*48" Fluor, Energy Saving, High Output, Rapid Start, 70 lum/watt		*
CATEGORY = FULL-SIZE-FLUOR SIZE = T-48-IN		
POWER-INPUT = 55 INIT-LUMEN-OUT = 3850 LUMEN-DEPREC = .82		
<b>F96T12/ES-HO-Rap</b>	T12 ES Fluor	
*96" Fluor, Energy Saving, High Output, Rapid Start, 84 lum/watt		*
CATEGORY = FULL-SIZE-FLUOR SIZE = T-96-IN		
POWER-INPUT = 95 INIT-LUMEN-OUT = 8020 LUMEN-DEPREC = .82		
<b>F48T12/ES-Ins</b>	T12 ES Fluor	
*48" Fluor, Energy Saving, Instant Start, 82 lum/watt		*
CATEGORY = FULL-SIZE-FLUOR SIZE = T-48-IN		
POWER-INPUT = 32 INIT-LUMEN-OUT = 2610 LUMEN-DEPREC = .82		
<b>F96T8/ES-Ins</b>	T8 ES Fluor	
*96" Fluor, Energy Saving, Instant Start, 86 lum/watt		*
CATEGORY = FULL-SIZE-FLUOR SIZE = T-96-IN		
POWER-INPUT = 40 INIT-LUMEN-OUT = 3450 LUMEN-DEPREC = .82		
<b>F96T12/ES-Ins</b>	T12 ES Fluor	
*96" Fluor, Energy Saving, Instant Start, 91 lum/watt		*
CATEGORY = FULL-SIZE-FLUOR SIZE = T-96-IN		
POWER-INPUT = 60 INIT-LUMEN-OUT = 5430 LUMEN-DEPREC = .82		
<b>F40T12/ES-Ins</b>	T12 ES Fluor	
*48" Fluor, Energy Saving, Instant Start, 80 lum/watt		*
CATEGORY = FULL-SIZE-FLUOR SIZE = T-48-IN		
POWER-INPUT = 35 INIT-LUMEN-OUT = 2800 LUMEN-DEPREC = .82		
<b>F40T12/ES-Rap</b>	T12 ES Fluor	
*48" Fluor, Energy Saving, Rapid Start, 80 lum/watt		*
CATEGORY = FULL-SIZE-FLUOR SIZE = T-48-IN		
POWER-INPUT = 35 INIT-LUMEN-OUT = 2800 LUMEN-DEPREC = .82		
<b>F40T12/U/6-ES-Rap</b>	T12 ES Fluor	
*24" U-Tube Fluor, Energy Saving, Rapid Start, 82 lum/watt		*
CATEGORY = FULL-SIZE-FLUOR SIZE = T-24-IN		
POWER-INPUT = 34 INIT-LUMEN-OUT = 2800 LUMEN-DEPREC = .77		
<b>F30T12/Rap</b>	T12 Fluor	
*36" Fluor, Rapid Start, 78 lum/watt		*
CATEGORY = FULL-SIZE-FLUOR SIZE = T-36-IN		
POWER-INPUT = 30 INIT-LUMEN-OUT = 2350 LUMEN-DEPREC = .81		
<b>F40T12/Rap</b>	T12 Fluor	
*48" Fluor, Rapid Start, 76 lum/watt		*
CATEGORY = FULL-SIZE-FLUOR SIZE = T-48-IN		

POWER-INPUT = 40 INIT-LUMEN-OUT = 3050 LUMEN-DEPREC = .84

**F40T10/Rap** T10 Fluor  
 \*48" Fluor, Rapid Start, 78 lum/watt \*  
 CATEGORY = FULL-SIZE-FLUOR SIZE = T-48-IN  
 POWER-INPUT = 40 INIT-LUMEN-OUT = 3100 LUMEN-DEPREC = .84

**F24T12/HO-Rap** T12 Fluor  
 \*24" Fluor, High Output, Rapid Start, 47 lum/watt \*  
 CATEGORY = FULL-SIZE-FLUOR SIZE = T-24-IN  
 POWER-INPUT = 35 INIT-LUMEN-OUT = 1640 LUMEN-DEPREC = .77

**F36T12/HO-Rap** T12 Fluor  
 \*36" Fluor, High Output, Rapid Start, 60 lum/watt \*  
 CATEGORY = FULL-SIZE-FLUOR SIZE = T-36-IN  
 POWER-INPUT = 47 INIT-LUMEN-OUT = 2815 LUMEN-DEPREC = .77

**F48T12/HO-Rap** T12 Fluor  
 \*48" Fluor, High Output, Rapid Start, 68 lum/watt \*  
 CATEGORY = FULL-SIZE-FLUOR SIZE = T-48-IN  
 POWER-INPUT = 60 INIT-LUMEN-OUT = 4067 LUMEN-DEPREC = .82

**F72T12/HO-Rap** T12 Fluor  
 \*72" Fluor, High Output, Rapid Start, 75 lum/watt \*  
 CATEGORY = FULL-SIZE-FLUOR SIZE = T-72-IN  
 POWER-INPUT = 85 INIT-LUMEN-OUT = 6367 LUMEN-DEPREC = .82

**F96T12/HO-Rap** T12 Fluor  
 \*96" Fluor, High Output, Rapid Start, 80 lum/watt \*  
 CATEGORY = FULL-SIZE-FLUOR SIZE = T-96-IN  
 POWER-INPUT = 110 INIT-LUMEN-OUT = 8830 LUMEN-DEPREC = .82

**F48T10/Rap** T10 Fluor  
 \*48" Fluor, Rapid Start, 56 lum/watt \*  
 CATEGORY = FULL-SIZE-FLUOR SIZE = T-48-IN  
 POWER-INPUT = 110 INIT-LUMEN-OUT = 6200 LUMEN-DEPREC = .66

**F72T10/Rap** T10 Fluor  
 \*72" Fluor, Rapid Start, 61 lum/watt \*  
 CATEGORY = FULL-SIZE-FLUOR SIZE = T-72-IN  
 POWER-INPUT = 160 INIT-LUMEN-OUT = 9700 LUMEN-DEPREC = .66

**F96T10/VHO-Rap** T10 Fluor  
 \*96" Fluor, Very High Output, Rapid Start, 69 lum/watt \*  
 CATEGORY = FULL-SIZE-FLUOR SIZE = T-96-IN  
 POWER-INPUT = 195 INIT-LUMEN-OUT = 13500 LUMEN-DEPREC = .66

**F48T12/Rap** T12 Fluor  
 \*48" Fluor, Rapid Start, 60 lum/watt \*  
 CATEGORY = FULL-SIZE-FLUOR SIZE = T-48-IN  
 POWER-INPUT = 110 INIT-LUMEN-OUT = 6617 LUMEN-DEPREC = .69

**F72T12/Rap** T12 Fluor  
 \*72" Fluor, Rapid Start, 64 lum/watt \*  
 CATEGORY = FULL-SIZE-FLUOR SIZE = T-72-IN  
 POWER-INPUT = 165 INIT-LUMEN-OUT = 10617 LUMEN-DEPREC = .72

**F96T12/Rap** T12 Fluor  
 \*96" Fluor, Rapid Start, 66 lum/watt \*  
 CATEGORY = FULL-SIZE-FLUOR SIZE = T-96-IN  
 POWER-INPUT = 217 INIT-LUMEN-OUT = 14400 LUMEN-DEPREC = .72

**F24T12/Ins** T12 Fluor  
 \*24" Fluor, Instant Start, 58 lum/watt \*  
 CATEGORY = FULL-SIZE-FLUOR SIZE = T-24-IN  
 POWER-INPUT = 20 INIT-LUMEN-OUT = 1150 LUMEN-DEPREC = .81

**F36T12/Ins** T12 Fluor  
 \*36" Fluor, Instant Start, 65 lum/watt \*  
 CATEGORY = FULL-SIZE-FLUOR SIZE = T-36-IN  
 POWER-INPUT = 30 INIT-LUMEN-OUT = 1940 LUMEN-DEPREC = .81



<b>F48T12/Ins</b>	T12 Fluor	
*48" Fluor, Instant Start, 74 lum/watt		*
CATEGORY = FULL-SIZE-FLUOR SIZE = T-48-IN		
POWER-INPUT = 39 INIT-LUMEN-OUT = 2890 LUMEN-DEPREC = .82		
<b>F72T12/Ins</b>	T12 Fluor	
*72" Fluor, Instant Start, 81 lum/watt		*
CATEGORY = FULL-SIZE-FLUOR SIZE = T-72-IN		
POWER-INPUT = 55 INIT-LUMEN-OUT = 4480 LUMEN-DEPREC = .89		
<b>F96T12/Ins</b>	T12 Fluor	
*96" Fluor, Instant Start, 88 lum/watt		*
CATEGORY = FULL-SIZE-FLUOR SIZE = T-96-IN		
POWER-INPUT = 75 INIT-LUMEN-OUT = 6620 LUMEN-DEPREC = .89		
<b>F72T8/Ins</b>	T8 Fluor	
*72" Fluor, Instant Start, 82 lum/watt		*
CATEGORY = FULL-SIZE-FLUOR SIZE = T-72-IN		
POWER-INPUT = 37 INIT-LUMEN-OUT = 3025 LUMEN-DEPREC = .83		
<b>F96T8/Ins</b>	T8 Fluor	
*96" Fluor, Instant Start, 81 lum/watt		*
CATEGORY = FULL-SIZE-FLUOR SIZE = T-96-IN		
POWER-INPUT = 50 INIT-LUMEN-OUT = 4025 LUMEN-DEPREC = .89		
<b>FB16T8/Rap</b>	T8 U-Tube Fluor	
*12" U-Tube Fluor, Rapid Start, 78 lum/watt		*
CATEGORY = FULL-SIZE-FLUOR SIZE = T-12-IN		
POWER-INPUT = 16 INIT-LUMEN-OUT = 1250 LUMEN-DEPREC = .80		
<b>FB24T8/Rap</b>	T8 U-Tube Fluor	
*18" U-Tube Fluor, Rapid Start, 85 lum/watt		*
CATEGORY = FULL-SIZE-FLUOR SIZE = T-18-IN		
POWER-INPUT = 24 INIT-LUMEN-OUT = 2050 LUMEN-DEPREC = .80		
<b>FB31T8/Rap</b>	T8 U-Tube Fluor	
*24" U-Tube Fluor, Rapid Start, 90 lum/watt		*
CATEGORY = FULL-SIZE-FLUOR SIZE = T-24-IN		
POWER-INPUT = 31 INIT-LUMEN-OUT = 2800 LUMEN-DEPREC = .80		
<b>FB35T12/Rap</b>	T12 U-Tube Fluor	
*22.5" U-Tube Fluor, Rapid Start, 67 lum/watt		*
CATEGORY = FULL-SIZE-FLUOR SIZE = T-24-IN		
POWER-INPUT = 35 INIT-LUMEN-OUT = 2350 LUMEN-DEPREC = .80		
<b>FB40T12/Rap</b>	T12 U-Tube Fluor	
*22.5" U-Tube Fluor, Rapid Start, 75 lum/watt		*
CATEGORY = FULL-SIZE-FLUOR SIZE = T-24-IN		
POWER-INPUT = 40 INIT-LUMEN-OUT = 3000 LUMEN-DEPREC = .80		
<b>FT18W/2G11-Rap</b>	Twin-Tube Fluor	
*11" U-Tube Fluor, Rapid Start, 69 lum/watt		*
CATEGORY = FULL-SIZE-FLUOR SIZE = T-12-IN		
POWER-INPUT = 18 INIT-LUMEN-OUT = 1250 LUMEN-DEPREC = .80		
<b>FT39W/2G11-Rap</b>	Twin-Tube Fluor	
*17" U-Tube Fluor, Rapid Start, 73 lum/watt		*
CATEGORY = FULL-SIZE-FLUOR SIZE = T-18-IN		
POWER-INPUT = 39 INIT-LUMEN-OUT = 2850 LUMEN-DEPREC = .80		
<b>FT40W/2G11-Rap</b>	Twin-Tube Fluor	
*11" U-Tube Fluor, Rapid Start, 79 lum/watt		*
CATEGORY = FULL-SIZE-FLUOR SIZE = T-24-IN		
POWER-INPUT = 40 INIT-LUMEN-OUT = 3150 LUMEN-DEPREC = .80		
<b>FT50W/2G11-Rap</b>	Twin-Tube Fluor	
*23" U-Tube Fluor, Rapid Start, 80 lum/watt		*
CATEGORY = FULL-SIZE-FLUOR SIZE = T-24-IN		
POWER-INPUT = 50 INIT-LUMEN-OUT = 4000 LUMEN-DEPREC = .80		

**FT55W/2G11-Rap** Twin-Tube Fluor  
 \*21" U-Tube Fluor, Rapid Start, 87 lum/watt \*  
 CATEGORY = FULL-SIZE-FLUOR SIZE = T-24-IN  
 POWER-INPUT = 55 INIT-LUMEN-OUT = 4800 LUMEN-DEPREC = .80

**CFT5W/G23** Twin-Tube CFL  
 \*5-Watt Twin-Tube Compact T4 Fluorescent, 50 lum/watt \*  
 CATEGORY = COMPACT-FLUOR SIZE = T-0-6-IN  
 POWER-INPUT = 5 INIT-LUMEN-OUT = 250 LUMEN-DEPREC = .80

**CFT7W/G23** Twin-Tube CFL  
 \*7-Watt Twin-Tube Compact T4 Fluorescent, 57 lum/watt \*  
 CATEGORY = COMPACT-FLUOR SIZE = T-0-6-IN  
 POWER-INPUT = 7 INIT-LUMEN-OUT = 400 LUMEN-DEPREC = .80

**CFT9W/G23** Twin-Tube CFL  
 \*9-Watt Twin-Tube Compact T4 Fluorescent, 67 lum/watt \*  
 CATEGORY = COMPACT-FLUOR SIZE = T-6-12-IN  
 POWER-INPUT = 9 INIT-LUMEN-OUT = 600 LUMEN-DEPREC = .80

**CFT13W/GX23** Twin-Tube CFL  
 \*13-Watt Twin-Tube Compact T4 Fluorescent, 69 lum/watt \*  
 CATEGORY = COMPACT-FLUOR SIZE = T-6-12-IN  
 POWER-INPUT = 13 INIT-LUMEN-OUT = 900 LUMEN-DEPREC = .80

**CFT18W** Twin-Tube CFL  
 \*18-Watt Twin-Tube Compact T5 Fluorescent, 10.5", 69 lum/watt \*  
 CATEGORY = COMPACT-FLUOR SIZE = T-6-12-IN  
 POWER-INPUT = 18 INIT-LUMEN-OUT = 1250 LUMEN-DEPREC = .83

**CFT27W** Twin-Tube CFL  
 \*27-Watt Twin-Tube Compact T5 Fluorescent, 12.8", 67 lum/watt \*  
 CATEGORY = COMPACT-FLUOR SIZE = T-12-IN  
 POWER-INPUT = 27 INIT-LUMEN-OUT = 1800 LUMEN-DEPREC = .83

**CFT39W** Twin-Tube CFL  
 \*39-Watt Twin-Tube Compact T5 Fluorescent, 16.5", 73 lum/watt \*  
 CATEGORY = COMPACT-FLUOR SIZE = T-18-IN  
 POWER-INPUT = 39 INIT-LUMEN-OUT = 2850 LUMEN-DEPREC = .80

**CFT50W** Twin-Tube CFL  
 \*39-Watt Twin-Tube Compact T5 Fluorescent, 22.5", 80 lum/watt \*  
 CATEGORY = COMPACT-FLUOR SIZE = T-24-IN  
 POWER-INPUT = 50 INIT-LUMEN-OUT = 4000 LUMEN-DEPREC = .74

**CFQ9W/G23** Quad-Tube CFL  
 \*9-Watt Quad-Tube Compact T4 Fluorescent, 67 lum/watt \*  
 CATEGORY = COMPACT-FLUOR SIZE = T-0-6-IN  
 POWER-INPUT = 9 INIT-LUMEN-OUT = 600 LUMEN-DEPREC = .80

**CFQ13W/GX23** Quad-Tube CFL  
 \*13-Watt Quad-Tube Compact T4 Fluorescent, 66 lum/watt \*  
 CATEGORY = COMPACT-FLUOR SIZE = T-0-6-IN  
 POWER-INPUT = 13 INIT-LUMEN-OUT = 860 LUMEN-DEPREC = .80

**CFQ15W/GX32D** Quad-Tube CFL  
 \*15-Watt Quad-Tube Compact T4 Fluorescent, 60 lum/watt \*  
 CATEGORY = COMPACT-FLUOR SIZE = T-0-6-IN  
 POWER-INPUT = 15 INIT-LUMEN-OUT = 900 LUMEN-DEPREC = .80

**CFQ18W/G24D** Quad-Tube CFL  
 \*18-Watt Quad-Tube Compact T4 Fluorescent, 69 lum/watt \*  
 CATEGORY = COMPACT-FLUOR SIZE = T-6-12-IN  
 POWER-INPUT = 18 INIT-LUMEN-OUT = 1250 LUMEN-DEPREC = .80

**CFQ20W/GX32D** Quad-Tube CFL  
 \*20-Watt Quad-Tube Compact T4 Fluorescent, 60 lum/watt \*  
 CATEGORY = COMPACT-FLUOR SIZE = T-6-12-IN  
 POWER-INPUT = 20 INIT-LUMEN-OUT = 1200 LUMEN-DEPREC = .80

**CFQ26W/G24D** Quad-Tube CFL

\*26-Watt Quad-Tube Compact T4 Fluorescent, 69 lum/watt \*  
 CATEGORY = COMPACT-FLUOR SIZE = T-6-12-IN  
 POWER-INPUT = 26 INIT-LUMEN-OUT = 1800 LUMEN-DEPREC = .80

**CFH13W** Hex-Tube CFL  
 \*13-Watt Hex-Tube Compact T4 Fluorescent, 4.2", 65 lum/watt \*  
 CATEGORY = COMPACT-FLUOR SIZE = T-0-6-IN  
 POWER-INPUT = 13 INIT-LUMEN-OUT = 840 LUMEN-DEPREC = .73

**CFH18W** Hex-Tube CFL  
 \*18-Watt Hex-Tube Compact T4 Fluorescent, 4.6", 62 lum/watt \*  
 CATEGORY = COMPACT-FLUOR SIZE = T-0-6-IN  
 POWER-INPUT = 18 INIT-LUMEN-OUT = 1120 LUMEN-DEPREC = .73

**CFH26W** Hex-Tube CFL  
 \*26-Watt Hex-Tube Compact T4 Fluorescent, 5.2", 62 lum/watt \*  
 CATEGORY = COMPACT-FLUOR SIZE = T-0-6-IN  
 POWER-INPUT = 26 INIT-LUMEN-OUT = 1610 LUMEN-DEPREC = .74

**CFH32W** Hex-Tube CFL  
 \*32-Watt Hex-Tube Compact T4 Fluorescent, 5.8", 69 lum/watt \*  
 CATEGORY = COMPACT-FLUOR SIZE = T-0-6-IN  
 POWER-INPUT = 32 INIT-LUMEN-OUT = 2200 LUMEN-DEPREC = .74

**Incand50W/A19** Incand Frosted  
 \*50-Watt INCANDESCENT, Inside Frosted, A19, 14 lum/watt \*  
 CATEGORY = INCANDESCENT SIZE = ALPHA-0-21  
 POWER-INPUT = 50 INIT-LUMEN-OUT = 680 LUMEN-DEPREC = .88

**Incand75W/A19** Incand Frosted  
 \*75-Watt INCANDESCENT, Inside Frosted, A19, 16 lum/watt \*  
 CATEGORY = INCANDESCENT SIZE = ALPHA-0-21  
 POWER-INPUT = 75 INIT-LUMEN-OUT = 1190 LUMEN-DEPREC = .92

**Incand100W/A19** Incand Frosted  
 \*100-Watt INCANDESCENT, Inside Frosted, A19, 17 lum/watt \*  
 CATEGORY = INCANDESCENT SIZE = ALPHA-0-21  
 POWER-INPUT = 100 INIT-LUMEN-OUT = 1740 LUMEN-DEPREC = .91

**Incand150W/A21** Incand Frosted  
 \*150-Watt INCANDESCENT, Inside Frosted, A21, 19 lum/watt \*  
 CATEGORY = INCANDESCENT SIZE = ALPHA-0-21  
 POWER-INPUT = 150 INIT-LUMEN-OUT = 2873 LUMEN-DEPREC = .89

**Incand200W/A23** Incand Frosted  
 \*200-Watt INCANDESCENT, Inside Frosted, A23, 20 lum/watt \*  
 CATEGORY = INCANDESCENT SIZE = ALPHA-22-30  
 POWER-INPUT = 200 INIT-LUMEN-OUT = 4003 LUMEN-DEPREC = .89

**Incand300W/PS30** Incand Frosted  
 \*300-Watt INCANDESCENT, Inside Frosted, PS30, 20 lum/watt \*  
 CATEGORY = INCANDESCENT SIZE = ALPHA-22-30  
 POWER-INPUT = 300 INIT-LUMEN-OUT = 6103 LUMEN-DEPREC = .83

**Incand500W/PS40** Incand Frosted  
 \*500-Watt INCANDESCENT, Inside Frosted, PS40, 20 lum/watt \*  
 CATEGORY = INCANDESCENT SIZE = ALPHA-31-50  
 POWER-INPUT = 500 INIT-LUMEN-OUT = 10035 LUMEN-DEPREC = .89

**Incand1000W/PS52** Incand Frosted  
 \*1000-Watt INCANDESCENT, Inside Frosted, PS52, 24 lum/watt \*  
 CATEGORY = INCANDESCENT SIZE = ALPHA-31-50  
 POWER-INPUT = 1000 INIT-LUMEN-OUT = 23510 LUMEN-DEPREC = .89

**Incand1500W/PS52** Incand Frosted  
 \*1500-Watt INCANDESCENT, Inside Frosted, PS52, 23 lum/watt \*  
 CATEGORY = INCANDESCENT SIZE = ALPHA-31-50  
 POWER-INPUT = 1500 INIT-LUMEN-OUT = 33850 LUMEN-DEPREC = .78

**Incand45W/PAR38** Incand Flood  
 \*45-Watt INCANDESCENT Parabolic Reflector, PAR38, 12 lum/watt \*

CATEGORY = INCANDESCENT SIZE = REFL-31-50  
POWER-INPUT = 45 INIT-LUMEN-OUT = 540 LUMEN-DEPREC = .88

**Incand75W/PAR38** Incand Flood  
\*75-Watt INCANDESCENT Parabolic Reflector, PAR38, 12 lum/watt \*  
CATEGORY = INCANDESCENT SIZE = REFL-31-50  
POWER-INPUT = 75 INIT-LUMEN-OUT = 900 LUMEN-DEPREC = .88

**Incand100W/PAR38** Incand Flood  
\*100-Watt INCANDESCENT Parabolic Reflector, PAR38, 13 lum/watt \*  
CATEGORY = INCANDESCENT SIZE = REFL-31-50  
POWER-INPUT = 100 INIT-LUMEN-OUT = 1250 LUMEN-DEPREC = .91

**Incand150W/PAR38** Incand Flood  
\*150-Watt INCANDESCENT Parabolic Reflector, PAR38, 12 lum/watt \*  
CATEGORY = INCANDESCENT SIZE = REFL-31-50  
POWER-INPUT = 150 INIT-LUMEN-OUT = 1735 LUMEN-DEPREC = .89

**Incand250W/PAR38** Incand Flood  
\*250-Watt INCANDESCENT Parabolic Reflector, PAR38, 13 lum/watt \*  
CATEGORY = INCANDESCENT SIZE = REFL-31-50  
POWER-INPUT = 250 INIT-LUMEN-OUT = 3200 LUMEN-DEPREC = .89

**Incand500W/PAR64** Incand Flood  
\*500-Watt INCANDESCENT Parabolic Reflector, PAR64, 13 lum/watt \*  
CATEGORY = INCANDESCENT SIZE = REFL-31-50  
POWER-INPUT = 500 INIT-LUMEN-OUT = 6500 LUMEN-DEPREC = .89

**Incand1000W/PAR64** Incand Flood  
\*1000-Watt INCANDESCENT Parabolic Reflector, PAR64, 18 lum/watt \*  
CATEGORY = INCANDESCENT SIZE = REFL-31-50  
POWER-INPUT = 1000 INIT-LUMEN-OUT = 17700 LUMEN-DEPREC = .89

**Incand50W/R20** Incand Flood  
\*50-Watt INCANDESCENT Reflector, R20, 8 lum/watt \*  
CATEGORY = INCANDESCENT SIZE = REFL-0-21  
POWER-INPUT = 50 INIT-LUMEN-OUT = 415 LUMEN-DEPREC = .89

**Incand75W/R30** Incand Flood  
\*75-Watt INCANDESCENT Reflector, R30, 12 lum/watt \*  
CATEGORY = INCANDESCENT SIZE = REFL-22-30  
POWER-INPUT = 75 INIT-LUMEN-OUT = 865 LUMEN-DEPREC = .89

**Incand120W/R40** Incand Flood  
\*120-Watt INCANDESCENT Reflector, R40, 13 lum/watt \*  
CATEGORY = INCANDESCENT SIZE = REFL-31-50  
POWER-INPUT = 120 INIT-LUMEN-OUT = 1600 LUMEN-DEPREC = .89

**Incand300W/R40** Incand Flood  
\*300-Watt INCANDESCENT Reflector, R40, 14 lum/watt \*  
CATEGORY = INCANDESCENT SIZE = REFL-31-50  
POWER-INPUT = 300 INIT-LUMEN-OUT = 4250 LUMEN-DEPREC = .89

**Incand500W/R40** Incand Flood  
\*500-Watt INCANDESCENT Reflector, R40, 13 lum/watt \*  
CATEGORY = INCANDESCENT SIZE = REFL-31-50  
POWER-INPUT = 500 INIT-LUMEN-OUT = 6500 LUMEN-DEPREC = .89

**MetalHalide32W/E17** Metal Halide  
\*32-Watt Metal Halide, Vertical, Screw Base, E17, 78 lum/watt \*  
CATEGORY = HID-MET-HALIDE SIZE = ALPHA-0-21  
POWER-INPUT = 32 INIT-LUMEN-OUT = 2500 LUMEN-DEPREC = .89

**MetalHalide75W/ED17** Metal Halide  
\*75-Watt Metal Halide, Vertical, Screw Base, ED17, 75 lum/watt \*  
CATEGORY = HID-MET-HALIDE SIZE = ALPHA-0-21  
POWER-INPUT = 75 INIT-LUMEN-OUT = 5600 LUMEN-DEPREC = .89

**MetalHalide150W/ED17** Metal Halide  
\*150-Watt Metal Halide, Vertical, Screw Base, ED17, 83 lum/watt \*  
CATEGORY = HID-MET-HALIDE SIZE = ALPHA-0-21

POWER-INPUT = 150 INIT-LUMEN-OUT = 12500 LUMEN-DEPREC = .89

**MetalHalide250W/ED28** Metal Halide  
 \*250-Watt Metal Halide, Vertical, Screw Base, ED28, 92 lum/watt \*  
 CATEGORY = HID-MET-HALIDE SIZE = ALPHA-22-30  
 POWER-INPUT = 250 INIT-LUMEN-OUT = 23000 LUMEN-DEPREC = .89

**MetalHalide400W/ED37** Metal Halide  
 \*400-Watt Metal Halide, Vertical, Screw Base, ED37, 100 lum/watt \*  
 CATEGORY = HID-MET-HALIDE SIZE = ALPHA-31-50  
 POWER-INPUT = 400 INIT-LUMEN-OUT = 40000 LUMEN-DEPREC = .89

**MetalHalide70W/T6.5** Metal Halide  
 \*75-Watt Metal Halide, Horizont, Double End, T6.5, 79 lum/watt \*  
 CATEGORY = HID-MET-HALIDE SIZE = T-6-12-IN  
 POWER-INPUT = 70 INIT-LUMEN-OUT = 5500 LUMEN-DEPREC = .89

**MetalHalide100W/T7.5** Metal Halide  
 \*100-Watt Metal Halide, Horizont, Double End, T7.5, 68 lum/watt \*  
 CATEGORY = HID-MET-HALIDE SIZE = T-6-12-IN  
 POWER-INPUT = 100 INIT-LUMEN-OUT = 6800 LUMEN-DEPREC = .89

**MetalHalide150W/T7.5** Metal Halide  
 \*150-Watt Metal Halide, Horizont, Double End, T7.5, 80 lum/watt \*  
 CATEGORY = HID-MET-HALIDE SIZE = T-6-12-IN  
 POWER-INPUT = 150 INIT-LUMEN-OUT = 12000 LUMEN-DEPREC = .89

**MetalHalide250W/T9.5** Metal Halide  
 \*150-Watt Metal Halide, Horizont, Double End, T9.5, 80 lum/watt \*  
 CATEGORY = HID-MET-HALIDE SIZE = T-6-12-IN  
 POWER-INPUT = 250 INIT-LUMEN-OUT = 20000 LUMEN-DEPREC = .89

**MetalHalide400W/T10** Metal Halide  
 \*400-Watt Metal Halide, Horizont, Double End, T10, 85 lum/watt \*  
 CATEGORY = HID-MET-HALIDE SIZE = T-6-12-IN  
 POWER-INPUT = 400 INIT-LUMEN-OUT = 34000 LUMEN-DEPREC = .89

**HPS35W/E17** Hi Press Sodium  
 \*35-Watt HPS, Universal Position, Screw Base, E17, 64 lum/watt \*  
 CATEGORY = HID-HI-PR-SODIUM SIZE = ALPHA-0-21  
 POWER-INPUT = 35 INIT-LUMEN-OUT = 2250 LUMEN-DEPREC = .89

**HPS70W/E17** Hi Press Sodium  
 \*70-Watt HPS, Universal Position, Screw Base, E17, 90 lum/watt \*  
 CATEGORY = HID-HI-PR-SODIUM SIZE = ALPHA-0-21  
 POWER-INPUT = 70 INIT-LUMEN-OUT = 6300 LUMEN-DEPREC = .89

**HPS150W/B17** Hi Press Sodium  
 \*150-Watt HPS, Universal Position, Screw Base, B17, 107 lum/watt \*  
 CATEGORY = HID-HI-PR-SODIUM SIZE = ALPHA-0-21  
 POWER-INPUT = 150 INIT-LUMEN-OUT = 16000 LUMEN-DEPREC = .89

**HPS250W/ED18** Hi Press Sodium  
 \*250-Watt HPS, Universal Position, Screw Base, ED18, 110 lum/watt \*  
 CATEGORY = HID-HI-PR-SODIUM SIZE = ALPHA-0-21  
 POWER-INPUT = 250 INIT-LUMEN-OUT = 27500 LUMEN-DEPREC = .89

**HPS400W/ED18** Hi Press Sodium  
 \*400-Watt HPS, Universal Position, Screw Base, ED18, 125 lum/watt \*  
 CATEGORY = HID-HI-PR-SODIUM SIZE = ALPHA-0-21  
 POWER-INPUT = 400 INIT-LUMEN-OUT = 50000 LUMEN-DEPREC = .89

**TungHal75W/T3** Tungsten Halogen  
 \*75-Watt Tungsten Halogen, Single Ended, T3, 19 lum/watt \*  
 CATEGORY = TUNGSTEN-HALOGEN SIZE = T-0-6-IN  
 POWER-INPUT = 75 INIT-LUMEN-OUT = 1400 LUMEN-DEPREC = .96

**TungHal100W/T4** Tungsten Halogen  
 \*100-Watt Tungsten Halogen, Single Ended, T4, 18 lum/watt \*  
 CATEGORY = TUNGSTEN-HALOGEN SIZE = T-0-6-IN  
 POWER-INPUT = 100 INIT-LUMEN-OUT = 1800 LUMEN-DEPREC = .96

**TungHal150W/T4** Tungsten Halogen  
\*150-Watt Tungsten Halogen, Single Ended, T4, 19 lum/watt \*  
CATEGORY = TUNGSTEN-HALOGEN SIZE = T-0-6-IN  
POWER-INPUT = 150 INIT-LUMEN-OUT = 2900 LUMEN-DEPREC = .96

**TungHal250W/T4** Tungsten Halogen  
\*250-Watt Tungsten Halogen, Single Ended, T4, 19 lum/watt \*  
CATEGORY = TUNGSTEN-HALOGEN SIZE = T-0-6-IN  
POWER-INPUT = 250 INIT-LUMEN-OUT = 4850 LUMEN-DEPREC = .96

**TungHal500W/T4** Tungsten Halogen  
\*500-Watt Tungsten Halogen, Single Ended, T4, 23 lum/watt \*  
CATEGORY = TUNGSTEN-HALOGEN SIZE = T-0-6-IN  
POWER-INPUT = 500 INIT-LUMEN-OUT = 11500 LUMEN-DEPREC = .96

## LIGHTING-SYSTEM LUMINAIRE-TYPE LIBRARY

The following is a list of the luminaire types in the Library. The meaning of each entry is as follows.

The bold-faced text is the U-name of the luminaire type to be used as the value of the keyword LUMINAIRE-TYPE in the LIGHTING-SYSTEM command. For example, to choose the first luminaire in the library, which has the U-name Troffer-2X4-2-Lamp, your input would look like:

```

LS-1 = LIGHTING-SYSTEM
      LIGHTING-CALC-METHOD = LUMINAIRE-LAMP
      LUMINAIRE-TYPE        = Troffer-2X4-2-Lamp
      . . . .

```

Following the U-name is the luminaire category, such as “Full-size Fluor.”

The second line of an entry gives a description of the luminaire type. The remaining lines give the value of the CURCR-1 through ACCEPT-CONFIG keywords for this luminaire type. The program will use the indicated keyword values in the lighting system calculation. For a description of these keywords, see “LUMINAIRE-TYPE Command” in the *Command/Keyword Dictionary*.

Table 15 Luminaire Library

<b>Troffer-2X4-2-Lamp</b>	Full-Size Fluor
*Troffer, 2'x4', 2 Lamps, Pattern Acrylic Diffuser	*
CU-RCR-1 = (.69,.71,.72,.71,.73,.75,.72,.77,.80)	
CU-RCR-5 = (.41,.45,.49,.41,.45,.50,.42,.46,.52)	
CU-RCR-10 = (.22,.25,.30,.22,.25,.30,.22,.26,.32)	
NO-OF-LAMPS = 2 ACCEPT-LAMP-SIZE = T-48-IN	
LUM-MAINT-CAT = LUM-MAINT-V	
ACCEPT-CONFIG = (RECESS-STATIC)	
<b>Troffer-2X4-3-Lamp</b>	Full-Size Fluor
*Troffer, 2'x4', 3 Lamps, Pattern Acrylic Diffuser	*
CU-RCR-1 = (.65,.66,.67,.67,.68,.70,.68,.72,.75)	
CU-RCR-5 = (.39,.42,.46,.39,.42,.47,.39,.44,.49)	
CU-RCR-10 = (.20,.24,.26,.21,.24,.29,.21,.24,.30)	
NO-OF-LAMPS = 3 ACCEPT-LAMP-SIZE = T-48-IN	
LUM-MAINT-CAT = LUM-MAINT-V	
ACCEPT-CONFIG = (RECESS-STATIC)	
<b>Troffer-2X4-4-Lamp</b>	Full-Size Fluor
*Troffer, 2'x4', 4 Lamps, Pattern Acrylic Diffuser	*
CU-RCR-1 = (.62,.64,.65,.64,.66,.68,.65,.69,.72)	
CU-RCR-5 = (.37,.40,.44,.37,.41,.45,.38,.42,.47)	
CU-RCR-10 = (.20,.23,.27,.20,.23,.27,.20,.23,.28)	
NO-OF-LAMPS = 4 ACCEPT-LAMP-SIZE = T-48-IN	
LUM-MAINT-CAT = LUM-MAINT-V	
ACCEPT-CONFIG = (RECESS-STATIC)	
<b>Air-Handling-Troffer-2X4-2-Lamp</b>	Full-Size Fluor
*Air Handling Troffer, 2'x4', 2 Lamps, Pattern Acrylic Diffuser	*
CU-RCR-1 = (.66,.67,.69,.68,.70,.72,.71,.74,.76)	
CU-RCR-5 = (.38,.41,.45,.38,.42,.47,.39,.43,.49)	
CU-RCR-10 = (.20,.23,.26,.20,.23,.28,.20,.24,.29)	
NO-OF-LAMPS = 2 ACCEPT-LAMP-SIZE = T-48-IN	
LUM-MAINT-CAT = LUM-MAINT-V	
ACCEPT-CONFIG = (RECESS-VENTED)	
<b>Air-Handling-Troffer-2X4-3-Lamp</b>	Full-Size Fluor
*Air Handling Troffer, 2'x4', 3 Lamps, Pattern Acrylic Diffuser	*
CU-RCR-1 = (.60,.62,.63,.62,.64,.66,.65,.68,.70)	
CU-RCR-5 = (.35,.38,.42,.35,.38,.43,.36,.40,.45)	
CU-RCR-10 = (.18,.21,.25,.18,.22,.26,.19,.22,.27)	
NO-OF-LAMPS = 3 ACCEPT-LAMP-SIZE = T-48-IN	
LUM-MAINT-CAT = LUM-MAINT-V	
ACCEPT-CONFIG = (RECESS-VENTED)	
<b>Air-Handling-Troffer-2X4-4-Lamp</b>	Full-Size Fluor
*Air Handling Troffer, 2'x4', 4 Lamps, Acrylic Diffuser	*
CU-RCR-1 = (.58,.59,.61,.60,.62,.63,.63,.65,.67)	
CU-RCR-5 = (.33,.36,.40,.34,.37,.41,.34,.38,.43)	
CU-RCR-10 = (.18,.21,.25,.18,.21,.25,.18,.21,.26)	
NO-OF-LAMPS = 4 ACCEPT-LAMP-SIZE = T-48-IN	
LUM-MAINT-CAT = LUM-MAINT-V	
ACCEPT-CONFIG = (RECESS-VENTED)	
<b>Parabolic-Troffer-2X4-2-Lamp</b>	Full-Size Fluor
*Parabolic Troffer, 2'x4', 2 Lamps, Louvered	*
CU-RCR-1 = (.72,.74,.75,.75,.76,.78,.75,.81,.83)	
CU-RCR-5 = (.41,.44,.49,.41,.45,.50,.42,.46,.53)	
CU-RCR-10 = (.20,.23,.28,.20,.24,.29,.20,.24,.30)	
NO-OF-LAMPS = 2 ACCEPT-LAMP-SIZE = T-48-IN	
LUM-MAINT-CAT = LUM-MAINT-IV	
ACCEPT-CONFIG = (RECESS-STATIC)	
<b>Parabolic-Troffer-2X4-3-Lamp</b>	Full-Size Fluor
*Parabolic Troffer, 2'x4', 3 Lamps, Louvered	*
CU-RCR-1 = (.67,.68,.69,.69,.70,.72,.70,.74,.76)	
CU-RCR-5 = (.40,.43,.47,.40,.44,.48,.41,.45,.50)	
CU-RCR-10 = (.21,.24,.28,.21,.24,.29,.21,.24,.30)	



NO-OF-LAMPS = 3 ACCEPT-LAMP-SIZE = T-48-IN  
 LUM-MAINT-CAT = LUM-MAINT-IV  
 ACCEPT-CONFIG = (RECESS-STATIC)

**Parabolic-Troffer-2X4-4-Lamp** Full-Size Fluor

\*Parabolic Troffer, 2'x4', 4 Lamps, Louvered \*  
 CU-RCR-1 = (.59,.60,.60,.60,.62,.63,.61,.65,.67)  
 CU-RCR-5 = (.36,.39,.42,.36,.39,.43,.37,.40,.45)  
 CU-RCR-10 = (.19,.22,.26,.19,.22,.26,.19,.22,.27)  
 NO-OF-LAMPS = 4 ACCEPT-LAMP-SIZE = T-48-IN  
 LUM-MAINT-CAT = LUM-MAINT-IV  
 ACCEPT-CONFIG = (RECESS-STATIC)

**Surf/Susp-Parabolic-2X4-2-Lamp** Full-Size Fluor

\*Surface or Suspended Parabolic, 2'x4', 2 Lamps, Louvered \*  
 CU-RCR-1 = (.72,.74,.75,.75,.76,.78,.75,.81,.83)  
 CU-RCR-5 = (.41,.44,.49,.41,.45,.50,.42,.46,.53)  
 CU-RCR-10 = (.20,.23,.28,.20,.24,.29,.20,.24,.30)  
 NO-OF-LAMPS = 2 ACCEPT-LAMP-SIZE = T-48-IN  
 LUM-MAINT-CAT = LUM-MAINT-IV  
 ACCEPT-CONFIG = (SURFACE-OPEN,SUSPEND-OPEN)

**Surf/Susp-Parabolic-2X4-3-Lamp** Full-Size Fluor

\*Surface or Suspended Parabolic, 2'x4', 3 Lamps, Louvered \*  
 CU-RCR-1 = (.67,.68,.69,.69,.70,.72,.70,.74,.76)  
 CU-RCR-5 = (.40,.43,.47,.40,.44,.48,.41,.45,.50)  
 CU-RCR-10 = (.21,.24,.28,.21,.24,.29,.21,.24,.30)  
 NO-OF-LAMPS = 3 ACCEPT-LAMP-SIZE =T-48-IN  
 LUM-MAINT-CAT = LUM-MAINT-IV  
 ACCEPT-CONFIG = (SURFACE-OPEN,SUSPEND-OPEN)

**Surf/Susp-Parabolic-2X4-4-Lamp** Full-Size Fluor

\*Surface or Suspended Parabolic, 2'x4', 4 Lamps, Louvered \*  
 CU-RCR-1 = (.59,.60,.60,.60,.62,.63,.61,.65,.67)  
 CU-RCR-5 = (.36,.39,.42,.36,.39,.43,.37,.40,.45)  
 CU-RCR-10 = (.19,.22,.26,.19,.22,.26,.19,.22,.27)  
 NO-OF-LAMPS = 4 ACCEPT-LAMP-SIZE = T-48-IN  
 LUM-MAINT-CAT = LUM-MAINT-IV  
 ACCEPT-CONFIG = (SURFACE-OPEN,SUSPEND-OPEN)

**Air-Handling-Troffer-2X4-4-Lamp** Full-Size Fluor

\*Air Handling Troffer, 2'x4', 4 Lamps, Floating Louver \*  
 CU-RCR-1 = (.52,.53,.53,.53,.54,.55,.56,.57,.59)  
 CU-RCR-5 = (.33,.35,.38,.34,.36,.39,.34,.37,.41)  
 CU-RCR-10 = (.18,.20,.23,.18,.20,.24,.18,.21,.25)  
 NO-OF-LAMPS = 4 ACCEPT-LAMP-SIZE = T-48-IN  
 LUM-MAINT-CAT = LUM-MAINT-IV  
 ACCEPT-CONFIG = (RECESS-VENTED)

**Air-Handling-Troffer-2X2-2-Lamp** Full-Size Fluor

\*Air Handling Troffer, 2'x2', 2 Lamps, Floating Louver \*  
 CU-RCR-1 = (.46,.47,.48,.48,.49,.50,.50,.52,.53)  
 CU-RCR-5 = (.30,.32,.34,.30,.32,.35,.31,.33,.37)  
 CU-RCR-10 = (.16,.18,.21,.16,.18,.21,.16,.18,.22)  
 NO-OF-LAMPS = 2 ACCEPT-LAMP-SIZE = T-24-IN  
 LUM-MAINT-CAT = LUM-MAINT-IV  
 ACCEPT-CONFIG = (RECESS-VENTED)

**Air-Handling-Troffer-1X4-2-Lamp** Full-Size Fluor

\*Air Handling Troffer, 1'x4', 2 Lamps, Floating Louver \*  
 CU-RCR-1 = (.46,.47,.48,.48,.49,.50,.50,.51,.53)  
 CU-RCR-5 = (.31,.32,.35,.31,.33,.36,.31,.34,.37)  
 CU-RCR-10 = (.17,.19,.22,.17,.19,.22,.17,.20,.23)  
 NO-OF-LAMPS = 2 ACCEPT-LAMP-SIZE = T-48-IN  
 LUM-MAINT-CAT = LUM-MAINT-IV  
 ACCEPT-CONFIG = (RECESS-VENTED)

**Sur/Susp-Wraparound-1.3X4-4-Lamp** Full-Size Fluor

\*Surf or Suspend Wraparound, 16'x4', 4 Lamps, Acrylic Prism Dif \*  
 CU-RCR-1 = (.55,.57,.58,.59,.59,.61,.62,.64,.66)  
 CU-RCR-5 = (.33,.36,.39,.34,.37,.41,.35,.38,.43)

CU-RCR-10 = (.18,.20,.24,.18,.21,.25,.19,.22,.26)  
 NO-OF-LAMPS = 4 ACCEPT-LAMP-SIZE = T-48-IN  
 LUM-MAINT-CAT = LUM-MAINT-V  
 ACCEPT-CONFIG = (SURFACE-CLOSED,SUSPEND-CLOSED)

**Sur/Susp-Wraparound-0.8X4-2-Lamp** Full-Size Fluor  
 \*Surf or Suspend Wraparound, 11'x4', 2 Lamps, Acrylic Prism Dif \*  
 CU-RCR-1 = (.57,.58,.60,.60,.62,.63,.65,.67,.69)  
 CU-RCR-5 = (.34,.37,.40,.35,.38,.42,.36,.40,.45)  
 CU-RCR-10 = (.18,.21,.24,.19,.22,.26,.19,.23,.26)  
 NO-OF-LAMPS = 2 ACCEPT-LAMP-SIZE = T-48-IN  
 LUM-MAINT-CAT = LUM-MAINT-V  
 ACCEPT-CONFIG = (SURFACE-CLOSED,SUSPEND-CLOSED)

**Sur/Susp-Wraparound-1.5X4-2-Lamp** Full-Size Fluor  
 \*Surf or Suspend Wraparound, 18'x4', 2 Lamps, Acrylic Prism Dif \*  
 CU-RCR-1 = (.68,.69,.71,.70,.72,.75,.75,.78,.81)  
 CU-RCR-5 = (.38,.42,.46,.39,.43,.48,.40,.45,.51)  
 CU-RCR-10 = (.19,.22,.27,.19,.23,.28,.20,.24,.30)  
 NO-OF-LAMPS = 2 ACCEPT-LAMP-SIZE = T-48-IN  
 LUM-MAINT-CAT = LUM-MAINT-V  
 ACCEPT-CONFIG = (SURFACE-CLOSED,SUSPEND-CLOSED)

**Sur/Susp-Wraparound-1.5X4-4-Lamp** Full-Size Fluor  
 \*Surf or Suspend Wraparound, 18'x4', 4 Lamps, Acrylic Prism Dif \*  
 CU-RCR-1 = (.63,.65,.66,.66,.68,.70,.70,.73,.76)  
 CU-RCR-5 = (.35,.38,.43,.36,.39,.44,.36,.41,.47)  
 CU-RCR-10 = (.18,.21,.25,.18,.21,.26,.18,.22,.28)  
 NO-OF-LAMPS = 4 ACCEPT-LAMP-SIZE = T-48-IN  
 LUM-MAINT-CAT = LUM-MAINT-V  
 ACCEPT-CONFIG = (SURFACE-CLOSED,SUSPEND-CLOSED)

**Sur/Susp-Wraparound-1.3X8-4-Lamp** Full-Size Fluor  
 \*Surf or Suspend Wraparound, 16'x8', 4 Lamps, Acrylic Prism Dif \*  
 CU-RCR-1 = (.55,.57,.58,.59,.59,.61,.62,.64,.66)  
 CU-RCR-5 = (.33,.36,.39,.34,.37,.41,.35,.38,.43)  
 CU-RCR-10 = (.18,.20,.24,.18,.21,.25,.19,.22,.26)  
 NO-OF-LAMPS = 4 ACCEPT-LAMP-SIZE = T-96-IN  
 LUM-MAINT-CAT = LUM-MAINT-V  
 ACCEPT-CONFIG = (SURFACE-CLOSED,SUSPEND-CLOSED)

**Sur/Susp-Wraparound-0.8X8-2-Lamp** Full-Size Fluor  
 \*Surf or Suspend Wraparound, 11'x8', 2 Lamps, Acrylic Prism Dif \*  
 CU-RCR-1 = (.57,.58,.60,.60,.62,.63,.65,.67,.69)  
 CU-RCR-5 = (.34,.37,.40,.35,.38,.42,.36,.40,.45)  
 CU-RCR-10 = (.18,.21,.24,.19,.22,.26,.19,.23,.26)  
 NO-OF-LAMPS = 2 ACCEPT-LAMP-SIZE = T-96-IN  
 LUM-MAINT-CAT = LUM-MAINT-V  
 ACCEPT-CONFIG = (SURFACE-CLOSED,SUSPEND-CLOSED)

**Sur/Susp-Wraparound-1.5X8-2-Lamp** Full-Size Fluor  
 \*Surf or Suspend Wraparound, 18'x8', 2 Lamps, Acrylic Prism Dif \*  
 CU-RCR-1 = (.68,.69,.71,.70,.72,.75,.75,.78,.81)  
 CU-RCR-5 = (.38,.42,.46,.39,.43,.48,.40,.45,.51)  
 CU-RCR-10 = (.19,.22,.27,.19,.23,.28,.20,.24,.30)  
 NO-OF-LAMPS = 2 ACCEPT-LAMP-SIZE = T-96-IN  
 LUM-MAINT-CAT = LUM-MAINT-V  
 ACCEPT-CONFIG = (SURFACE-CLOSED,SUSPEND-CLOSED)

**Sur/Susp-Wraparound-1.5X8-4-Lamp** Full-Size Fluor  
 \*Surf or Suspend Wraparound, 18'x8', 4 Lamps, Acrylic Prism Dif \*  
 CU-RCR-1 = (.63,.65,.66,.66,.68,.70,.70,.73,.76)  
 CU-RCR-5 = (.35,.38,.43,.36,.39,.44,.36,.41,.47)  
 CU-RCR-10 = (.18,.21,.25,.18,.21,.26,.18,.22,.28)  
 NO-OF-LAMPS = 4 ACCEPT-LAMP-SIZE = T-96-IN  
 LUM-MAINT-CAT = LUM-MAINT-V  
 ACCEPT-CONFIG = (SURFACE-CLOSED,SUSPEND-CLOSED)

**Corridor-Wraparound-0.6X4-1-Lamp** Full-Size Fluor  
 \*Corridor Wraparound, 7'x4', 1 Lamp, Acrylic Prismatic Dif \*  
 CU-RCR-1 = (.61,.63,.65,.67,.69,.72,.76,.79,.83)

CU-RCR-5 = (.32,.36,.41,.35,.39,.45,.38,.44,.51)  
 CU-RCR-10 = (.16,.20,.24,.17,.21,.27,.19,.23,.30)  
 NO-OF-LAMPS = 1 ACCEPT-LAMP-SIZE = T-48-IN  
 LUM-MAINT-CAT = LUM-MAINT-V  
 ACCEPT-CONFIG = (SURFACE-CLOSED,SUSPEND-CLOSED)

**Corridor-Wraparound-0.6X4-2-Lamp** Full-Size Fluor  
 \*Corridor Wraparound, 7'x4', 2 Lamps, Acrylic Prismatic Dif \*  
 CU-RCR-1 = (.54,.56,.58,.59,.61,.63,.66,.69,.71)  
 CU-RCR-5 = (.29,.32,.36,.30,.34,.39,.33,.38,.44)  
 CU-RCR-10 = (.15,.17,.22,.15,.19,.23,.16,.20,.26)  
 NO-OF-LAMPS = 2 ACCEPT-LAMP-SIZE = T-48-IN  
 LUM-MAINT-CAT = LUM-MAINT-V  
 ACCEPT-CONFIG = (SURFACE-CLOSED,SUSPEND-CLOSED)

**Louvered-Commercial-1.1X4-2-Lamp** Full-Size Fluor  
 \*Commercial, 13'x4', 2 Lamps, Louvered \*  
 CU-RCR-1 = (.52,.53,.54,.62,.64,.65,.78,.81,.84)  
 CU-RCR-5 = (.29,.32,.35,.33,.37,.42,.40,.46,.53)  
 CU-RCR-10 = (.15,.18,.21,.17,.20,.25,.20,.25,.31)  
 NO-OF-LAMPS = 2 ACCEPT-LAMP-SIZE = T-48-IN  
 LUM-MAINT-CAT = LUM-MAINT-II  
 ACCEPT-CONFIG = (SURFACE-OPEN,SUSPEND-OPEN)

**Louvered-Commercial-1.5X4-4-Lamp** Full-Size Fluor  
 \*Commercial, 17'x4', 4 Lamps, Louvered \*  
 CU-RCR-1 = (.45,.46,.48,.55,.57,.58,.71,.74,.77)  
 CU-RCR-5 = (.26,.28,.31,.30,.33,.37,.37,.42,.48)  
 CU-RCR-10 = (.14,.16,.19,.16,.19,.23,.19,.23,.29)  
 NO-OF-LAMPS = 4 ACCEPT-LAMP-SIZE = T-48-IN  
 LUM-MAINT-CAT = LUM-MAINT-II  
 ACCEPT-CONFIG = (SURFACE-OPEN,SUSPEND-OPEN)

**Turret-Industrial-1.1X4-3-Lamp** Full-Size Fluor  
 \*Turret Industrial, 13'x6', 3 Lamps, No Diffuser or Louver \*  
 CU-RCR-1 = (.68,.70,.71,.73,.75,.77,.81,.84,.87)  
 CU-RCR-5 = (.36,.39,.44,.37,.42,.48,.40,.46,.53)  
 CU-RCR-10 = (.17,.21,.26,.18,.22,.28,.19,.24,.31)  
 NO-OF-LAMPS = 3 ACCEPT-LAMP-SIZE = T-72-IN  
 LUM-MAINT-CAT = LUM-MAINT-III  
 ACCEPT-CONFIG = (SURFACE-OPEN,SUSPEND-OPEN)

**Turret-Industrial-1.1X8-3-Lamp** Full-Size Fluor  
 \*Turret Industrial, 13'x8', 3 Lamps, No Diffuser or Louver \*  
 CU-RCR-1 = (.68,.70,.71,.73,.75,.77,.81,.84,.87)  
 CU-RCR-5 = (.36,.39,.44,.37,.42,.48,.40,.46,.53)  
 CU-RCR-10 = (.17,.21,.26,.18,.22,.28,.19,.24,.31)  
 NO-OF-LAMPS = 3 ACCEPT-LAMP-SIZE = T-96-IN  
 LUM-MAINT-CAT = LUM-MAINT-III  
 ACCEPT-CONFIG = (SURFACE-OPEN,SUSPEND-OPEN)

**Parabol-Industrial-1.1X4-2-Lamp** Full-Size Fluor  
 \*Parabolic Industrial, 13'x4', 2 Lamps, No Diffuser or Louver \*  
 CU-RCR-1 = (.69,.70,.72,.74,.76,.78,.83,.86,.89)  
 CU-RCR-5 = (.39,.43,.47,.41,.45,.50,.44,.49,.56)  
 CU-RCR-10 = (.20,.24,.28,.21,.25,.30,.22,.27,.33)  
 NO-OF-LAMPS = 2 ACCEPT-LAMP-SIZE = T-48-IN  
 LUM-MAINT-CAT = LUM-MAINT-III  
 ACCEPT-CONFIG = (SURFACE-OPEN,SUSPEND-OPEN)

**Parabol-Industrial-1.1X6-2-Lamp** Full-Size Fluor  
 \*Parabolic Industrial, 13'x6', 2 Lamps, No Diffuser or Louver \*  
 CU-RCR-1 = (.69,.70,.72,.74,.76,.78,.83,.86,.89)  
 CU-RCR-5 = (.39,.43,.47,.41,.45,.50,.44,.49,.56)  
 CU-RCR-10 = (.20,.24,.28,.21,.25,.30,.22,.27,.33)  
 NO-OF-LAMPS = 2 ACCEPT-LAMP-SIZE = T-72-IN  
 LUM-MAINT-CAT = LUM-MAINT-III  
 ACCEPT-CONFIG = (SURFACE-OPEN,SUSPEND-OPEN)

**Parabol-Industrial-1.1X8-2-Lamp** Full-Size Fluor  
 \*Parabolic Industrial, 13'x8', 2 Lamps, No Diffuser or Louver \*

CU-RCR-1 = (.69,.70,.72,.74,.76,.78,.83,.86,.89)  
 CU-RCR-5 = (.39,.43,.47,.41,.45,.50,.44,.49,.56)  
 CU-RCR-10 = (.20,.24,.28,.21,.25,.30,.22,.27,.33)  
 NO-OF-LAMPS = 2 ACCEPT-LAMP-SIZE = T-96-IN  
 LUM-MAINT-CAT = LUM-MAINT-III  
 ACCEPT-CONFIG = (SURFACE-OPEN,SUSPEND-OPEN)

**Strip-Light-0.25X1.5-1-Lamp** Full-Size Fluor  
 \*Strip Light, 3''x1.5', 1 Lamp, No Diffuser or Louver \*  
 CU-RCR-1 = (.62,.65,.68,.69,.72,.76,.79,.84,.89)  
 CU-RCR-5 = (.28,.32,.38,.30,.36,.43,.34,.41,.50)  
 CU-RCR-10 = (.13,.17,.23,.14,.19,.25,.16,.21,.29)  
 NO-OF-LAMPS = 1 ACCEPT-LAMP-SIZE = T-18-IN  
 LUM-MAINT-CAT = LUM-MAINT-I  
 ACCEPT-CONFIG = (SURFACE-OPEN,SUSPEND-OPEN)

**Strip-Light-0.25X2-1-Lamp** Full-Size Fluor  
 \*Strip Light, 3''x2', 1 Lamp, No Diffuser or Louver \*  
 CU-RCR-1 = (.62,.65,.68,.69,.72,.76,.79,.84,.89)  
 CU-RCR-5 = (.28,.32,.38,.30,.36,.43,.34,.41,.50)  
 CU-RCR-10 = (.13,.17,.23,.14,.19,.25,.16,.21,.29)  
 NO-OF-LAMPS = 1 ACCEPT-LAMP-SIZE = T-24-IN  
 LUM-MAINT-CAT = LUM-MAINT-I  
 ACCEPT-CONFIG = (SURFACE-OPEN,SUSPEND-OPEN)

**Strip-Light-0.25X3-1-Lamp** Full-Size Fluor  
 \*Strip Light, 3''x3', 1 Lamp, No Diffuser or Louver \*  
 CU-RCR-1 = (.62,.65,.68,.69,.72,.76,.79,.84,.89)  
 CU-RCR-5 = (.28,.32,.38,.30,.36,.43,.34,.41,.50)  
 CU-RCR-10 = (.13,.17,.23,.14,.19,.25,.16,.21,.29)  
 NO-OF-LAMPS = 1 ACCEPT-LAMP-SIZE = T-36-IN  
 LUM-MAINT-CAT = LUM-MAINT-I  
 ACCEPT-CONFIG = (SURFACE-OPEN,SUSPEND-OPEN)

**Strip-Light-0.25X4-1-Lamp** Full-Size Fluor  
 \*Strip Light, 3''x4', 1 Lamp, No Diffuser or Louver \*  
 CU-RCR-1 = (.62,.65,.68,.69,.72,.76,.79,.84,.89)  
 CU-RCR-5 = (.28,.32,.38,.30,.36,.43,.34,.41,.50)  
 CU-RCR-10 = (.13,.17,.23,.14,.19,.25,.16,.21,.29)  
 NO-OF-LAMPS = 1 ACCEPT-LAMP-SIZE = T-48-IN  
 LUM-MAINT-CAT = LUM-MAINT-I  
 ACCEPT-CONFIG = (SURFACE-OPEN,SUSPEND-OPEN)

**Strip-Light-0.25X6-1-Lamp** Full-Size Fluor  
 \*Strip Light, 3''x6', 1 Lamp, No Diffuser or Louver \*  
 CU-RCR-1 = (.62,.65,.68,.69,.72,.76,.79,.84,.89)  
 CU-RCR-5 = (.28,.32,.38,.30,.36,.43,.34,.41,.50)  
 CU-RCR-10 = (.13,.17,.23,.14,.19,.25,.16,.21,.29)  
 NO-OF-LAMPS = 1 ACCEPT-LAMP-SIZE = T-72-IN  
 LUM-MAINT-CAT = LUM-MAINT-I  
 ACCEPT-CONFIG = (SURFACE-OPEN,SUSPEND-OPEN)

**Strip-Light-0.25X8-1-Lamp** Full-Size Fluor  
 \*Strip Light, 3''x8', 1 Lamp, No Diffuser or Louver \*  
 CU-RCR-1 = (.62,.65,.68,.69,.72,.76,.79,.84,.89)  
 CU-RCR-5 = (.28,.32,.38,.30,.36,.43,.34,.41,.50)  
 CU-RCR-10 = (.13,.17,.23,.14,.19,.25,.16,.21,.29)  
 NO-OF-LAMPS = 1 ACCEPT-LAMP-SIZE = T-96-IN  
 LUM-MAINT-CAT = LUM-MAINT-I  
 ACCEPT-CONFIG = (SURFACE-OPEN,SUSPEND-OPEN)

**Channel-0.7X4-3-Lamp** Full-Size Fluor  
 \*General Purpose Channel, 9''x4', 3 Lamps, No Diffuser or Louver \*  
 CU-RCR-1 = (.69,.72,.74,.73,.76,.79,.80,.84,.88)  
 CU-RCR-5 = (.33,.37,.43,.34,.39,.46,.36,.42,.51)  
 CU-RCR-10 = (.16,.20,.25,.16,.20,.27,.17,.22,.29)  
 NO-OF-LAMPS = 3 ACCEPT-LAMP-SIZE = T-48-IN  
 LUM-MAINT-CAT = LUM-MAINT-I  
 ACCEPT-CONFIG = (SURFACE-OPEN,SUSPEND-OPEN)

**Channel-0.7X6-3-Lamp** Full-Size Fluor

\*General Purpose Channel, 9'x6', 3 Lamps, No Diffuser or Louver \*  
 CU-RCR-1 = (.69,.72,.74,.73,.76,.79,.80,.84,.88)  
 CU-RCR-5 = (.33,.37,.43,.34,.39,.46,.36,.42,.51)  
 CU-RCR-10 = (.16,.20,.25,.16,.20,.27,.17,.22,.29)  
 NO-OF-LAMPS = 3 ACCEPT-LAMP-SIZE = T-72-IN  
 LUM-MAINT-CAT = LUM-MAINT-I  
 ACCEPT-CONFIG = (SURFACE-OPEN,SUSPEND-OPEN)

**Channel-0.7X8-3-Lamp** Full-Size Fluor  
 \*General Purpose Channel, 9'x8', 3 Lamps, No Diffuser or Louver \*  
 CU-RCR-1 = (.69,.72,.74,.73,.76,.79,.80,.84,.88)  
 CU-RCR-5 = (.33,.37,.43,.34,.39,.46,.36,.42,.51)  
 CU-RCR-10 = (.16,.20,.25,.16,.20,.27,.17,.22,.29)  
 NO-OF-LAMPS = 3 ACCEPT-LAMP-SIZE = T-96-IN  
 LUM-MAINT-CAT = LUM-MAINT-I  
 ACCEPT-CONFIG = (SURFACE-OPEN,SUSPEND-OPEN)

**Turret-Channel-0.7X4-3-Lamp** Full-Size Fluor  
 \*Turret Channel, 9'x4', 3 Lamps, No Diffuser or Louver \*  
 CU-RCR-1 = (.64,.66,.68,.70,.73,.76,.81,.84,.89)  
 CU-RCR-5 = (.31,.35,.41,.34,.39,.45,.38,.44,.52)  
 CU-RCR-10 = (.15,.19,.24,.16,.21,.26,.18,.23,.30)  
 NO-OF-LAMPS = 3 ACCEPT-LAMP-SIZE = T-48-IN  
 LUM-MAINT-CAT = LUM-MAINT-I  
 ACCEPT-CONFIG = (SURFACE-OPEN,SUSPEND-OPEN)

**Turret-Channel-0.7X6-3-Lamp** Full-Size Fluor  
 \*Turret Channel, 9'x6', 3 Lamps, No Diffuser or Louver \*  
 CU-RCR-1 = (.64,.66,.68,.70,.73,.76,.81,.84,.89)  
 CU-RCR-5 = (.31,.35,.41,.34,.39,.45,.38,.44,.52)  
 CU-RCR-10 = (.15,.19,.24,.16,.21,.26,.18,.23,.30)  
 NO-OF-LAMPS = 3 ACCEPT-LAMP-SIZE = T-72-IN  
 LUM-MAINT-CAT = LUM-MAINT-I  
 ACCEPT-CONFIG = (SURFACE-OPEN,SUSPEND-OPEN)

**Turret-Channel-0.7X8-3-Lamp** Full-Size Fluor  
 \*Turret Channel, 9'x8', 3 Lamps, No Diffuser or Louver \*  
 CU-RCR-1 = (.64,.66,.68,.70,.73,.76,.81,.84,.89)  
 CU-RCR-5 = (.31,.35,.41,.34,.39,.45,.38,.44,.52)  
 CU-RCR-10 = (.15,.19,.24,.16,.21,.26,.18,.23,.30)  
 NO-OF-LAMPS = 3 ACCEPT-LAMP-SIZE = T-96-IN  
 LUM-MAINT-CAT = LUM-MAINT-I  
 ACCEPT-CONFIG = (SURFACE-OPEN,SUSPEND-OPEN)

**Parabolic-Troffer-1X1-2-Lamp** Compact T Lamp  
 \*Parabolic Troffer, 1'x1', 2 Compact T Lamps, Louvered \*  
 CU-RCR-1 = (.55,.56,.57,.56,.58,.59,.59,.61,.62)  
 CU-RCR-5 = (.35,.37,.40,.35,.38,.41,.36,.39,.43)  
 CU-RCR-10 = (.19,.21,.25,.19,.22,.25,.19,.22,.26)  
 NO-OF-LAMPS = 2 ACCEPT-LAMP-SIZE = T-6-12-IN  
 LUM-MAINT-CAT = LUM-MAINT-IV  
 ACCEPT-CONFIG = (RECESS-STATIC)

**4-In-Black-Baffle** Compact Refl Lmp  
 \*Black Baffle, 4" Round, 1 Reflector Lamp, No Diffuser or Louver \*  
 CU-RCR-1 = (.70,.73,.74,.75,.76,.77,.78,.80,.81)  
 CU-RCR-5 = (.54,.57,.60,.55,.58,.61,.56,.59,.63)  
 CU-RCR-10 = (.39,.43,.47,.41,.44,.47,.41,.44,.48)  
 NO-OF-LAMPS = 1 ACCEPT-LAMP-SIZE = REFL-0-21  
 LUM-MAINT-CAT = LUM-MAINT-IV  
 ACCEPT-CONFIG = (RECESS-STATIC)

**4-In-Reflector-Cone** Compact Refl Lmp  
 \*Refl Cone, 4" Round, 1 Reflector Lamp, No Diffuser or Louver \*  
 CU-RCR-1 = (.87,.88,.89,.90,.91,.92,.94,.96,.98)  
 CU-RCR-5 = (.65,.68,.71,.65,.69,.73,.67,.70,.75)  
 CU-RCR-10 = (.48,.52,.56,.48,.52,.56,.49,.52,.57)  
 NO-OF-LAMPS = 1 ACCEPT-LAMP-SIZE = REFL-0-21  
 LUM-MAINT-CAT = LUM-MAINT-IV  
 ACCEPT-CONFIG = (RECESS-STATIC)

**6-In-Black-Baffle-1** Compact Refl Lmp  
 Black Baffle, 6" Round  
 \*Black Baffle, 6" Round, 1 Reflector Lamp, No Diffuser or Louver \*  
 CU-RCR-1 = (.60,.61,.62,.62,.63,.64,.65,.66,.68)  
 CU-RCR-5 = (.42,.45,.48,.43,.46,.49,.44,.47,.51)  
 CU-RCR-10 = (.29,.32,.35,.30,.33,.36,.30,.33,.37)  
 NO-OF-LAMPS = 1 ACCEPT-LAMP-SIZE = REFL-22-30  
 LUM-MAINT-CAT = LUM-MAINT-IV  
 ACCEPT-CONFIG = (RECESS-STATIC)

**6-In-Black-Baffle-2** Compact Refl Lmp  
 \*Black Baffle, 6" Round, 1 Reflector Lamp, No Diffuser or Louver \*  
 CU-RCR-1 = (.6970,.71,.70,.72,.74,.74,.76,.78)  
 CU-RCR-5 = (.48,.51,.54,.47,.51,.55,.49,.53,.57)  
 CU-RCR-10 = (.32,.36,.40,.32,.36,.40,.34,.37,.41)  
 NO-OF-LAMPS = 1 ACCEPT-LAMP-SIZE = REFL-31-50  
 LUM-MAINT-CAT = LUM-MAINT-IV  
 ACCEPT-CONFIG = (RECESS-STATIC)

**6-In-Reflector-Cone** Compact Refl Lmp  
 \*Refl Cone, 6" Round, 1 Reflector Lamp, No Diffuser or Louver \*  
 CU-RCR-1 = (.85,.86,.87,.88,.89,.90,.92,.94,.96)  
 CU-RCR-5 = (.61,.65,.69,.62,.66,.70,.64,.68,.73)  
 CU-RCR-10 = (.45,.49,.53,.45,.49,.53,.46,.50,.55)  
 NO-OF-LAMPS = 1 ACCEPT-LAMP-SIZE = REFL-22-30  
 LUM-MAINT-CAT = LUM-MAINT-IV  
 ACCEPT-CONFIG = (RECESS-STATIC)

**6-In-Ellipsoid-Reflect-Baffled** Cmpct A-Like Lmp  
 \*Refl Ellipse, Black Baffle, 6", 1 A-Like Lamp, No Diff or Louver\*  
 CU-RCR-1 = (.57,.58,.59,.59,.60,.61,.62,.63,.65)  
 CU-RCR-5 = (.39,.42,.45,.40,.43,.46,.41,.44,.48)  
 CU-RCR-10 = (.27,.30,.33,.27,.30,.33,.28,.30,.34)  
 NO-OF-LAMPS = 1 ACCEPT-LAMP-SIZE = ALPHA-0-21  
 LUM-MAINT-CAT = LUM-MAINT-IV  
 ACCEPT-CONFIG = (RECESS-STATIC)

**6-In-Ellipsoid-Reflect-Open** Cmpct A-Like Lmp  
 \*Refl Ellipse, 6", 1 A-Like Lamp, No Diffuser or Louver \*  
 CU-RCR-1 = (.59,.60,.61,.61,.62,.63,.64,.65,.67)  
 CU-RCR-5 = (.44,.46,.48,.43,.46,.49,.45,.47,.51)  
 CU-RCR-10 = (.31,.34,.37,.31,.34,.37,.32,.34,.38)  
 NO-OF-LAMPS = 1 ACCEPT-LAMP-SIZE = ALPHA-0-21  
 LUM-MAINT-CAT = LUM-MAINT-IV  
 ACCEPT-CONFIG = (RECESS-STATIC)

**8-In-Ellipsoid-Reflect-Baffled** Cmpct A-Like Lmp  
 Reflctr Ellipse, Black Baffle, 8"  
 \*Refl Ellipse, Black Baffle, 8", 1 A-Like Lamp, No Diff or Louver\*  
 CU-RCR-1 = (.59,.60,.60,.61,.62,.63,.64,.65,.66)  
 CU-RCR-5 = (.44,.47,.50,.45,.48,.51,.47,.49,.52)  
 CU-RCR-10 = (.35,.37,.39,.34,.37,.40,.35,.37,.40)  
 NO-OF-LAMPS = 1 ACCEPT-LAMP-SIZE = ALPHA-22-30  
 LUM-MAINT-CAT = LUM-MAINT-IV  
 ACCEPT-CONFIG = (RECESS-STATIC)

**8-In-Ellipsoid-Reflect-Open** Cmpct A-Like Lmp  
 \*Refl Ellipse, Open, 8", 1 A-Like Lamp, No Diffuser or Louver \*  
 CU-RCR-1 = (.62,.63,.64,.65,.66,.67,.68,.69,.71)  
 CU-RCR-5 = (.48,.50,.52,.47,.50,.53,.49,.51,.55)  
 CU-RCR-10 = (.35,.38,.41,.35,.38,.41,.36,.38,.42)  
 NO-OF-LAMPS = 1 ACCEPT-LAMP-SIZE = ALPHA-22-30  
 LUM-MAINT-CAT = LUM-MAINT-IV  
 ACCEPT-CONFIG = (RECESS-STATIC)

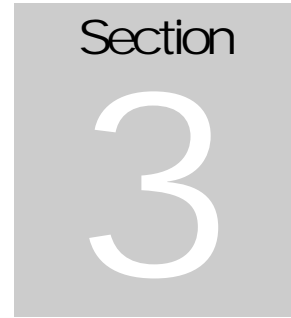
**8-In-Reflector-Lens** Cmpct A-Like Lmp  
 \*Reflector, 8" Round, 1 A-Like Lamp, Prismatic Glass Diffuser \*  
 CU-RCR-1 = (.46,.47,.48,.48,.49,.50,.50,.52,.53)  
 CU-RCR-5 = (.29,.32,.35,.30,.33,.36,.31,.34,.37)  
 CU-RCR-10 = (.20,.22,.24,.19,.22,.25,.20,.22,.25)  
 NO-OF-LAMPS = 1 ACCEPT-LAMP-SIZE = ALPHA-0-21

LUM-MAINT-CAT = LUM-MAINT-V  
 ACCEPT-CONFIG = (RECESS-STATIC)

**10-In-Reflector-Lens** Cmpct A-Like Lmp  
 \*Reflector, 10" Round, 1 A-Like Lamp, Prismatic Glass Diffuser \*  
 CU-RCR-1 = (.47,.48,.49,.48,.49,.50,.51,.52,.53)  
 CU-RCR-5 = (.32,.34,.36,.31,.34,.37,.33,.35,.38)  
 CU-RCR-10 = (.22,.24,2.6,.21,.24,.27,.22,.24,.27)  
 NO-OF-LAMPS = 1 ACCEPT-LAMP-SIZE = ALPHA-22-30  
 LUM-MAINT-CAT = LUM-MAINT-V  
 ACCEPT-CONFIG = (RECESS-STATIC)

**6-In-Reflector-Open-T** Cmpct T-Type Lmp  
 \*Reflector, 6" Round, 2 T-Type Lamps, No Diffuser or Louver \*  
 CU-RCR-1 = (.41,.42,.42,.42,.43,.44,.44,.45,.47)  
 CU-RCR-5 = (.27,.29,.31,.28,.30,.32,.28,.30,.33)  
 CU-RCR-10 = (.18,.20,.22,.18,.20,.22,.18,.20,.23)  
 NO-OF-LAMPS = 2 ACCEPT-LAMP-SIZE = T-0-6-IN  
 LUM-MAINT-CAT = LUM-MAINT-IV  
 ACCEPT-CONFIG = (RECESS-STATIC)

**8-In-Reflector-Open-T** Cmpct T-Type Lmp  
 \*Reflector, 8" Round, 2 T-Type Lamps, No Diffuser or Louver \*  
 CU-RCR-1 = (.65,.66,.67,.67,.68,.69,.70,.71,.73)  
 CU-RCR-5 = (.44,.47,.50,.43,.47,.51,.45,.49,.53)  
 CU-RCR-10 = (.29,.32,.35,.28,.32,.36,.30,.33,.37)  
 NO-OF-LAMPS = 2 ACCEPT-LAMP-SIZE = T-6-12-IN  
 LUM-MAINT-CAT = LUM-MAINT-IV  
 ACCEPT-CONFIG = (RECESS-STATIC)



# Mechanical Equipment Libraries

This section is a place holder for future libraries of mechanical equipment.





# Reports

Reports fall into three main categories:

1. Verification reports – summarize the model input, as well as design values calculated by the program
2. Summary reports – present the results of the program simulation
3. Hourly reports – tabulate the hourly values of a user-selected set of simulation variables.

The following sections present a map of the reports to reference for simulation results, verification and summary reports, and hourly reports. The sample reports in this section are in English units. For metric runs the corresponding units can be determined from Report LV-M, Units Table.

# REPORT MAP

This section consists of four tables, one each for LOADS, SYSTEMS, PLANT and ECONOMICS, that show in which reports you can find various calculated quantities, like space loads, cooling peaks, temperatures, etc.

<b>LOADS SUMMARY REPORTS</b>		<b>Bldg Level Info</b>		<b>Space Level Info</b>											
						Space Peak Loads	Space Peak Load Components	Bldg Peak Load Components	Building Monthly Loads	Space Monthly Load Components	Bldg Monthly Load Components	Space Daylighting Summary			
		LS-A	LS-B	LS-C	LS-D	LS-E	LS-F	LS-G							
<b>THERMAL LOAD</b>	Total (Sens&Lat) Heat/Cool Space Load		P	P		T	T								
	Sensible Heat/Cool Space Load	P	P	P	P/T	T	T								
	Latent Cooling Space Load		P	P		T	T								
	Heat/Cool Space Load Components		P	P		T	T								
	Heat/Cool Peak Hour, Date, OA	n	n	n											
<b>ELECTRIC ENERGY</b>	Total (Lights/Plugs/Process)				P/T										
	Lights														
	Equipment / Plugs														
	Process Electric														
<b>OTHER ENERGY</b>	Process Fuel														
	Domestic Hot Water														
	Solar Gain														
<b>DAYLIGHTING</b>	% Lighting Reduction														n
	% Lighting Reduction Scatter Plot														
	Ave. Daylight Illuminance														n
	Ave. Glare Index														n
	% Hrs. Glare Too High														n
Frequency of Illuminance Levels															
<b>OTHER</b>	Floor Area & Volume		n	n											
	Weather File Name	n	n	n	n	n	n	n	n	n	n	n	n	n	n
	DESIGN-DAY reports provided ①	n	n	n	n	n	n	n	n	n	n	n	n	n	n

**NOTES:**

T = Total energy or Total load reported for these items

P = Peak demand or Peak load reported for these items

① Duplicate reports are provided for each LOADS report (if DESIGN-DAYs are used) where the first set of reports provides results for the design day conditions. A complete second set reports the annual simulation results.

left-to-right order of report columns above corresponds to top-down order of reports printed in DOE2 output files

## SYSTEMS SUMMARY REPORTS

		Building HVAC Load Summary	Building HVAC Load Hours	Building HVAC Fan Electric	Bldg HVAC Equip. Performance	System Loads Summary	System Loads Summary	System Load Hours	System Utility Energy Use	Sensible/Latent Summary	Peak Heating & Cooling	Space Temperature Summary	Zone Performance Summary	Fan Electric Energy Use	Relative Humidity Summary	System Heat/Cool Performance	HP Heat/Cool Performance	Zone Loads Summary	Zone Demand Summary
		SS-D	SS-E	SS-M	SS-P ①	SS-A	SS-B	SS-C	SS-H	SS-I	SS-J	SS-K	SS-R	SS-L	SS-N	SS-P ②	SS-Q	SS-G	SS-F
<b>THERMAL ENERGY</b>	Total (Sens&Lat) Heat/Cool Coil Load	P/T			P/T	P/T				P	P							P/T	T
	Sensible Heat/Cool Coil Load									T									
	Latent Heat/Cool Coil Load									T									
	Zone Coil Heat/Cool Load							P/T											
	Baseboard Heat							P/T											P/
	Pre-heat							P/T											
	Heat/Cool Addition/Extraction																		T
	Cooling Peak Hour, Date, OA	n		n		n				n	n						n	n	
	Heating Peak Hour, Date, OA	n		n		n				n	n						n	n	
	Heat/Cool Peak Load Hourly Profile											P							
	Max Daily Integrated Cooling Load	P										P							
	Heat Coincident w Cool Peak		P																
	Natural Ventilation Cooling ③							P/T											
<b>ELECTRIC ENERGY</b>	Total Elec (LOADS + Fans, DX, Reheat)	P/T			T	P/T										T		P/T	
	Total Elec Coincident w Cool Peak		P					P											
	Heating/Cooling Elec Use				P/T				P/T							P/T			
	Fan Total Elec				P/T				P/T							P/T	T		
	Fan Elec for H/C/Coincident/Float			T										T					
	Fan Elec for Supply/Return/Hot Deck													T					
	Auxiliary/Fan/Pump Elec				P/T			P/T								P/T	T		
<b>OTHER ENERGY</b>	Heating/Cooling Fuel Use				T				P/T							T			
	Waste Heat																T		
<b>HOURS</b>	Hours Heat/Cool/Float/Available	n								n								n	
	Fan Hours	n								n									
	Hours Night Venting/Night Cycle On	n								n									
	Hours Loads Not Met													n					n
	Zone Hrs at Max Demand													n					n
	Hours at RH ranges														n				n
<b>SPACE TEMPERATURE</b>	Average (H/C/Fans On/Off)											n							n
	Min / Max																		
	Indoor/Outdoor Temp. Delta											n							
	Scatter Plot																		
<b>OTHER</b>	Air Flow				n					P						n			
	Heat/Cool Capacity				n											n			
	Heat/Cool E-I-R				n											n	n		
	Relative Humidity Scatter Plot															n			
	Sensible Heat Ratio								n	n									
	Delta Humidity Ratio										n								
	Equipment Part Load Ratio				n							n	n	n	n	n			
	Weather File Name	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
	DESIGN-DAY report provided										n								

**NOTES:**

T = Total energy or Total load reported for these items

P = Peak demand or Peak load reported for these items

① SS-P at building level is provided for DHW tanks, water loop heat pumps and hydronic economizers used with unitary systems

② SS-P at air handler level is provided for unitary systems

③ Ventilative Cooling is provided only for system types: RESYS, PSZ

left-to-right order of report columns above corresponds to top-down order of reports printed in DOE2 output files

## PLANT SUMMARY REPORTS

		Plant Energy Utilization	Utility & Fuel Use Summary	Equipment Loads & Energy Use	Circulation Loop Loads	Energy End-Use, by Utility Type	Energy End-Use, by Utility Meter	Building Energy Performance
		PS-A	PS-B	PS-C	PS-D	PS-E ②	PS-F ③	BEPS
<b>THERMAL LOAD</b>	<b>by Total Plant</b>							
		T						
		T						
	<b>by Plant Equipment ①</b>				P/T			
				P/T				
				n	n			
					P/T			
					P/T			
<b>UTILITY ENERGY</b>	<b>by Total Plant, Site</b>							
		T						T
		T						
								T
		T				T		
		T						
	<b>by Total Plant, Source</b>							T
		T						
	<b>by Utility Type ②</b>		P/T			P/p/T		
			P/T			P/p/T		
	<b>by Utility Meter ③</b>		P/T				P/p/T	T
			P/T				P/p/T	
	<b>by End Use</b>					P/p/T		
						P/p/T		
							P/p/T	T
							P/p/T	
		T						
	<b>by Plant Equipment ①</b>			P/T				
<b>HOURS</b>	Hour & Date of Peak		n	n	n	n	n	
	Equipment Operations Hours			n	n			
	% Hours Outside Throttling Range							n
	% Hours Loads Not Met							n

**NOTES:**

T = Total load or Total energy reported for these items

P = Peak load or Peak demand (COINCIDENT) reported for these items

p = NON-COINCIDENT Peak demand reported for these items

① One copy of the PS-H report is produced for each plant component, i.e., for each circulation loop, pump, chiller, etc.

② One copy of the PS-E report is produced for each utility type, i.e., for all electric use and for all fuel use.

③ One copy of the PS-F report is produced for each utility meter, i.e., one report for each electric or fuel meter.

left-to-right order of report columns above corresponds to top-down order of reports printed in DOE2 output files

## ECONOMICS SUMMARY REPORTS

			Annual Operations Costs & Savings	Life-Cycle Non-Energy Costs	Energy Savings & Life-Cycle Costs	Energy Cost Summary	Utility Rate Summary	Block Charges & Ratchets, by Utility Rate	Summary of Pollutants	Pollutant Production, by Block Charge	
			ES-A	ES-B	ES-C	ES-D	ES-E ①	ES-F ②	ES-G	ES-H	
<b>ANNUAL Results</b>	<b>by Utility Rate ①</b>	Energy Use				T					
		Total Utility Costs (\$)				T	T				
		Total Utility Costs (\$/sqft)				T					
		Total Utility Costs (ave \$/billing unit)				T					
		Component Charges					P/T				
			Metered & Billing Use				P/T				
	<b>by Block or TOU Charge ②</b>	Total Utility Costs (\$)							T		
		Component Charges							P/T		
		Pollutant Production								T	T
<b>MONTHLY Results</b>	<b>by Utility Rate ①</b>	Total Utility Costs (\$)					T				
		Component Charges					P/T				
	<b>by Block or TOU Charge ②</b>	Total Utility Costs (\$)							T		
		Component Charges							P/T		
		Pollutant Production								T	T
<b>LIFE-CYCLE Results</b>	<b>Costs</b>	Installation, Repair, Replacement		T	T						
		Energy	T		T						
		Operations	T		T						
	<b>Savings</b>	Energy	T		T						
		Operations	T		T						
		Energy + Operations	T		T						
	<b>Investment Statistics</b>	Discounted Payback			T						
		S-I-R, cost			T						
		S-I-R, energy			T						

**NOTES:**

T = Total energy or Total costs reported for these items

P = Peak demand or Peak demand costs reported for these items

① One copy of the ES-E report is produced for each utility rate.

② One copy of the ES-F report is produced for each utility rate that includes at least one BLOCK-CHARGE.

left-to-right order of report columns above corresponds to top-down order of reports printed in DOE2 output files

## LOADS-REPORT

**LV-A General Project Parameters**

Simple Structure Run 3, Chicago      Divide into zones; add plenum      DOE-2.2b-027      Fri Jan 9 15:25:08 1998BDL RUN 1  
 Design-day sizing of VAV system      Show All Reports  
 REPORT- LV-A General Project and Building Input      WEATHER FILE- TRY CHICAGO

-----

## PERIOD OF STUDY

STARTING DATE	ENDING DATE	NUMBER OF DAYS
7 JAN 1997	7 JAN 1997	1
5 AUG 1997	5 AUG 1997	1
1 JAN 1997	31 DEC 1997	365

## SITE CHARACTERISTIC DATA

STATION NAME	LATITUDE (DEG)	LONGITUDE (DEG)	ALTITUDE (FT)	TIME ZONE	BUILDING AZIMUTH (DEG)
TRY CHICAGO	42.0	88.0	610.	6 CST	30.0

**LV-B Summary of Spaces**

Simple Structure Run 3, Chicago                      Divide into zones; add plenum  
 Design-day sizing of VAV system                      Show All Reports  
 REPORT- LV-B Summary of Spaces Occurring in the Project

DOE-2.2b-027 Fri Jan 9 15:25:08 1998BDL RUN 1

WEATHER FILE- TRY CHICAGO

-----  
 NUMBER OF SPACES    6                      EXTERIOR    5                      INTERIOR    1

SPACE	SPACE*FLOOR MULTIPLIER	SPACE TYPE	AZIM	LIGHTS		EQUIP		INFILTRATION METHOD	ACH	AREA (SQFT )	VOLUME (CUFT )
				(WATT / SQFT )	PEOPLE	(WATT / SQFT )					

Spaces on floor: Building-Floor

PLENUM-1	1.0	EXT	0.0	0.00	0.0	0.00	NO-INFILT.	0.00		5000.0	10000.0
SPACE1-1	1.0	EXT	0.0	1.50	11.0	1.00	AIR-CHANGE	0.25		1056.0	8448.0
SPACE2-1	1.0	EXT	-90.0	1.50	5.0	1.00	AIR-CHANGE	0.25		456.0	3648.0
SPACE3-1	1.0	EXT	180.0	1.50	11.0	1.00	AIR-CHANGE	0.25		1056.0	8448.0
SPACE4-1	1.0	EXT	90.0	1.50	5.0	1.00	AIR-CHANGE	0.25		456.0	3648.0
SPACE5-1	1.0	INT	0.0	1.50	20.0	1.00	AIR-CHANGE	0.25		1976.0	15808.0
BUILDING TOTALS						52.0				10000.0	50000.0



### LV-C Details of Space <space name>

Simple Structure Run 3, Chicago                      Divide into zones; add plenum                      DOE-2.2b-027    Fri Jan 9 15:25:08 1998BDL RUN 1  
 Design-day sizing of VAV system                      Show All Reports  
 REPORT- LV-C Details of Space                      SPACE1-1                      WEATHER FILE- TRY    CHICAGO

-----  
 DATA FOR SPACE    SPACE1-1                      IN FLOOR    Building-Floor

LOCATION OF ORIGIN IN BUILDING COORDINATES

XB (FT)	YB (FT)	ZB (FT)	SPACE AZIMUTH (DEG)	SPACE*FLOOR MULTIPLIER	HEIGHT (FT)	AREA (SQFT)	VOLUME (CUFT)
0.00	0.00	0.00	0.00	1.0	8.00	1056.00	8448.00

TOTAL NUMBER OF SURFACES	NUMBER OF EXTERIOR SURFACES	NUMBER OF INTERIOR SURFACES	NUMBER OF UNDERGROUND SURFACES	DAYLIGHTING	SUNSPACE
6	1	4	1	NO	NO

NUMBER OF SUBSURFACES

TOTAL	EXTERIOR WINDOWS	DOORS	INTERIOR WINDOWS
2	2	0	0

FLOOR WEIGHT (LB/SQFT)	CALCULATION TEMPERATURE (F)
0.0	70.0

INFILTRATION

SCHEDULE	INFILTRATION CALCULATION METHOD	FLOW RATE (CFM/SQFT)	AIR CHANGES PER HOUR
INFIL-SCH	AIR-CHANGE	0.033	0.25

PEOPLE

SCHEDULE	NUMBER	AREA PER PERSON (SQFT)	PEOPLE SENSIBLE (BTU/HR)	PEOPLE LATENT (BTU/HR)
OCCUPY-1	11.0	96.0	252.2	130.3

Simple Structure Run 3, Chicago  
 Design-day sizing of VAV system  
 REPORT- LV-C Details of Space

Divide into zones; add plenum  
 Show All Reports  
 SPACE1-1

DOE-2.2b-027 Fri Jan 9 15:25:08 1998BDL RUN 1

WEATHER FILE- TRY CHICAGO

----- (CONTINUED) -----

LIGHTING

SCHEDULE	LIGHTING TYPE	LOAD (WATTS/SQFT)	LOAD (KW)	FRACTION OF LOAD TO SPACE
LIGHTS-1	REC-FLUOR-RV	1.50	1.58	0.80

ELECTRICAL EQUIPMENT

SCHEDULE	ELEC LOAD (WATTS/SQFT)	ELEC LOAD (KW)	FRACTION OF LOAD TO SPACE	
			SENSIBLE	LATENT
EQUIP-1	1.00	1.06	1.00	0.00

INTERIOR SURFACES (U-VALUE INCLUDES BOTH AIR FILMS)

SURFACE	AREA (SQFT)		CONSTRUCTION	U-VALUE (BTU/HR-SQFT-F)	
C1-1	1056.00		CLNG-1	0.270	
SB12	135.76		SB-U	1.500	
SB14	135.76		SB-U	1.500	
SB15	608.00		SB-U	1.500	

SURFACE	SURFACE-TYPE		ADJACENT SPACE
C1-1	QUICK	STANDARD	PLENUM-1
SB12	QUICK	AIR	SPACE2-1
SB14	QUICK	AIR	SPACE4-1
SB15	QUICK	AIR	SPACE5-1

EXTERIOR SURFACES (U-VALUE EXCLUDES OUTSIDE AIR FILM)

SURFACE	MULTIPLIER	AREA (SQFT)		CONSTRUCTION	U-VALUE (BTU/HR-SQFT-F)			SURFACE TYPE
FRONT-1	1.0	800.00		WALL-1	0.069			DELAYED

SURFACE	AZIMUTH (DEG)		TILT (DEG)	LOCATION OF ORIGIN IN BUILDING COORDINATES			LOCATION OF ORIGIN IN SPACE COORDINATES		
				XB (FT)	YB (FT)	ZB (FT)	X (FT)	Y (FT)	Z (FT)
FRONT-1	-180.0		90.0	0.00	0.00	0.00	0.00	0.00	0.00

Simple Structure Run 3, Chicago  
 Design-day sizing of VAV system  
 REPORT- LV-C Details of Space

Divide into zones; add plenum  
 Show All Reports  
 SPACE1-1

DOE-2.2b-027 Fri Jan 9 15:25:08 1998BDL RUN 1

WEATHER FILE- TRY CHICAGO

----- (CONTINUED) -----

UNDERGROUND SURFACES (U-VALUE INCLUDES INSIDE AIR FILM)

SURFACE	MULTIPLIER	AREA (SQFT)	CONSTRUCTION	U-VALUE (BTU/HR-SQFT-F)
F1-1	1.0	1056.00	FLOOR-1	0.45

EXTERIOR WINDOWS (U-VALUE INCLUDES OUTSIDE AIR FILM)

WINDOW	MULTIPLIER	GLASS AREA (SQFT)	GLASS WIDTH (FT)	GLASS HEIGHT (FT)	SET- BACK (FT)	NUMBER OF PANES	CENTER-OF- GLASS U-VALUE (BTU/HR-SQFT-F)	GLASS SHADING COEFF	GLASS VISIBLE TRANS	GLASS SOLAR TRANS
WF-1	1.0	180.00	45.00	4.00	0.00	2	0.447	0.89	0.812	0.705
DF-1	1.0	64.00	8.00	8.00	0.00	1	1.003	0.83	0.611	0.626

WINDOW	LOCATED IN SURFACE	LOCATION OF ORIGIN IN BUILDING COORDINATES			LOCATION OF ORIGIN IN SURFACE COORDINATES	
		XB (FT)	YB (FT)	ZB (FT)	X (FT)	Y (FT)
WF-1	FRONT-1	10.00	0.00	3.00	10.00	3.00
DF-1	FRONT-1	70.00	0.00	0.00	70.00	0.00

**LV-D Details of Exterior Surfaces**

Simple Structure Run 3, Chicago

Divide into zones; add plenum

DOE-2.2b-027 Fri Jan 9 15:25:08 1998BDL RUN 1

Design-day sizing of VAV system

Show All Reports

REPORT- LV-D Details of Exterior Surfaces in the Project

WEATHER FILE- TRY CHICAGO

NUMBER OF EXTERIOR SURFACES 9

(U-VALUE INCLUDES OUTSIDE AIR FILM; WINDOW INCLUDES FRAME, IF DEFINED)

SURFACE	- - - W I N D O W S - - -		- - - - W A L L - - - -		- W A L L + W I N D O W S -		AZIMUTH
	U-VALUE (BTU/HR-SQFT-F)	AREA (SQFT)	U-VALUE (BTU/HR-SQFT-F)	AREA (SQFT)	U-VALUE (BTU/HR-SQFT-F)	AREA (SQFT)	
WALL-1PB in space: PLENUM-1	0.000	0.00	0.067	200.00	0.067	200.00	NORTH
BACK-1 in space: SPACE3-1	0.531	229.00	0.067	571.00	0.200	800.00	NORTH
RIGHT-1 in space: SPACE2-1	0.428	100.00	0.067	300.00	0.157	400.00	EAST
WALL-1PR in space: PLENUM-1	0.000	0.00	0.067	100.00	0.067	100.00	EAST
WALL-1PF in space: PLENUM-1	0.000	0.00	0.067	200.00	0.067	200.00	SOUTH
FRONT-1 in space: SPACE1-1	0.554	244.00	0.067	556.00	0.216	800.00	SOUTH
WALL-1PL in space: PLENUM-1	0.000	0.00	0.067	100.00	0.067	100.00	WEST
LEFT-1 in space: SPACE4-1	0.428	100.00	0.067	300.00	0.157	400.00	WEST
TOP-1 in space: PLENUM-1	0.000	0.00	0.168	5000.00	0.168	5000.00	ROOF
F1-1 in space: SPACE1-1	0.000	0.00	0.453	1056.00	0.453	1056.00	UNDERGRND
F2-1 in space: SPACE2-1	0.000	0.00	0.453	456.00	0.453	456.00	UNDERGRND
F3-1 in space: SPACE3-1	0.000	0.00	0.453	1056.00	0.453	1056.00	UNDERGRND
F4-1 in space: SPACE4-1	0.000	0.00	0.453	456.00	0.453	456.00	UNDERGRND
F5-1 in space: SPACE5-1	0.000	0.00	0.453	1976.00	0.453	1976.00	UNDERGRND

Simple Structure Run 3, Chicago                      Divide into zones; add plenum                      DOE-2.2b-027   Fri Jan 9 15:25:08 1998BDL RUN 1  
 Design-day sizing of VAV system                      Show All Reports  
 REPORT- LV-D Details of Exterior Surfaces in the Project                      WEATHER FILE- TRY CHICAGO  
 -----(CONTINUED)-----

	AVERAGE U-VALUE/WINDOWS (BTU/HR-SQFT-F)	AVERAGE U-VALUE/WALLS (BTU/HR-SQFT-F)	AVERAGE U-VALUE WALLS+WINDOWS (BTU/HR-SQFT-F)	WINDOW AREA (SQFT)	WALL AREA (SQFT)	WINDOW+WALL AREA (SQFT)
NORTH	0.531	0.067	0.173	229.00	771.00	1000.00
EAST	0.428	0.067	0.139	100.00	400.00	500.00
SOUTH	0.554	0.067	0.186	244.00	756.00	1000.00
WEST	0.428	0.067	0.139	100.00	400.00	500.00
ROOF	0.000	0.168	0.168	0.00	5000.00	5000.00
ALL WALLS	0.509	0.067	0.166	673.00	2327.00	3000.00
WALLS+ROOFS	0.509	0.136	0.167	673.00	7327.00	8000.00
UNDERGRND	0.000	0.453	0.453	0.00	5000.00	5000.00
BUILDING	0.509	0.264	0.277	673.00	12327.00	13000.00

**LV-E Details of Underground Surfaces**

Simple Structure Run 3, Chicago                    Divide into zones; add plenum  
 Design-day sizing of VAV system                Show All Reports  
 REPORT- LV-E Details of Underground Surfaces in the Project

DOE-2.2b-027 Fri Jan 9 15:25:08 1998BDL RUN 1  
 WEATHER FILE- TRY CHICAGO

-----  
 NUMBER OF UNDERGROUND SURFACES    5

SURFACE NAME	MULTIPLIER	AREA (SQFT )	CONSTRUCTION NAME	U-VALUE (BTU/HR-SQFT-F)
F1-1	1.0	1056.00	FLOOR-1	0.453
F2-1	1.0	456.00	FLOOR-1	0.453
F3-1	1.0	1056.00	FLOOR-1	0.453
F4-1	1.0	456.00	FLOOR-1	0.453
F5-1	1.0	1976.00	FLOOR-1	0.453

**LV-F Details of Interior Surfaces**

Simple Structure Run 3, Chicago      Divide into zones; add plenum  
 Design-day sizing of VAV system      Show All Reports  
 REPORT- LV-F Details of Interior Surfaces in the Project

DOE-2.2b-027 Fri Jan 9 15:25:08 1998BDL RUN 1  
 WEATHER FILE- TRY CHICAGO

Number of Interior Surfaces 13  
 (U-VALUE includes both air films)

SURFACE NAME	AREA (SQFT )	CONSTRUCTION NAME	SURFACE TYPE	U-VALUE (BTU/HR-SQFT-F)
C1-1	1056.00	CLNG-1	QUICK STANDARD	0.270
SB12	135.76	SB-U	QUICK AIR	1.500
SB14	135.76	SB-U	QUICK AIR	1.500
SB15	608.00	SB-U	QUICK AIR	1.500
C2-1	456.00	CLNG-1	QUICK STANDARD	0.270
SB23	135.76	SB-U	QUICK AIR	1.500
SB25	208.00	SB-U	QUICK AIR	1.500
C3-1	1056.00	CLNG-1	QUICK STANDARD	0.270
SB34	135.76	SB-U	QUICK AIR	1.500
SB35	608.00	SB-U	QUICK AIR	1.500
C4-1	456.00	CLNG-1	QUICK STANDARD	0.270
SB45	208.00	SB-U	QUICK AIR	1.500
C5-1	1976.00	CLNG-1	QUICK STANDARD	0.270

SURFACE NAME	ADJACENT SPACES	
	SPACE-1	SPACE-2
C1-1	SPACE1-1	PLENUM-1
SB12	SPACE1-1	SPACE2-1
SB14	SPACE1-1	SPACE4-1
SB15	SPACE1-1	SPACE5-1
C2-1	SPACE2-1	PLENUM-1
SB23	SPACE2-1	SPACE3-1
SB25	SPACE2-1	SPACE5-1
C3-1	SPACE3-1	PLENUM-1
SB34	SPACE3-1	SPACE4-1
SB35	SPACE3-1	SPACE5-1
C4-1	SPACE4-1	PLENUM-1
SB45	SPACE4-1	SPACE5-1
C5-1	SPACE5-1	PLENUM-1

# LV-G Details of Schedules

Simple Structure Run 3, Chicago                      Divide into zones; add plenum                      DOE-2.2b-027    Fri Jan 9 15:25:08 1998BDL RUN 1  
 Design-day sizing of VAV system                      Show All Reports  
 REPORT- LV-G Details of Schedules Occurring in the Project                      WEATHER FILE- TRY CHICAGO

NUMBER OF SCHEDULES 12

Schedule: OCCUPY-1    Type of Schedule: FRACTION

THROUGH 31 12

		FOR DAYS    SUN    SAT    HOL																							
HOUR		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
24		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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0.00																									

		FOR DAYS    MON    TUE    WED    THU    FRI																							
HOUR		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
24		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	0.80	0.40	0.80	1.00	1.00	1.00	1.00	0.50	0.10	0.10	0.00	0.00	
0.00																									

		FOR DAYS    HDD																							
HOUR		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
24		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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0.00																									

		FOR DAYS    CDD																							
HOUR		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
24		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
1.00																									



**LV-H Details of Windows**

This report contains the summary information on the location as well as glass, frame and curb areas and standard performance values.

Project 3

DOE-2.2-44d5 9/20/2006 17:06:43 BDL RUN 1

REPORT- LV-H Details of Windows

WEATHER FILE- CZ06RV2 WYEC2

NUMBER OF WINDOWS 8

(Note: u-values include outside air film)

WINDOW NAME	MULTIPLIER	GLASS AREA (SQFT)	GLASS HEIGHT (FT)	GLASS WIDTH (FT)	LOCATION OF ORIGIN IN SURFACE COORDINATES		FRAME AREA (SQFT)	CURB AREA	FRAME CURB U-VALUE (BTU/HR-SQFT-F)	
					X (FT)	Y (FT)			FRAME U-VALUE	CURB U-VALUE
South Win (G.S1.E1.W1)	1.0	232.38	5.00	46.45	4.61	3.11	11.19	0.00	1.519	0.000
East Win (G.E2.E2.W1)	1.0	232.38	5.00	46.45	4.61	3.11	11.19	0.00	1.519	0.000
North Win (G.N3.E3.W1)	1.0	232.38	5.00	46.45	4.61	3.11	11.19	0.00	1.519	0.000
West Win (G.W4.E4.W1)	1.0	232.38	5.00	46.45	4.61	3.11	11.19	0.00	1.519	0.000
South Win (T.S11.E9.W1)	1.0	513.28	5.00	102.59	4.61	3.11	23.36	0.00	1.519	0.000
Skylt (T.S11.I26.S1)	1.0	0.00	0.00	0.00	55.90	7.50	0.00	0.00	0.384	0.349
Skylt (T.S11.I26.S2)	1.0	0.00	0.00	0.00	77.28	7.50	0.00	0.00	0.384	0.349
Skylt (T.S11.I26.S3)	1.0	0.00	0.00	0.00	34.52	7.50	0.00	0.00	0.384	0.349

WINDOW NAME	SETBACK (FT)	GLASS SHADING COEFF	NUMBER OF PANES	CENTER-OF-GLASS U-VALUE (BTU/HR-SQFT-F)	GLASS VISIBLE TRANS	GLASS SOLAR TRANS	SURFACE TO ROUGH OPEN AREA RATIO
South Win (G.S1.E1.W1)	0.00	0.57	2	0.536	0.473	0.375	1.000
East Win (G.E2.E2.W1)	0.00	0.57	2	0.536	0.473	0.375	1.000
North Win (G.N3.E3.W1)	0.00	0.81	2	0.468	0.781	0.604	1.000
West Win (G.W4.E4.W1)	0.00	0.57	2	0.536	0.473	0.375	1.000
South Win (T.S11.E9.W1)	0.00	0.57	2	0.536	0.473	0.375	1.000
Skylt (T.S11.I26.S1)	0.00	0.54	1	1.101	0.495	0.878	1.196
Skylt (T.S11.I26.S2)	0.00	0.54	1	1.101	0.495	0.878	1.196
Skylt (T.S11.I26.S3)	0.00	0.54	1	1.101	0.495	0.878	1.196

**LV-I Details of Constructions**

Simple Structure Run 3, Chicago

Divide into zones; add plenum

DOE-2.2b-027 Fri Jan 9 15:25:08 1998BDL RUN 1

Design-day sizing of VAV system

Show All Reports

REPORT- LV-I Details of Constructions Occurring in the Project

WEATHER FILE- TRY CHICAGO

-----

NUMBER OF CONSTRUCTIONS 5            DELAYED 3            QUICK 2

CONSTRUCTION NAME	U-VALUE (BTU/HR-SQFT-F)	SURFACE		SURFACE TYPE	NUMBER OF RESPONSE FACTORS
		ABSORPTANCE	ROUGHNESS INDEX		
WALL-1	0.069	0.70	3	DELAYED	9
ROOF-1	0.180	0.70	3	DELAYED	5
CLNG-1	0.270	0.70	3	QUICK	0
SB-U	1.500	0.70	3	QUICK	0
FLOOR-1	0.453	0.70	3	DELAYED	16

**LV-J Details of Building Shades**

SINGLE FAMILY RESIDENCE

===WITH ATTACHED SUNSPACE===

REPORT- LV-J DETAILS OF BUILDING SHADES IN THE PROJECT

WEATHER FILE- TRY CHICAGO

-----

NUMBER OF BUILDING SHADES    2            RECTANGULAR    2            OTHER    0

## RECTANGULAR SHADES

SHADE NAME	TRANSMITTANCE	HEIGHT (FT)	WIDTH (FT)	AZIMUTH (DEG)	TILT (DEG)	LOCATION OF ORIGIN BUILDING COORDINATES		
						XB (FT)	YB (FT)	ZB (FT)
	0.00	1.5	42.0	180.	180.	0.0	0.0	8.0
	0.00	1.5	21.0	180.	0.	0.0	28.0	8.0

## **LV-K Weighting Factor Summary**

The entries in this report can be a combination of custom weighting factors (for spaces with FLOOR-WEIGHT = 0) and ASHRAE weighting factors (for spaces with FLOOR-WEIGHT > 0).

At the top of the report is the U-name of each SPACE (SP NAME) along with the U-name of the set of weighting factors for that space (WF NAME). WF NAME will be blank except for library creation runs and for those spaces in a LOADS run that use custom weighting factors from a user library.

Down the left side of the report are six groupings of variable names that label the six types of weighting factors:

- Solar
- General lighting
- Task lighting
- People/equipment
- Conduction
- Air temperature

The weighting factors V0, V1, V2, W1, V2, G0\*, G1, G2, G3, P1, and P2 are defined in the DOE-2 Engineers Manual (2.1A), p.II.67ff.

Simple Structure Run 3, Chicago  
 Design-day sizing of VAV system  
 REPORT- LV-K WEIGHTING FACTOR SUMMARY

Divide into zones; add plenum  
 Show All Reports

Fri Jan 9 15:25:08 1998BDL RUN 1

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SP NAME--  PLENUM-1      SPACE1-1      SPACE2-1      SPACE3-1      SPACE4-1      SPACE5-1

SOLAR
V0          0.50123        0.28789        0.28964        0.28893        0.28964        0.19700
V1          0.19470        -0.31695       -0.31317       -0.31749       -0.31317       -0.06700
V2          0.00000        0.06073        0.05625        0.06042        0.05625        0.00000
W1          0.30408        1.35264        1.34679        1.35243        1.34679        0.87000
W2          0.00000        -0.39084       -0.38577       -0.39054       -0.38577        0.00000

GENERAL
LIGHTING
V0          0.70580        0.64109        0.64837        0.64222        0.64837        0.59000
V1         -0.00988       -0.72695       -0.73092       -0.72752       -0.73092       -0.46000
V2          0.00000        0.14887        0.14697        0.14852        0.14697        0.00000
W1          0.30408        1.20584        1.20330        1.20552        1.20330        0.87000
W2          0.00000       -0.27570       -0.27431       -0.27539       -0.27431        0.00000

TASK
LIGHTING
V0          0.68697        0.59243        0.60069        0.59371        0.60069        0.50000
V1          0.00895       -0.66346       -0.66820       -0.66414       -0.66820       -0.37000
V2          0.00000        0.13201        0.13000        0.13165        0.13000        0.00000
W1          0.30408        1.20740        1.20474        1.20707        1.20474        0.87000
W2          0.00000       -0.27605       -0.27464       -0.27574       -0.27464        0.00000

PEOPLE-
EQUIPMENT
V0          0.80413        0.57418        0.58281        0.57552        0.58281        0.68100
V1         -0.10821       -0.63965       -0.64468       -0.64037       -0.64468       -0.55100
V2          0.00000        0.12568        0.12364        0.12532        0.12364        0.00000
W1          0.30408        1.20800        1.20529        1.20766        1.20529        0.87000
W2          0.00000       -0.27619       -0.27476       -0.27588       -0.27476        0.00000

CONDUCTION
V0          0.80413        0.61369        0.62209        0.61491        0.62209        0.68100
V1         -0.10821       -0.69121       -0.69636       -0.69183       -0.69636       -0.55100
V2          0.00000        0.13938        0.13762        0.13902        0.13762        0.00000
W1          0.30408        1.20623        1.20366        1.20591        1.20366        0.87000
W2          0.00000       -0.27578       -0.27439       -0.27548       -0.27439        0.00000

AIR
TEMP      (BTU/HR-SQFT-F )
G0*        1.11200        0.38719        0.41898        0.39146        0.41898        1.81000
G1*       -1.12493       -0.58182       -0.63280       -0.58840       -0.63280       -1.89000
G2*        0.01293        0.19652        0.21583        0.19885        0.21583        0.08000
G3*        0.00000       -0.00189       -0.00201       -0.00191       -0.00201        0.00000
P1         -0.30408       -1.25528       -1.24751       -1.25441       -1.24751       -0.87000
P2          0.00000        0.32209        0.31549        0.32128        0.31549        0.00000
  
```

# LV-L Daylight Factor Summary

This report is printed for each combination of window and reference point in a daylight space. The first part of the report summarizes some of the daylighting-related input information for the space, window, and reference point. The second part lists the daylight factors that were calculated by the daylighting preprocessor for 20 values of solar altitude and azimuth covering the annual range of sun positions at the location being analyzed.

Project 11 DOE-2.2-44d5 9/30/2006 20:31:34 BDL RUN 1

REPORT- LV-L Daylighting Factors Ref Pnt 1 South Win (G.S1.E1.W1) WEATHER FILE- CZ06RV2 WYEC2

Parent SPACE: South Perim Spc (G.S1) WINDOW-TYPE: STANDARD GLASS-TYPE: Window Type #2 GT  
SHADING-COEF: 0.570 VIS-TRANS: 0.473

Space Data: Window Data: AREA(SQFT) 232.383 Ref Point: X(FT) 27.830 Y(FT) 4.950 Z(FT) 2.500  
 AREA(SQFT) 1452.0 H(FT) 5.003 W(FT) 46.446 ZONE-FRACTION 0.50 MAX-GLARE 20.0  
 Ave Reflectance 0.44 AZIM(DEG) 180.0 TILT(DEG) 90.0 LTG-SET-POINT(FC) 50.0 VIEW-AZ(DEG) 270.0  
DAY-X-DIV 37 DAY-Y-DIV 8 LTG-CTRL-TYPE: DISCRETE  
X(FT) 4.606 Y(FT) 0.000 Z(FT) 3.108 WELL-EFFICIENCY 1.000  
WIN-SHADE-TYPE: NO-SHADE OBSTRUCTIONS FRAC 1.000

SUN	WIN	SUN	SUN	EXT	EXT	DIR	REFL	DIR	REFL	DAY	DAY	WIN	WIN	BACKG	BACKG		
POS	DAY	SHD	ALT	ILL	ILL	ILL	ILL	ILL	ILL	ILL	ILL	LUM	LUM	LUM	LUM	GLARE	
NO.	TYP	IND	(DEG)	-SKY	-SUN	-SKY	-SKY	-SUN	-SUN	-SKY	-SKY	-SKY	-SKY	-SKY	-SUN	INDEX	
			(DEG)	(FC)	(FC)	(FC)	(FC)	(FC)	(FC)	(FC)	(FC)	(FC)	(FC)	(FC)	(FC)		
1	1	1	10.	290.	1093.6	301.1	119.7	13.5	0.0	1.1	0.1217	0.0037	0.5321	0.0000	0.0054	0.0016	16.3
1	1	2	10.	290.	1093.6	301.1	0.0	18.2	0.0	0.8	0.0166	0.0027	0.0000	0.0000	0.0072	0.0012	0.0
1	2	1	10.	290.	366.9	0.0	38.1	3.6	0.0	0.0	0.1136	0.0000	0.2881	0.0000	0.0043	0.0000	8.1
1	2	2	10.	290.	366.9	0.0	0.0	4.7	0.0	0.0	0.0127	0.0000	0.0000	0.0000	0.0056	0.0000	0.0
2	1	1	10.	235.	1093.6	301.1	252.1	24.1	190.5	15.9	0.2525	0.6855	1.1762	99.0000	0.0096	0.0231	28.3
2	1	2	10.	235.	1093.6	301.1	0.0	35.3	0.0	24.8	0.0323	0.0824	0.0000	0.0000	0.0141	0.0359	0.0
3	1	1	10.	180.	1093.6	301.1	371.4	38.4	296.0	41.3	0.3747	1.1203	0.8508	0.0000	0.0153	0.0598	17.5
3	1	2	10.	180.	1093.6	301.1	0.0	58.5	0.0	65.9	0.0535	0.2188	0.0000	0.0000	0.0233	0.0954	0.0
4	1	1	10.	125.	1093.6	301.1	252.1	24.1	190.5	15.9	0.2525	0.6855	1.1762	0.0000	0.0096	0.0231	19.2
4	1	2	10.	125.	1093.6	301.1	0.0	35.3	0.0	24.8	0.0323	0.0824	0.0000	0.0000	0.0141	0.0359	0.0
5	1	1	10.	70.	1093.6	301.1	119.7	13.5	0.0	1.1	0.1217	0.0037	0.5321	0.0000	0.0054	0.0016	16.3
5	1	2	10.	70.	1093.6	301.1	0.0	18.2	0.0	0.8	0.0166	0.0027	0.0000	0.0000	0.0072	0.0012	0.0
6	1	1	33.	290.	1606.4	3226.7	149.3	17.5	0.0	12.0	0.1038	0.0037	0.4231	0.0000	0.0048	0.0016	16.9
6	1	2	33.	290.	1606.4	3226.7	0.0	23.0	0.0	8.7	0.0143	0.0027	0.0000	0.0000	0.0062	0.0012	0.0
7	1	1	33.	235.	1606.4	3226.7	337.5	28.9	0.0	46.0	0.2281	0.0143	0.8314	0.0000	0.0079	0.0062	19.0
7	1	2	33.	235.	1606.4	3226.7	0.0	41.5	0.0	63.7	0.0259	0.0198	0.0000	0.0000	0.0113	0.0086	0.0
8	1	1	33.	180.	1606.4	3226.7	549.6	42.6	2913.5	118.6	0.3686	0.9397	0.7756	0.0000	0.0116	0.0160	17.7
8	1	2	33.	180.	1606.4	3226.7	0.0	63.6	0.0	181.2	0.0396	0.0562	0.0000	0.0000	0.0173	0.0245	0.0
9	1	1	33.	125.	1606.4	3226.7	337.5	28.9	0.0	46.0	0.2281	0.0143	0.8314	0.0000	0.0079	0.0062	19.0
9	1	2	33.	125.	1606.4	3226.7	0.0	41.5	0.0	63.7	0.0259	0.0198	0.0000	0.0000	0.0113	0.0086	0.0
10	1	1	33.	70.	1606.4	3226.7	149.3	17.5	0.0	12.0	0.1038	0.0037	0.4231	0.0000	0.0048	0.0016	16.9
10	1	2	33.	70.	1606.4	3226.7	0.0	23.0	0.0	8.7	0.0143	0.0027	0.0000	0.0000	0.0062	0.0012	0.0
11	1	1	56.	290.	1910.6	5999.5	165.4	19.6	0.0	22.3	0.0968	0.0037	0.3422	0.0000	0.0045	0.0016	16.8
11	1	2	56.	290.	1910.6	5999.5	0.0	25.4	0.0	16.1	0.0133	0.0027	0.0000	0.0000	0.0058	0.0012	0.0
12	1	1	56.	235.	1910.6	5999.5	278.0	26.5	0.0	33.1	0.1594	0.0055	0.4842	0.0000	0.0061	0.0024	17.9
12	1	2	56.	235.	1910.6	5999.5	0.0	36.6	0.0	33.6	0.0191	0.0056	0.0000	0.0000	0.0083	0.0024	0.0
13	1	1	56.	180.	1910.6	5999.5	392.4	33.1	0.0	81.1	0.2227	0.0135	0.5333	0.0000	0.0076	0.0059	17.4
13	1	2	56.	180.	1910.6	5999.5	0.0	47.2	0.0	111.3	0.0247	0.0186	0.0000	0.0000	0.0108	0.0081	0.0
14	1	1	56.	125.	1910.6	5999.5	278.0	26.5	0.0	33.1	0.1594	0.0055	0.4842	0.0000	0.0061	0.0024	17.9
14	1	2	56.	125.	1910.6	5999.5	0.0	36.6	0.0	33.6	0.0191	0.0056	0.0000	0.0000	0.0083	0.0024	0.0
15	1	1	56.	70.	1910.6	5999.5	165.4	19.6	0.0	22.3	0.0968	0.0037	0.3422	0.0000	0.0045	0.0016	16.8
15	1	2	56.	70.	1910.6	5999.5	0.0	25.4	0.0	16.1	0.0133	0.0027	0.0000	0.0000	0.0058	0.0012	0.0
16	1	1	80.	290.	2556.7	7346.2	225.8	26.2	0.0	27.3	0.0986	0.0037	0.3074	0.0000	0.0045	0.0016	17.4
16	1	2	80.	290.	2556.7	7346.2	0.0	33.9	0.0	19.7	0.0133	0.0027	0.0000	0.0000	0.0058	0.0012	0.0
17	1	1	80.	235.	2556.7	7346.2	264.6	28.6	0.0	27.3	0.1147	0.0037	0.3394	0.0000	0.0049	0.0016	17.7
17	1	2	80.	235.	2556.7	7346.2	0.0	37.8	0.0	19.7	0.0148	0.0027	0.0000	0.0000	0.0064	0.0012	0.0
18	1	1	80.	180.	2556.7	7346.2	287.9	30.1	0.0	27.6	0.1244	0.0038	0.3544	0.0000	0.0051	0.0016	17.8
18	1	2	80.	180.	2556.7	7346.2	0.0	40.2	0.0	20.2	0.0157	0.0028	0.0000	0.0000	0.0069	0.0012	0.0
19	1	1	80.	125.	2556.7	7346.2	264.6	28.6	0.0	27.3	0.1147	0.0037	0.3394	0.0000	0.0049	0.0016	17.7
19	1	2	80.	125.	2556.7	7346.2	0.0	37.8	0.0	19.7	0.0148	0.0027	0.0000	0.0000	0.0064	0.0012	0.0
20	1	1	80.	70.	2556.7	7346.2	225.8	26.2	0.0	27.3	0.0986	0.0037	0.3074	0.0000	0.0045	0.0016	17.4
20	1	2	80.	70.	2556.7	7346.2	0.0	33.9	0.0	19.7	0.0133	0.0027	0.0000	0.0000	0.0058	0.0012	0.0

NOTE -- Above factors use VISIBLE TRANSMITTANCE = 1.0 for glass and shading device. Hourly calculation uses real transmittances.

## Part 1 Input Information

### Space-Related Quantities

#### Parent SPACE

is the U-name of space.

**AREA**

is the floor area of space (before multiplication by space multiplier).

**Ave Reflectance**

is the area-weighted average inside surface visible reflectance of space, which is calculated from INSIDE-VIS-REFL values for EXTERIOR-WALL, INTERIOR-WALL, UNDERGROUND-FLOOR, UNDERGROUND-WALL and WINDOW.

**Window-Related Quantities****WINDOW-TYPE**

is the value specified for the WINDOW-TYPE keyword; either STANDARD, SKYLIGHT-FLAT, SKYLIGHT-DOMED, SKYLIGHT-TUBULAR.

**GLASS-TYPE**

is the U-name of the GLASS-TYPE for the WINDOW.

**SHADING-COEF**

is the shading coefficient of the glazing.

**VIS-TRANS**

is the visible transmittance of the glazing at normal incidence.

**H**

is the height of the glazing,

**W**

is the width of the glazing.

**AZIM and TILT**

are the azimuth and tilt angle, respectively, of the window outward normal in the building coordinate system. AZIM is measured clockwise from the building y-axis.

**DAY-X-DIV and DAY-Y-DIV**

are the number of elements into which the window is divided along its WIDTH and HEIGHT, respectively, for the integration which determines the daylight reaching the reference point from the window. DAY-X-DIV and DAY-Y-DIV are automatically determined by the program to insure an accurate integration.

**X, Y, Z**

are the coordinates of the glazing origin in the space coordinate system. For vertical windows, Z is the sill height.

**WIN-SHADE-TYPE**

is the type of shading device on the window, if any, as entered with the WIN-SHADE-TYPE keyword.

**Reference Point-Related Quantities****X, Y, Z**

are the coordinates of reference point in the space coordinate system.

### **ZONE-FRACTION**

is the fraction of the space floor area controlled by the lighting system at this reference point (value of ZONE-FRACTION1 or ZONE-FRACTION2 keyword).

### **MAX-GLARE**

is the threshold for closing window shades to control glare (MAX-GLARE or MAX-GLARE2 keyword value; defaults to 100, which means no glare control).

### **LTG-SET-POINT**

is the illuminance setpoint as entered with keyword LIGHT-SET-POINT1 for reference point 1, or with LIGHT-SET-POINT2 for reference point 2.

### **VIEW-AZ**

(view azimuth) is the azimuth angle, measured clockwise from north, of the occupant's direction of view; used to calculate the daylight glare index. It is entered (relative to the SPACE y-axis) with the VIEW-AZIMUTH and VIEW-AZIMUTH2 keywords.

### **LTG-CTRL-TYPE**

is the lighting control type as entered with keyword LIGHT-CTRL-TYPE1 for reference point 1, or with or LIGHT-CTRL-TYPE2 for reference point 2.

### **WELL-EFFICIENCY**

is the well efficiency, either calculated or specified, for the light well under this window if it is a skylight.

### **OBSTRUCTIONS FRAC**

is the obstruction factor, either calculated or specified, for the daylight from this window to the reference point.

## **Part 2 Calculated Daylighting Factor Values**

### **SUN POS NO.**

(sun position number) is the sun-position index corresponding to different pairs of solar altitude and azimuth values (see SUN ALT and SUN AZIM, below).

### **DAY TYP**

(day type) is 1 for clear sky and 2 for overcast sky. For the latter, the daylight factors for only one sun position are calculated.

### **WIN SHD IND**

(window shade index) is 1 for bare window (shading device off), and 2 for window with shading device on. Visible transmittance of shade is taken to be 1.0 for daylight factor calculation.

### **SUN ALT**

is the altitude of sun above the horizon. It has four equally-spaced values ranging from 10o to the maximum altitude the sun can reach at the location being analyzed.

### **SUN AZIM**



is the azimuth of sun measured clockwise from North.

### **EXT ILL –SKY**

is the exterior horizontal illuminance due to diffuse light from sky (excludes direct sun).

### **EXT ILL –SUN**

is the exterior horizontal illuminance due to direct sun.

### **EXT ILL -SKY and EXT ILL –SUN**

are calculated for standard CIE skies using, for clear sky, the atmospheric turbidity and moisture for the month of May.

The following quantities relate to the interior of the space. For WIN SHD IND = 2 (window with shade), the shade is assumed to have 100% transmittance; the actual shade transmittance is taken into account in the hourly loads calculation.

### **DIR ILL –SKY**

(direct illuminance -sky) is the direct horizontal illuminance at the reference point produced by light which originates in the sky and reaches the reference point without reflection from the interior surfaces of the space. For an unshaded window (WIN SHD IND = 1), this includes the light coming directly from the sky or by reflection of sky light from exterior BUILDING-SHADES. For a window with shade (WIN SHD IND = 2 and WIN-SHADE-TYPE other than NO-SHADE), the light source is the shade itself, a diffusely transmitting surface illuminated by direct light from the sky, sky light reflected from the ground, and sky light reflected from exterior obstructions.

### **REFL ILL –SKY**

(reflected illuminance -sky) is the illuminance at the reference point produced by daylight which originates in the sky and reaches the reference point after reflecting from the interior surfaces of the space.

### **DIR ILL –SUN**

(direct illuminance -sun): for an unshaded window (WIN SHD IND = 1), this is the direct horizontal illuminance at the reference point produced by light from the sun reaching the reference point without reflection from the interior surfaces of the space. For a window with shade (WIN SHD IND = 2), the light source is the shade illuminated by direct sunlight and by sunlight reflected by the ground and exterior obstructions.

### **REFL ILL –SUN**

(reflected illuminance -sun) is the indirect horizontal illuminance at the reference point produced by sunlight which reflects from interior surfaces before reaching the reference point.

### **DAY ILL FAC –SKY**

(daylight illuminance factor -sky) is the ratio  $(DIR ILL -SKY + REFL ILL -SKY)/(EXT ILL -SKY)$ .

### **DAY ILL FAC –SUN**

(daylight illuminance factor -sun) is the ratio  $(DIR ILL -SUN + REFL ILL -SUN)/(EXT ILL -SUN)$ .

### **WIN LUM FAC –SKY**

(window luminance factor -sky) is the average luminance of the window (as seen from the reference point) due to light originating in the sky, divided by EXT ILL -SKY. It has units footlamberts/footcandle (English) or candelas/m<sup>2</sup>/lux (metric).

**WIN LUM FAC –SUN**

(window luminance factor -sun) is the ratio between the average luminance of the window (as seen from the reference point) due to light originating at the sun, divided by EXT ILL -SUN. This quantity is not calculated for an unshaded window.

**BACKG LUM FAC –SKY**

(background luminance factor -sky) is the average luminance of interior surfaces due to light originating in the sky, divided by EXT ILL -SKY. It has units footlamberts/footcandle (English) or (candelas/m<sup>2</sup>)/lux (metric).

**BACKG LUM FAC –SUN**

(background luminance factor -sun) is the average luminance of interior surfaces due to light originating at the sun, divided by EXT ILL -SUN.

**GLARE INDEX**

is the daylight glare index at the reference point due to this window. (It assumes 100% shade transmittance for a shaded window (WIN SHD IND = 2). The actual glare index in the hourly calculation will generally be lower for shade transmittance < 100%.

**LV-M DOE-2.2 Units Conversion Table**

Simple Structure Run 3, Chicago  
Design-day sizing of VAV system  
REPORT- LV-M DOE-2.2 Units Conversion Table

Divide into zones; add plenum  
Show All Reports

DOE-2.2-44a2 9/24/2004 18:18:14 BDL RUN 1

WEATHER FILE- TRY CHICAGO

	ENGLISH	MULTIPLIED BY	GIVES	METRIC	MULTIPLIED BY	GIVES	ENGLISH
1			1.000000			1.000000	
2			1.000000			1.000000	
3	BTU		0.293000	WH		3.412969	BTU
4	BTU/HR		0.293000	WATT		3.412969	BTU/HR
5	BTU/LB-F	4183.830078		J/KG-K		0.000239	BTU/LB-F
6	BTU/HR-SQFT-F	5.674460		W/M2-K		0.176228	BTU/HR-SQFT-F
7	DEGREES		1.000000	DEGREES		1.000000	DEGREES
9	SQFT		0.092903	M2		10.763915	SQFT
10	CUFT		0.028317	M3		35.314724	CUFT
11	LB/HR		0.453592	KG/HR		2.204624	LB/HR
12	LB/CUFT		16.018459	KG/M3		0.062428	LB/CUFT
13	MPH		0.447040	M/S		2.236936	MPH
14	BTU/HR-F		0.527178	W/K		1.896893	BTU/HR-F
15	FT		0.304800	M		3.280840	FT
16	BTU/HR-FT-F		1.729600	W/M-K		0.578168	BTU/HR-FT-F
17	BTU/HR- SQFT		3.152480	WATT /M2		0.317211	BTU/HR- SQFT
18	IN		2.540000	CM		0.393701	IN
19	UNITS/IN		0.393700	UNITS/CM		2.540005	UNITS/IN
20	UNITS		1.000000	UNITS		1.000000	UNITS
21	LB		0.453592	KG		2.204624	LB
22	FRAC.OR MULT.		1.000000	FRAC.OR MULT.		1.000000	FRAC.OR MULT.
23	HOURS		1.000000	HRS		1.000000	HOURS
24	PERCENT-RH		1.000000	PERCENT-RH		1.000000	PERCENT-RH
25	CFM		1.699010	M3/H		0.588578	CFM
26	IN-WATER		25.400000	MM-WATER		0.039370	IN-WATER
27	LB/SQFT		4.882400	KG/M2		0.204817	LB/SQFT
28	KW		1.000000	KW		1.000000	KW
29	W/SQFT		10.763920	W/M2		0.092903	W/SQFT
30	THERMS		25.000000	THERMIES		0.040000	THERMS
31	KNOTS		0.514440	M/SEC		1.943861	KNOTS
32	HR-SQFT-F /BTU		0.176228	M2-K /W		5.674467	HR-SQFT-F /BTU
33	\$DOLLARS		1.000000	\$DOLLARS		1.000000	\$DOLLARS
34	MBTU/HR		0.293000	MWATT		3.412969	MBTU/HR
35	YEARS		1.000000	YEARS		1.000000	YEARS
36	\$/HR		1.000000	\$/HR		1.000000	\$/HR
37	HRS/YEARS		1.000000	HRS/YEARS		1.000000	HRS/YEARS
38	PERCENT		1.000000	PERCENT		1.000000	PERCENT
39	\$/MONTH		1.000000	\$/MONTH		1.000000	\$/MONTH
40	GALLONS/MIN/TON		1.078000	LITERS/MIN/KW		0.927644	GALLONS/MIN/TON
41	BTU/LB		0.645683	WH/KG		1.548748	BTU/LB
42	LBS/SQIN-GAGE		68.947571	MBAR-GAGE		0.014504	LBS/SQIN-GAGE
43	\$/UNIT		1.000000	\$/UNIT		1.000000	\$/UNIT
44	BTU/HR/PERSON		0.293000	W/PERSON		3.412969	BTU/HR/PERSON
45	LBS/LB		1.000000	KGS/KG		1.000000	LBS/LB
46	BTU/BTU		1.000000	KWH/KWH		1.000000	BTU/BTU
47	LBS/KW		0.453590	KG/KW		2.204634	LBS/KW
48	REV/MIN		1.000000	REV/MIN		1.000000	REV/MIN
49	KW/TON		1.000000	KW/TON		1.000000	KW/TON
50	MBTU		0.293000	MWH		3.412969	MBTU
51	GAL		3.785410	LITER		0.264172	GAL
52	GAL/MIN		3.785410	LITERS/MIN		0.264172	GAL/MIN
53	BTU/F	1897.800049		J/K		0.000527	BTU/F
54	KWH		1.000000	KWH		1.000000	KWH
55	\$/UNIT-HR		1.000000	\$/UNIT-HR		1.000000	\$/UNIT-HR
56	KW/CFM		0.588500	KW/M3/HR		1.699235	KW/CFM
57	BTU/SQFT-F	20428.400391		J/M2-K		0.000049	BTU/SQFT-F
58	HR/HR		1.000000	HR/HR		1.000000	HR/HR
59	BTU/FT-F	6226.479980		J/M-K		0.000161	BTU/FT-F
60	R		0.555556	K		1.799999	R
61	INCH MER		33.863800	MBAR		0.029530	INCH MER
62	UNITS/GAL/MIN		0.264170	UNITS/LITER/MIN		3.785441	UNITS/GAL/MIN
63	(HR-SQFT-F/BTU)2		0.031056	(M2-K /W)2		32.199585	(HR-SQFT-F/BTU)2
64	KBTU/HR		0.293000	KW		3.412969	KBTU/HR
65	KBTU		0.293000	KWH		3.412969	KBTU
66	CFM		0.471900	L/S		2.119093	CFM
67	CFM/SQFT		18.288000	M3/H-M2		0.054681	CFM/SQFT
68	1/R		1.799900	1/K		0.555586	1/R
69	1/KNOT		1.943860	SEC/M		0.514440	1/KNOT
70	FOOTCANDLES		10.763910	LUX		0.092903	FOOTCANDLES
71	FOOTLAMBERT		3.426259	CANDELA/M2		0.291864	FOOTLAMBERT
72	LUMEN / WATT		1.000000	LUMEN / WATT		1.000000	LUMEN / WATT
73	KBTU/SQFT-YR		3.152480	KWH/M2-YR		0.317211	KBTU/SQFT-YR
74	F (DELTA)		0.555556	C (DELTA)		1.799999	F (DELTA)
75	BTU/DAY		0.012202	WATT		81.953773	BTU/DAY
76	\$/YEAR		1.000000	\$/YEAR		1.000000	\$/YEAR
77	BTU/WATT		0.293000	WATT/WATT		3.412969	BTU/WATT

78	RADIANS	1.000000	RADIANS	1.000000	RADIANS
79	WATT/BTU	3.413000	WATT/WATT	0.292997	WATT/BTU
80	BTU	0.000293	KWH	3412.969482	BTU
81	WATT	1.000000	WATT	1.000000	WATT
82	LUMENS	1.000000	LUMENS	1.000000	LUMENS
83	BTU/HR-FT-R2	3.115335	W/M-K2	0.320993	BTU/HR-FT-R2
84	LB/FT-S	1.488163	KG/M-S	0.671969	LB/FT-S
85	LB/FT-S-R	2.678693	KG/M-S-K	0.373316	LB/FT-S-R
86	LB/CUFT-R	28.833212	KG/M3-K	0.034682	LB/CUFT-R
87	BTU/HR-FT-R	1.730741	W/M-K	0.577787	BTU/HR-FT-R
88	THERM	2.831700	M3	0.353145	THERM
89	THERM/HR	2.831700	M3/HR	0.353145	THERM/HR
90	TON	0.907180	TONNE	1.102317	TON
91	TON/HR	0.907180	TONNE/HR	1.102317	TON/HR
92	BTU/UNIT	1.000000	BTU/UNIT	1.000000	BTU/UNIT
93	\$	1.000000	\$	1.000000	\$
94	KW/GAL/MIN	0.264170	KW/LITER/MIN	3.785441	KW/GAL/MIN
95	CUFT/GAL	0.448831	M3-MIN/H-LITERS	2.228010	CUFT/GAL
96	MINUTES	1.000000	MINUTES	1.000000	MINUTES
97	UNUSED	1.000000	UNUSED	1.000000	UNUSED
98	UNUSED	1.000000	UNUSED	1.000000	UNUSED
99	UNUSED	1.000000	UNUSED	1.000000	UNUSED
100	UNUSED	1.000000	UNUSED	1.000000	UNUSED
101	UNUSED	1.000000	UNUSED	1.000000	UNUSED
102	UNUSED	1.000000	UNUSED	1.000000	UNUSED
103	UNUSED	1.000000	UNUSED	1.000000	UNUSED
104	UNUSED	1.000000	UNUSED	1.000000	UNUSED
105	UNUSED	1.000000	UNUSED	1.000000	UNUSED
106	UNUSED	1.000000	UNUSED	1.000000	UNUSED
107	UNUSED	1.000000	UNUSED	1.000000	UNUSED
108	UNUSED	1.000000	UNUSED	1.000000	UNUSED
109	UNUSED	1.000000	UNUSED	1.000000	UNUSED
110	UNUSED	1.000000	UNUSED	1.000000	UNUSED
111	UNUSED	1.000000	UNUSED	1.000000	UNUSED
112	UNUSED	1.000000	UNUSED	1.000000	UNUSED
113	BTU-F/BTU	0.555560	KWH-C/KWH	1.799986	BTU-F/BTU
114	UNUSED	1.000000	UNUSED	1.000000	UNUSED
115	VOLTS	1.000000	VOLTS	1.000000	VOLTS
116	C	1.000000	C	1.000000	C
117	AMPS	1.000000	AMPS	1.000000	AMPS
118	VOLTS/C	1.000000	VOLTS/C	1.000000	VOLTS/C
119	1/C	1.000000	1/C	1.000000	1/C
120	FT/MIN	0.005080	M/S	196.850388	FT/MIN
121	GAL/MIN	227.160004	LITERS/HR	0.004402	GAL/MIN
122	KW/CFM	588.500000	W/M3/HR	0.001699	KW/CFM
123	BTU/HR-F	0.000527	KW/C	1896.892578	BTU/HR-F
124	HP	0.102000	KW	9.803922	HP
125	CFM/TON	0.483200	(M3/H)/KW	2.069536	CFM/TON
126	UNUSED	1.000000	UNUSED	1.000000	UNUSED
127	UNUSED	1.000000	UNUSED	1.000000	UNUSED
128	UNUSED	1.000000	UNUSED	1.000000	UNUSED
129	UNUSED	1.000000	UNUSED	1.000000	UNUSED
130	1/VOLTS	1.000000	1/VOLTS	1.000000	1/VOLTS
131	(C-M2)/W	1.000000	(C-M2)/W	1.000000	(C-M2)/W
132	(C-M-SEC)/W	1.000000	(C-M-SEC)/W	1.000000	(C-M-SEC)/W
133	W/M2	1.000000	W/M2	1.000000	W/M2
134	TDV-MBTUH	0.293000	TDV-MW	3.412969	TDV-MBTUH
135	TDV-MBTU	0.293000	TDV-MWH	3.412969	TDV-MBTU
136	TDV-KBTU/KWH	0.293000	TDV-KWH/KWH	3.412969	TDV-KBTU/KWH
137	TDV-KBTU/THERM	0.010000	TDV-KWH/KWH	100.000000	TDV-KBTU/THERM

# LV-N Building Coordinate Geometry

Simple Structure Run 3, Chicago      Divide into zones; add plenum      DOE-2.2-44a2    9/24/2004    18:18:14    BDL RUN 1  
 Design-day sizing of VAV system      Show All Reports  
 REPORT- LV-N Building Coordinate Geometry      WEATHER FILE- TRY    CHICAGO

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SPACE..... (SPACE ORIGIN)
  WALL..... (VERTEX1) (VERTEX2) (...)
  WINDOW..... (VERTEX1) (VERTEX2) (...)
-----

PLENUM-1..... ( 0.0 0.0 8.0)
  WALL-1PF..... ( 0.0 0.0 10.0) ( 0.0 0.0 8.0) ( 100.0 0.0 8.0) ( 100.0 0.0 10.0)
  WALL-1PR..... ( 100.0 0.0 10.0) ( 100.0 0.0 8.0) ( 100.0 50.0 8.0) ( 100.0 50.0 10.0)
  WALL-1PB..... ( 100.0 50.0 10.0) ( 100.0 50.0 8.0) ( 0.0 50.0 8.0) ( 0.0 50.0 10.0)
  WALL-1PL..... ( 0.0 50.0 10.0) ( 0.0 50.0 8.0) ( 0.0 0.0 8.0) ( 0.0 0.0 10.0)
  TOP-1..... ( 0.0 0.0 10.0) ( 100.0 0.0 10.0) ( 100.0 50.0 10.0) ( 0.0 50.0 10.0)
  C1-1..... ( 0.0 0.0 8.0) ( 100.0 0.0 8.0) ( 88.0 12.0 8.0) ( 12.0 12.0 8.0)
  C2-1..... ( 100.0 0.0 8.0) ( 100.0 50.0 8.0) ( 88.0 38.0 8.0) ( 88.0 12.0 8.0)
  C3-1..... ( 100.0 50.0 8.0) ( 0.0 50.0 8.0) ( 12.0 38.0 8.0) ( 88.0 38.0 8.0)
  C4-1..... ( 0.0 50.0 8.0) ( 0.0 0.0 8.0) ( 12.0 12.0 8.0) ( 12.0 38.0 8.0)
  C5-1..... ( 12.0 12.0 8.0) ( 88.0 12.0 8.0) ( 88.0 38.0 8.0) ( 12.0 38.0 8.0)
SPACE1-1..... ( 0.0 0.0 0.0)
  FRONT-1..... ( 0.0 0.0 8.0) ( 0.0 0.0 0.0) ( 100.0 0.0 0.0) ( 100.0 0.0 8.0)
    WF-1..... ( 10.0 0.0 7.0) ( 10.0 0.0 3.0) ( 55.0 0.0 3.0) ( 55.0 0.0 7.0)
    DF-1..... ( 70.0 0.0 8.0) ( 70.0 0.0 0.0) ( 78.0 0.0 0.0) ( 78.0 0.0 8.0)
    C1-1..... ( 0.0 0.0 8.0) ( 100.0 0.0 8.0) ( 88.0 12.0 8.0) ( 12.0 12.0 8.0)
    SB12..... ( 100.0 0.0 8.0) ( 100.0 0.0 0.0) ( 88.0 12.0 0.0) ( 88.0 12.0 8.0)
    SB14..... ( 12.0 12.0 8.0) ( 12.0 12.0 0.0) ( 0.0 0.0 0.0) ( 0.0 0.0 8.0)
    SB15..... ( 88.0 12.0 8.0) ( 88.0 12.0 0.0) ( 12.0 12.0 0.0) ( 12.0 12.0 8.0)
SPACE2-1..... ( 100.0 0.0 0.0)
  RIGHT-1..... ( 100.0 0.0 8.0) ( 100.0 0.0 0.0) ( 100.0 50.0 0.0) ( 100.0 50.0 8.0)
    WR-1..... ( 100.0 12.5 7.0) ( 100.0 12.5 3.0) ( 100.0 37.5 3.0) ( 100.0 37.5 7.0)
    SB12..... ( 100.0 0.0 8.0) ( 100.0 0.0 0.0) ( 88.0 12.0 0.0) ( 88.0 12.0 8.0)
    C2-1..... ( 100.0 0.0 8.0) ( 100.0 50.0 8.0) ( 88.0 38.0 8.0) ( 88.0 12.0 8.0)
    SB23..... ( 100.0 50.0 8.0) ( 100.0 50.0 0.0) ( 88.0 38.0 0.0) ( 88.0 38.0 8.0)
    SB25..... ( 88.0 38.0 8.0) ( 88.0 38.0 0.0) ( 88.0 12.0 0.0) ( 88.0 12.0 8.0)
SPACE3-1..... ( 100.0 50.0 0.0)
  BACK-1..... ( 100.0 50.0 8.0) ( 100.0 50.0 0.0) ( 0.0 50.0 0.0) ( 0.0 50.0 8.0)
    WB-1..... ( 90.0 50.0 7.0) ( 90.0 50.0 3.0) ( 45.0 50.0 3.0) ( 45.0 50.0 7.0)
    DB-1..... ( 30.0 50.0 7.0) ( 30.0 50.0 0.0) ( 23.0 50.0 0.0) ( 23.0 50.0 7.0)
    SB23..... ( 100.0 50.0 8.0) ( 100.0 50.0 0.0) ( 88.0 38.0 0.0) ( 88.0 38.0 8.0)
    C3-1..... ( 100.0 50.0 8.0) ( 0.0 50.0 8.0) ( 12.0 38.0 8.0) ( 88.0 38.0 8.0)
    SB34..... ( 0.0 50.0 8.0) ( 0.0 50.0 0.0) ( 12.0 38.0 0.0) ( 12.0 38.0 8.0)
    SB35..... ( 12.0 38.0 8.0) ( 12.0 38.0 0.0) ( 88.0 38.0 0.0) ( 88.0 38.0 8.0)
SPACE4-1..... ( 0.0 50.0 0.0)
  LEFT-1..... ( 0.0 50.0 8.0) ( 0.0 50.0 0.0) ( 0.0 0.0 0.0) ( 0.0 0.0 8.0)
    WL-1..... ( 0.0 37.5 7.0) ( 0.0 37.5 3.0) ( 0.0 12.5 3.0) ( 0.0 12.5 7.0)
    SB14..... ( 12.0 12.0 8.0) ( 12.0 12.0 0.0) ( 0.0 0.0 0.0) ( 0.0 0.0 8.0)
    SB34..... ( 0.0 50.0 8.0) ( 0.0 50.0 0.0) ( 12.0 38.0 0.0) ( 12.0 38.0 8.0)
    C4-1..... ( 0.0 50.0 8.0) ( 0.0 0.0 8.0) ( 12.0 12.0 8.0) ( 12.0 38.0 8.0)
    SB45..... ( 12.0 12.0 8.0) ( 12.0 12.0 0.0) ( 12.0 38.0 0.0) ( 12.0 38.0 8.0)
SPACE5-1..... ( 12.0 12.0 0.0)
  SB15..... ( 88.0 12.0 8.0) ( 88.0 12.0 0.0) ( 12.0 12.0 0.0) ( 12.0 12.0 8.0)
  SB25..... ( 88.0 38.0 8.0) ( 88.0 38.0 0.0) ( 88.0 12.0 0.0) ( 88.0 12.0 8.0)
  SB35..... ( 12.0 38.0 8.0) ( 12.0 38.0 0.0) ( 88.0 38.0 0.0) ( 88.0 38.0 8.0)
  SB45..... ( 12.0 12.0 8.0) ( 12.0 12.0 0.0) ( 12.0 38.0 0.0) ( 12.0 38.0 8.0)
  C5-1..... ( 12.0 12.0 8.0) ( 88.0 12.0 8.0) ( 88.0 38.0 8.0) ( 12.0 38.0 8.0)
    
```

## LS-A Space Peak Loads Summary

This report lists each space by U-name and shows the number of times each space is repeated (based on the keywords MULTIPLIER and FLOOR-MULTIPLIER) on the left of the report.

The individual space peak sensible cooling load with the month, day and hour it occurred is reported in the center. The sum of the cooling loads for all spaces (which is the non-coincident building peak load) is also reported.

The coincident building peak cooling load (the "block" load) is reported directly below the non-coincident peak, but it does not include the plenum load. The outside drybulb and wetbulb temperatures are also reported for the time of the peak load in each space and for the building. All hours are given in standard time.

The heating peak loads are treated similarly on the right.

A "load" here is defined as the amount of heat that must be added or removed from the space air per hour to maintain a constant air temperature equal to the TEMPERATURE keyword value in SPACE. These loads are modified in the SYSTEMS program to account for time-varying air temperatures.

```

Simple Structure Run 3, Chicago          Divide into zones; add plenum          DOE-2.2b-027  Fri Jan  9 15:25:08 1998BDL RUN  1
Design-day sizing of VAV system        Show All Reports
REPORT- LS-A Space Peak Loads Summary          DESIGN DAY  WEATHER FILE- TRY  CHICAGO
-----

```

SPACE NAME	MULTIPLIER		COOLING LOAD (KBTU/HR)	TIME OF PEAK	DRY- BULB	WET- BULB	HEATING LOAD (KBTU/HR)	TIME OF PEAK	DRY- BULB	WET- BULB
	SPACE	FLOOR								
PLENUM-1	1.	1.	68.071	AUG 5 4 PM	94.F	74.F	-71.422	JAN 7 7 AM	-5.F	-6.F
SPACE1-1	1.	1.	27.707	AUG 5 5 PM	94.F	74.F	-14.109	JAN 7 8 AM	-5.F	-6.F
SPACE2-1	1.	1.	13.641	AUG 5 11 AM	80.F	70.F	-5.793	JAN 7 7 AM	-5.F	-6.F
SPACE3-1	1.	1.	19.296	AUG 5 9 AM	75.F	68.F	-15.393	JAN 7 7 AM	-5.F	-6.F
SPACE4-1	1.	1.	13.261	AUG 5 7 PM	92.F	73.F	-6.230	JAN 7 7 AM	-5.F	-6.F
SPACE5-1	1.	1.	19.881	AUG 5 1 AM	82.F	71.F	-4.895	JAN 7 12 MDNT	-5.F	-6.F
SUM			161.856				-117.842			

## **LS-B Space Peak Load Components <space name>**

This report gives a breakdown of cooling and heating peak loads, according to the source of the load, for each space. A "load" here is defined as the amount of heat that must be added or removed from the space air per hour to maintain a constant air temperature equal to the TEMPERATURE keyword value in SPACE. These loads are modified in the SYSTEMS program to account for time-varying air temperatures.

The time of occurrence (in local standard time) of the peaks is indicated along with the corresponding outside conditions. The load components are:

### **WALL CONDUCTION**

is the load due to conduction through exterior walls (TILT  $\geq$  45°).

### **ROOF CONDUCTION**

is the load due to conduction through roof sections (exterior walls with TILT < 45°).

### **WINDOW GLASS+FRM COND**

is the load due to UADT heat gain through all the exterior windows (glass plus frames) plus solar energy absorbed by the glass and frames and conducted into the space.

### **WINDOW GLASS SOLAR**

is the load caused by direct and diffuse solar radiation transmitted by the window glass into the space. Note that all sensible loads are calculated as delayed in time with weighting factors so that it is possible to have load contributions from WINDOW GLASS SOLAR at night.

### **DOOR CONDUCTION**

is the load due to conduction through external doors in the space.

### **INTERNAL SURFACE COND**

is the load due to conduction through INTERIOR-WALLs such as partitions and drop ceilings. These loads will be zero in this report if you choose the same LOADS calculation temperature for all spaces (as was the case in this example).

### **UNDERGROUND SURF COND**

is the load due to conduction through basement floors and walls or slabs on grade.

The next five entries are the loads due to

### **Occupants**

(resulting from user-supplied entries for keywords PEOPLE-SCHEDULE, NUMBER-OF-PEOPLE, AREA-PERSON, and PEOPLE-HEAT-GAIN)

### **Electric lighting**

(from keywords LIGHTING-SCHEDULE, LIGHTING-TYPE, LIGHTING-W/AREA, TASK-LT-W/AREA, etc., or from commands LIGHTING-SYSTEM, LUMINAIRE-TYPE, LAMP-TYPE, etc.)

### **Equipment**

(from keywords EQUIP-SCHEDULE, EQUIPMENT-W/AREA, etc.)

**Process**

(from keywords SOURCE-SCHEDULE, SOURCE-TYPE, SOURCE-POWER, etc.)

**Infiltration of outside air**

(from keywords INF-SCHEDULE, INF-METHOD, AIR-CHANGES/HR, etc.).

The RUN number in the upper right hand corner refers to the number of the pass through the LOADS program. For example, if you were doing parametric runs as part of the same job, successive passes through LOADS would be recorded as RUN 1, RUN 2, RUN 3, etc.

Simple Structure Run 3, Chicago                      Divide into zones; add plenum                      DOE-2.2b-027    Fri Jan 9 15:25:08 1998BDL RUN 1  
 Design-day sizing of VAV system                      Show All Reports  
 REPORT- LS-B Space Peak Load Components                      SPACE1-1                      WEATHER FILE- TRY CHICAGO

-----  
 SPACE SPACE1-1  
 SPACE TEMPERATURE USED FOR THE LOADS CALCULATION IS 70 F / 21 C

MULTIPLIER                      1.0                      FLOOR MULTIPLIER                      1.0  
 FLOOR AREA                      1056 SQFT                      98 M2  
 VOLUME                      8448 CUFT                      239 M3

TIME	COOLING LOAD		HEATING LOAD	
	OCT 22 4PM		JAN 12 8AM	
DRY-BULB TEMP	70 F	21 C	-7 F	-22 C
WET-BULB TEMP	55 F	13 C	-7 F	-22 C
TOT HORIZONTAL SOLAR RAD	119 BTU/H.SQFT	375 W/M2	3 BTU/H.SQFT	8 W/M2
WINDSPEED AT SPACE	8.3 KTS	4.3 M/S	5.1 KTS	2.6 M/S
CLOUD AMOUNT 0(CLEAR)-10	0		0	

	SENSIBLE		LATENT		SENSIBLE	
	(KBTU/H)	( KW )	(KBTU/H)	( KW )	(KBTU/H)	( KW )
WALL CONDUCTION	0.860	0.252	0.000	0.000	-2.418	-0.708
ROOF CONDUCTION	0.000	0.000	0.000	0.000	0.000	0.000
WINDOW GLASS+FRM COND	1.655	0.485	0.000	0.000	-8.995	-2.636
WINDOW GLASS SOLAR	20.144	5.902	0.000	0.000	0.968	0.284
DOOR CONDUCTION	0.000	0.000	0.000	0.000	0.000	0.000
INTERNAL SURFACE COND	0.000	0.000	0.000	0.000	0.000	0.000
UNDERGROUND SURF COND	-0.665	-0.195	0.000	0.000	-1.814	-0.532
OCCUPANTS TO SPACE	2.080	0.609	1.433	0.420	0.012	0.003
LIGHT TO SPACE	3.494	1.024	0.000	0.000	0.210	0.061
EQUIPMENT TO SPACE	2.053	0.602	0.000	0.000	0.641	0.188
PROCESS TO SPACE	0.000	0.000	0.000	0.000	0.000	0.000
INFILTRATION	0.000	0.000	0.000	0.000	-1.689	-0.495
TOTAL	29.621	8.679	1.433	0.420	-13.086	-3.834
TOTAL / AREA	0.028	0.088	0.001	0.004	-0.012	-0.039
TOTAL LOAD	31.054 KBTU/H		9.099 KW		-13.086 KBTU/H	-3.834 KW
TOTAL LOAD / AREA	29.41 BTU/H.SQFT		92.745 W/M2		12.392 BTU/H.SQFT	39.081 W/M2

\*\*\*\*\*  
 \*  
 \* NOTE 1)THE ABOVE LOADS EXCLUDE OUTSIDE VENTILATION AIR \*  
 \* ---- LOADS \*  
 \* 2)TIMES GIVEN IN STANDARD TIME FOR THE LOCATION \*  
 \* IN CONSIDERATION \*  
 \* 3)THE ABOVE LOADS ARE CALCULATED ASSUMING A \*  
 \* CONSTANT INDOOR SPACE TEMPERATURE \*  
 \*  
 \*\*\*\*\*



## **LS-C Building Peak Load Components**

This report is similar in format to LS-B. The major difference is that LS-C is generated at the "building level," i.e., the space loads are summed each hour to give the building coincident load and the peak values of this load are shown here.

"Floor area" in this report is that of conditioned spaces only (ZONE-TYPE = CONDITIONED); it excludes plenums and other unconditioned spaces (ZONE-TYPE = PLENUM or UNCONDITIONED). "Volume" is that of conditioned spaces and plenums; it excludes ZONE-TYPE = UNCONDITIONED.

The building coincident peak load does not include plenums (ZONE-TYPE = PLENUM) or other unconditioned spaces (ZONE-TYPE = UNCONDITIONED).

Although no infiltration is indicated for the peak cooling load in this example, the user should realize how DOE-2 treats infiltration loads. The sensible portion is treated as an instantaneous heat gain or loss. The latent portion is reported in LOADS, but is passed to SYSTEMS as a flow with the calculated humidity ratio for each hour. The contribution of the latent heat (negative or positive in relation to room humidity) is then calculated from a mass balance of moisture in the space to determine the return air humidity ratio. In dry climates the infiltration may actually result in a decreased space latent load and thus a decreased total SYSTEMS load. The opposite is true in humid climates where infiltration acts to increase the SYSTEMS load.

The heat gain or loss that occurs in plenums, including heat due to lights, is accounted for in the SYSTEMS simulation and causes a temperature change in the return air flowing through the plenum. Therefore, you should not specify plenums unless they are actually return air plenums. Unconditioned, non-return-air spaces should be specified in the SPACE command with ZONE-TYPE = UNCONDITIONED.

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 Design-day sizing of VAV system                      Show All Reports  
 REPORT- LS-C Building Peak Load Components                      WEATHER FILE- TRY CHICAGO

\*\*\* BUILDING \*\*\*

FLOOR AREA                      5000 SQFT                      465 M2  
 VOLUME                              50000 CUFT                      1416 M3

TIME	COOLING LOAD		HEATING LOAD	
	=====		=====	
	JUL 9 4PM		MAR 24 6AM	
DRY-BULB TEMP	94 F	34 C	8 F	-13 C
WET-BULB TEMP	74 F	23 C	7 F	-14 C
TOT HORIZONTAL SOLAR RAD	228 BTU/H.SQFT	717 W/M2	0 BTU/H.SQFT	0 W/M2
WINDSPEED AT SPACE	5.4 KTS	2.8 M/S	9.4 KTS	4.8 M/S
CLOUD AMOUNT 0(CLEAR)-10	4		7	

	SENSIBLE		LATENT		SENSIBLE	
	(KBTU/H)	( KW )	(KBTU/H)	( KW )	(KBTU/H)	( KW )
	-----	-----	-----	-----	-----	-----
WALL CONDUCTION	3.987	1.168	0.000	0.000	-6.123	-1.794
ROOF CONDUCTION	0.000	0.000	0.000	0.000	0.000	0.000
WINDOW GLASS+FRM COND	10.157	2.976	0.000	0.000	-19.651	-5.758
WINDOW GLASS SOLAR	22.881	6.704	0.000	0.000	2.414	0.707
DOOR CONDUCTION	0.000	0.000	0.000	0.000	0.000	0.000
INTERNAL SURFACE COND	0.000	0.000	0.000	0.000	0.000	0.000
UNDERGROUND SURF COND	-1.093	-0.320	0.000	0.000	-5.645	-1.654
OCCUPANTS TO SPACE	10.434	3.057	6.776	1.985	0.004	0.001
LIGHT TO SPACE	16.957	4.968	0.000	0.000	0.969	0.284
EQUIPMENT TO SPACE	10.332	3.027	0.000	0.000	0.807	0.237
PROCESS TO SPACE	0.000	0.000	0.000	0.000	0.000	0.000
INFILTRATION	0.000	0.000	0.000	0.000	-11.157	-3.269
TOTAL	73.656	21.581	6.776	1.985	-38.381	-11.246
TOTAL / AREA	0.015	0.046	0.001	0.004	-0.008	-0.024
TOTAL LOAD	80.431 KBTU/H		23.566 KW		-38.381 KBTU/H	-11.246 KW
TOTAL LOAD / AREA	16.09 BTU/H.SQFT		50.733 W/M2		7.676 BTU/H.SQFT	24.210 W/M2

```

*****
*
* NOTE 1)THE ABOVE LOADS EXCLUDE OUTSIDE VENTILATION AIR
* ---- LOADS
*
* 2)TIMES GIVEN IN STANDARD TIME FOR THE LOCATION
* IN CONSIDERATION
*
* 3)THE ABOVE LOADS ARE CALCULATED ASSUMING A
* CONSTANT INDOOR SPACE TEMPERATURE
*
*****
    
```

## **LS-D Building Monthly Loads Summary**

This report gives a summary of monthly cooling, heating, and electrical requirements plus annual total energy requirements and maximum monthly peak loads. Unconditioned spaces (ZONE-TYPE = UNCONDITIONED or PLENUM) are not included in this report's monthly load.

Once again, you should be aware that these loads are based on a constant temperature within each SPACE (that is, no setback, no floating, and no other temperature variations within the SPACE). Additionally, these loads do not account for conditioning of outside ventilation air. Later, in SYSTEMS, these items will be accounted for.

### **COOLING, HEATING, and ELEC**

are the three sections of this building level report.

#### **COOLING ENERGY**

is the monthly sensible cooling load for all conditioned SPACES in the building.

#### **MAXIMUM COOLING LOAD**

is the peak coincident sensible cooling load for all conditioned SPACES in the building. To the left of this column are the day and hour (local standard time) of the peak cooling load along with the outside drybulb and wetbulb temperatures at that time.

#### **HEATING ENERGY**

is the monthly heating load for all conditioned SPACES in the building.

#### **MAXIMUM HEATING LOAD**

is the peak coincident heating load for all conditioned SPACES in the building. To the left of this column are the day and hour (local standard time) of the peak heating load along with the outside drybulb and wetbulb temperatures at that time.

#### **ELECTRICAL ENERGY**

is the monthly electrical consumption for lights, convenience outlets and non-HVAC equipment.

#### **MAXIMUM ELEC LOAD**

is the monthly peak electrical consumption in a one-hour period for lights, convenience outlets, and miscellaneous equipment input as SOURCE.

#### **TOTAL**

is the annual total for the cooling load, heating load and electrical load of the building.

#### **MAX**

is the highest monthly peak cooling load, heating load and electrical load.

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 REPORT- LS-D Building Monthly Loads Summary                      WEATHER FILE- TRY CHICAGO

C O O L I N G						H E A T I N G						E L E C		
MONTH	COOLING ENERGY (MBTU)	TIME OF DAY	MAX	DRY-BULB TEMP	WET-BULB TEMP	MAXIMUM COOLING LOAD (KBTU/HR)	HEATING ENERGY (MBTU)	TIME OF DAY	MAX	DRY-BULB TEMP	WET-BULB TEMP	MAXIMUM HEATING LOAD (KBTU/HR)	ELEC-TRICAL ENERGY (KWH)	MAXIMUM ELEC LOAD (KW)
JAN	5.38947	31	15	30.F	25.F	45.418	-10.065	12	3	1.F	0.F	-37.352	3027.	12.000
FEB	4.90776	28	15	52.F	42.F	44.295	-9.185	4	6	7.F	6.F	-36.168	2654.	12.000
MAR	6.74509	3	16	79.F	62.F	52.219	-6.658	24	6	8.F	7.F	-38.381	2936.	12.000
APR	12.32965	2	15	69.F	53.F	57.821	-2.017	8	6	32.F	29.F	-16.160	2994.	12.000
MAY	14.45126	20	14	76.F	67.F	63.784	-0.757	9	5	40.F	38.F	-10.506	2936.	12.000
JUN	18.19720	20	15	90.F	77.F	69.729	-0.075	23	5	52.F	48.F	-4.085	2903.	12.000
JUL	22.84128	9	15	94.F	74.F	73.656	0.000	0	0	0.F	0.F	0.000	3027.	12.000
AUG	20.40500	19	16	90.F	71.F	72.721	-0.001	5	5	55.F	54.F	-0.557	2936.	12.000
SEP	16.13781	17	15	82.F	66.F	70.483	-0.371	22	6	35.F	31.F	-10.162	2903.	12.000
OCT	12.67929	10	15	68.F	54.F	65.100	-1.562	21	6	30.F	29.F	-13.971	3027.	12.000
NOV	6.27171	7	15	55.F	46.F	58.931	-5.518	28	7	26.F	24.F	-23.169	2629.	12.000
DEC	5.11098	10	15	41.F	35.F	47.798	-9.108	22	8	15.F	15.F	-30.361	3027.	12.000
TOTAL	145.467						-45.318						34996.	
MAX						73.656						-38.381		12.000

## **LS-E Space Monthly Load Components <space name>**

This report gives a breakdown of loads for each space on a monthly basis, according to the source of the load. All entries are in MBtu/month or MWh/month. Each load is broken down into three types: heating (HEATNG), sensible cooling (SEN CL) and latent cooling (LAT CL). Latent cooling loads are accumulated only for those hours in each month that have a net sensible cooling load. Positive entries correspond to heat gain, negative entries correspond to heat loss, and all sensible loads are calculated as delayed in time with weighting factors.

The load sources, listed across the top of the report, are described below. The corresponding headings from Report LS-B are given in brackets.

### **WALLS**

is the heat conduction through exterior walls with TILT greater than 45o, plus conduction through doors located in exterior walls. [WALLS plus DOOR]

### **ROOFS**

is the heat conduction through exterior walls with TILT less than 45o. [ROOFS]

### **INT SUR**

is the heat conduction through interior walls. This entry will be non-zero only if there are one or more adjoining spaces with a loads calculation temperature that is different from that of the space being reported. [INTERNAL SURFACES]

### **UND SUR**

is the heat conduction through underground surfaces. [UNDERGROUND SURFACES]

### **INFIL**

is the load due to air infiltration. [INFILTRATION]

### **WIN CON**

is the sum of the UADT load through the windows (glass plus frames) plus solar energy absorbed by the glass and frames and conducted into the space. [WINDOW CONDUCTION]

### **WIN SOL**

is the load from direct and diffuse solar radiation transmitted by the window glass. [WINDOW SOLAR]

### **OCCUP**

is the heat gain from occupants. [OCCUPANTS TO SPACE]

### **LIGHTS**

is the heat gain from lights. [LIGHT TO SPACE]

### **EQUIP**

is the load resulting from equipment. These values are calculated from user-supplied entries for EQUIP-SCHEDULE, EQUIPMENT-KW, EQUIPMENT-W/SQFT (AREA??), EQUIP-SENSIBLE and EQUIP-LATENT. [EQUIPMENT TO SPACE]

### **SOURCE**

is the load resulting from internal heating loads other than people, lights, or equipment. These values are calculated from the user-supplied entries for SOURCE-SCHEDULE, SOURCE-TYPE, SOURCE-BTU/HR, SOURCE-SENSIBLE, and SOURCE-LATENT. [PROCESS TO SPACE]

The LS-E Report is printed once for the combined DESIGN-DAY intervals (if one or more DESIGN-DAYs are specified) and once for the combined RUN-PERIOD intervals that use the weather file.

To illustrate how the entries in this report are accumulated, consider a sequence of four hours in January in which the load components from conduction through walls and heat from lights are as follows (the other load components are assumed to be zero):

	<b>Walls</b>	<b>Lights</b>
hour 1:	-0.01	0.03
hour 2:	-0.02	0.03
hour 3:	-0.04	0.03
hour 4:	-0.05	0.03

In hours 1 and 2 the net loads are  $(-0.01 + 0.03) = 0.02$ , and  $(-0.02 + 0.03) = 0.01$ , respectively. Thus, both these hours have a net (sensible) cooling load. In hours 3 and 4, on the other hand, the net loads are  $(-0.04 + 0.03) = -0.01$  and  $(-0.05 + 0.03) = -0.02$ , respectively. Thus, these hours have a net heating load. The entries in the LS-E Report for January would then be (assuming all other hours have zero loads):

		<b>WALLS</b>	<b>LIGHTS</b>	<b>TOTAL</b>
	HEATNG	-0.09	0.06	-0.03 (from hours 3 and 4)
JAN	SEN CL	-0.03	0.06	0.03 (from hours 1 and 2)
	LAT CL	0.	0.	0.

Simple Structure Run 3, Chicago                      Divide into zones; add plenum                      DOE-2.2b-027    Fri Jan 9 15:25:08 1998BDL RUN  
 Design-day sizing of VAV system                      Show All Reports  
 REPORT- LS-E Space Monthly Load Components    SPACE1-1                      WEATHER FILE- TRY    CHICAGO

(UNITS=MBTU)	WALLS	ROOFS	INT SUR	UND SUR	INFIL	WIN CON	WIN SOL	OCCUP	LIGHTS	EQUIP	SOURCE	TOTAL	
JAN	HEATING	-0.810	0.000	0.000	-0.996	-0.395	-2.914	1.028	0.228	0.458	0.357	0.000	-3.045
	SEN CL	-0.153	0.000	0.000	-0.354	-0.155	-0.737	1.362	0.291	0.528	0.357	0.000	1.138
	LAT CL					0.000			0.199		0.000	0.000	0.199
FEB	HEATING	-0.682	0.000	0.000	-0.965	-0.504	-2.556	1.035	0.193	0.392	0.316	0.000	-2.770
	SEN CL	-0.122	0.000	0.000	-0.375	-0.163	-0.632	1.461	0.258	0.469	0.319	0.000	1.216
	LAT CL					0.000			0.176		0.000	0.000	0.176
MAR	HEATING	-0.511	0.000	0.000	-0.928	-0.417	-1.971	1.062	0.120	0.273	0.262	0.000	-2.110
	SEN CL	-0.128	0.000	0.000	-0.467	-0.206	-0.657	1.565	0.379	0.680	0.441	0.000	1.608
	LAT CL					0.006			0.260		0.000	0.000	0.265
APR	HEATING	-0.223	0.000	0.000	-0.427	0.000	-0.856	0.569	0.055	0.128	0.114	0.000	-0.640
	SEN CL	-0.056	0.000	0.000	-0.706	0.000	-0.483	2.453	0.468	0.858	0.585	0.000	3.119
	LAT CL					0.000			0.303		0.000	0.000	0.303
MAY	HEATING	-0.131	0.000	0.000	-0.240	0.000	-0.502	0.411	0.027	0.077	0.087	0.000	-0.271
	SEN CL	-0.014	0.000	0.000	-0.616	0.000	-0.376	2.517	0.474	0.878	0.617	0.000	3.480
	LAT CL					0.000			0.292		0.000	0.000	0.292
JUN	HEATING	-0.024	0.000	0.000	-0.037	0.000	-0.090	0.090	0.005	0.016	0.015	0.000	-0.026
	SEN CL	0.124	0.000	0.000	-0.487	0.000	0.123	2.851	0.492	0.928	0.673	0.000	4.705
	LAT CL					0.000			0.292		0.000	0.000	0.292
JUL	HEATING	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	SEN CL	0.348	0.000	0.000	-0.271	0.000	0.823	3.174	0.522	0.990	0.714	0.000	6.302
	LAT CL					0.000			0.306		0.000	0.000	0.306
AUG	HEATING	-0.001	0.000	0.000	0.000	0.000	-0.003	0.003	0.000	0.001	0.000	0.000	0.000
	SEN CL	0.260	0.000	0.000	-0.180	0.000	0.506	3.180	0.501	0.955	0.704	0.000	5.925
	LAT CL					0.000			0.292		0.000	0.000	0.292
SEP	HEATING	-0.052	0.000	0.000	-0.028	0.000	-0.197	0.123	0.008	0.026	0.027	0.000	-0.095
	SEN CL	0.052	0.000	0.000	-0.233	0.000	-0.216	3.399	0.489	0.918	0.660	0.000	5.070
	LAT CL					0.000			0.292		0.000	0.000	0.292
OCT	HEATING	-0.168	0.000	0.000	-0.141	0.000	-0.625	0.369	0.027	0.078	0.084	0.000	-0.377
	SEN CL	-0.063	0.000	0.000	-0.353	0.000	-0.554	2.872	0.496	0.912	0.630	0.000	3.939
	LAT CL					0.000			0.306		0.000	0.000	0.306
NOV	HEATING	-0.438	0.000	0.000	-0.464	-0.314	-1.650	0.669	0.100	0.230	0.227	0.000	-1.640
	SEN CL	-0.126	0.000	0.000	-0.319	-0.169	-0.684	1.652	0.331	0.606	0.429	0.000	1.720
	LAT CL					0.003			0.226		0.000	0.000	0.229
DEC	HEATING	-0.716	0.000	0.000	-0.853	-0.472	-2.648	0.634	0.201	0.418	0.350	0.000	-3.087
	SEN CL	-0.150	0.000	0.000	-0.271	-0.140	-0.674	0.876	0.319	0.569	0.363	0.000	0.893
	LAT CL					0.000			0.221		0.000	0.000	0.221
TOT	HEATING	-3.756	0.000	0.000	-5.080	-2.102	-14.013	5.990	0.965	2.096	1.839	0.000	-4.060
	SEN CL	-0.026	0.000	0.000	-4.632	-0.834	-3.560	27.361	5.020	9.292	6.493	0.000	9.114
	LAT CL					0.009			3.164		0.000	0.000	3.173

## LS-F Building Monthly Load Components

This report gives a breakdown of loads on a monthly basis for the entire building, according to the source of the load. The loads in unconditioned spaces (ZONE-TYPE = UNCONDITIONED or PLENUM) are not included; all entries are in millions of Btu/month.

Like Report LS-E, three types of loads are shown: heating (HEATNG), sensible cooling (SEN CL), and latent cooling (LAT CL). The reported sources of the load (WALLS, ROOFS, etc.) are defined in the LS-E report description.

For multizone buildings, the load components are obtained by summing the corresponding load components for each conditioned space after multiplication by the space MULTIPLIER or FLOOR-MULTIPLIER. For example, consider a building with two spaces, Z-1 and Z-2, with space MULTIPLIERS of 2 and 3, respectively. If the heating load components in January due to glass conduction are -5.90 MBtu for Z-1 and -2.30 MBtu for Z-2, then the corresponding building load component is  $2 \times (-5.90) + 3 \times (-2.30) = -18.70$  MBtu. The total monthly heating and sensible cooling loads in the last column of this report are the same as those given in Report LS-D, Building Monthly Loads Summary, under the headings HEATING ENERGY and COOLING ENERGY.

Simple Structure Run 3, Chicago		Divide into zones; add plenum							DOE-2.2b-027 Fri Jan 9 15:25:08 1998BDL RUN				
Design-day sizing of VAV system		Show All Reports							WEATHER FILE- TRY CHICAGO				
REPORT- LS-F Building Monthly Load Components in MBTU													
(UNITS=MBTU)		WALLS	ROOFS	INT SUR	UND SUR	INFIL	WIN CON	WIN SOL	OCCUP	LIGHTS	EQUIP	SOURCE	TOTAL
JAN	HEATNG	-2.799	0.000	0.000	-3.225	-1.462	-8.167	1.914	0.793	1.600	1.280	0.000	-10.065
	SEN CL	-0.440	0.000	0.000	-0.839	-1.145	-1.535	1.993	1.796	3.279	2.282	0.000	5.389
	LAT CL					0.000			1.059		0.000	0.000	1.059
FEB	HEATNG	-2.339	0.000	0.000	-3.142	-1.932	-7.154	2.157	0.667	1.391	1.168	0.000	-9.185
	SEN CL	-0.374	0.000	0.000	-0.894	-1.224	-1.363	2.308	1.581	2.869	2.006	0.000	4.908
	LAT CL					0.000			0.943		0.000	0.000	0.943
MAR	HEATNG	-1.668	0.000	0.000	-2.911	-1.566	-5.276	2.515	0.392	0.928	0.928	0.000	-6.658
	SEN CL	-0.453	0.000	0.000	-1.290	-1.383	-1.684	3.096	2.093	3.783	2.584	0.000	6.745
	LAT CL					0.032			1.274		0.000	0.000	1.306
APR	HEATNG	-0.730	0.000	0.000	-1.419	0.000	-2.334	1.517	0.174	0.406	0.368	0.000	-2.017
	SEN CL	-0.223	0.000	0.000	-1.992	0.000	-1.238	5.759	2.429	4.471	3.123	0.000	12.330
	LAT CL					0.000			1.439		0.000	0.000	1.439
MAY	HEATNG	-0.394	0.000	0.000	-0.697	0.000	-1.271	1.064	0.078	0.218	0.246	0.000	-0.757
	SEN CL	-0.071	0.000	0.000	-1.880	0.000	-1.002	7.210	2.417	4.509	3.269	0.000	14.451
	LAT CL					0.000			1.379		0.000	0.000	1.379
JUN	HEATNG	-0.069	0.000	0.000	-0.102	0.000	-0.226	0.224	0.014	0.044	0.040	0.000	-0.075
	SEN CL	0.397	0.000	0.000	-1.475	0.000	0.348	8.448	2.460	4.626	3.392	0.000	18.197
	LAT CL					0.000			1.380		0.000	0.000	1.380
JUL	HEATNG	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	SEN CL	1.084	0.000	0.000	-0.816	0.000	2.142	9.365	2.602	4.898	3.566	0.000	22.841
	LAT CL					0.000			1.446		0.000	0.000	1.446
AUG	HEATNG	-0.003	0.000	0.000	-0.002	0.000	-0.010	0.009	0.001	0.002	0.002	0.000	-0.001
	SEN CL	0.743	0.000	0.000	-0.541	0.000	1.216	8.254	2.495	4.725	3.514	0.000	20.405
	LAT CL					0.000			1.380		0.000	0.000	1.380
SEP	HEATNG	-0.219	0.000	0.000	-0.126	0.000	-0.694	0.390	0.039	0.118	0.121	0.000	-0.371
	SEN CL	0.038	0.000	0.000	-0.660	0.000	-0.631	7.096	2.433	4.550	3.311	0.000	16.138
	LAT CL					0.000			1.380		0.000	0.000	1.380
OCT	HEATNG	-0.663	0.000	0.000	-0.575	0.000	-2.035	0.905	0.125	0.330	0.350	0.000	-1.562
	SEN CL	-0.296	0.000	0.000	-0.913	0.000	-1.349	4.979	2.476	4.567	3.215	0.000	12.679
	LAT CL					0.000			1.444		0.000	0.000	1.444
NOV	HEATNG	-1.506	0.000	0.000	-1.556	-1.159	-4.603	1.399	0.316	0.767	0.822	0.000	-5.518
	SEN CL	-0.445	0.000	0.000	-0.801	-1.129	-1.651	2.648	1.826	3.369	2.454	0.000	6.272
	LAT CL					0.019			1.107		0.000	0.000	1.126
DEC	HEATNG	-2.319	0.000	0.000	-2.632	-1.612	-6.999	1.292	0.656	1.371	1.135	0.000	-9.108
	SEN CL	-0.507	0.000	0.000	-0.751	-1.287	-1.673	1.461	1.934	3.508	2.427	0.000	5.111
	LAT CL					0.000			1.160		0.000	0.000	1.160
TOT	HEATNG	-12.887	0.000	0.000	-16.491	-8.028	-39.333	13.566	3.256	7.176	6.461	0.000	-6.280
	SEN CL	-0.488	0.000	0.000	-12.892	-6.169	-8.286	62.964	26.834	49.616	35.526	0.000	147.104
	LAT CL					0.051			15.556		0.000	0.000	15.607



## **LS-G Space Daylighting Summary <space name>**

This report gives monthly-average lighting energy reduction, illuminance, and glare for each daylit space. If only one lighting reference point is specified, the entries under REF PT 2 will be zero. Task lighting energy, as determined by TASK-LIGHTING-KW or TASK-LT-W/AREA, is not considered.

### **PERCENT LIGHTING ENERGY REDUCTION BY DAYLIGHTING (ALL HOURS)**

gives the percentage by which electric lighting energy is reduced, due to daylighting, for the entire space (TOTAL ZONE), and for the lighting zones at each lighting reference point (REF PT 1 and REF PT 2). In this section of the report, all hours of the day are taken into account, including nighttime hours when the lighting energy reduction due to daylighting is zero.

### **PERCENT LIGHTING ENERGY REDUCTION BY DAYLIGHTING (REPORT SCHEDULE HOURS)**

gives the percentage by which electric lighting energy is reduced, due to daylighting, for the entire space (TOTAL ZONE), and for the lighting zones at each lighting reference point (REF PT 1 and REF PT 2). In this section of the report, only those hours are taken into account for which the value of DAYLIGHT-REP-SCH for this space is non-zero (the default). If DAYLIGHT-REP-SCH is not defined the entries will be the same as those in Part 1 above.

In the following four sections, only those hours are taken into account for which the sun is up and the value of DAYLIGHT-REP-SCH is non-zero (the default).

### **AVERAGE DAYLIGHT ILLUMINANCE**

gives the average illuminance due to daylight at each lighting reference point.

### **PERCENT HOURS DAYLIGHT ILLUMINANCE ABOVE SETPOINT**

gives the percentage of hours that the illuminance from daylight exceeds the required illuminance level as specified by LIGHT-SET-POINT1 at REF PT 1 and LIGHT-SET-POINT2 at REF PT 2. (See Report LS-J for the frequency of occurrence distribution for daylight illuminance.)

### **AVERAGE GLARE INDEX**

gives the average daylight glare index at each lighting reference point (REF PT 1 and REF PT 2).

### **PERCENT HOURS GLARE TOO HIGH**

gives the percentage of hours at each lighting reference point that the daylight glare index exceeds the MAX-GLARE value (or a value of 22, the maximum recommended for general office work, if MAX-GLARE has not been specified).

DAYLIGHTING EXAMPLE FLOOR OF OFFICE BUILDING IN CHICAGO DOE-2.2b-027 Fri Jan 30 14:26:19 1998BDL RUN  
 30-FT DEEP PERIM OFFS DAYLIT TO 15 FT AUTO SHADE MANAGEMENT FOR SUN CONTROL  
 REPORT- LS-G Space Daylighting Summary SOUTHZONE WEATHER FILE- TRY CHICAGO

SPACE SOUTHZONE

-----REPORT SCHEDULE HOURS WITH SUN UP-----

MONTH	PERCENT LIGHTING ENERGY REDUCTION BY DAYLIGHTING (ALL HOURS)			PERCENT LIGHTING ENERGY REDUCTION BY DAYLIGHTING (REPORT SCHEDULE HOURS)			AVERAGE DAYLIGHT ILLUMINANCE (FOOTCANDLES)		PERCENT HOURS DAYLIGHT ILLUMINANCE ABOVE SETPOINT		AVERAGE GLARE INDEX		PERCENT HOURS GLARE TOO HIGH	
	TOTAL ZONE	REF PT 1	REF PT 2	TOTAL ZONE	REF PT 1	REF PT 2	REF PT 1	REF PT 2	REF PT 1	REF PT 2	REF PT 1	REF PT 2	REF PT 1	REF PT 2
	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
JAN	16.2	32.4	0.0	21.0	42.0	0.0	71.5	0.0	33.0	0.0	6.0	0.0	0.0	0.0
FEB	21.7	43.4	0.0	27.8	55.6	0.0	77.0	0.0	39.3	0.0	7.1	0.0	0.0	0.0
MAR	25.1	50.3	0.0	31.5	63.1	0.0	76.3	0.0	52.7	0.0	7.8	0.0	0.0	0.0
APR	27.6	55.3	0.0	33.7	67.3	0.0	95.6	0.0	73.3	0.0	9.1	0.0	0.0	0.0
MAY	29.0	57.9	0.0	34.4	68.8	0.0	92.6	0.0	83.5	0.0	9.1	0.0	0.0	0.0
JUN	29.9	59.8	0.0	34.8	69.7	0.0	96.1	0.0	87.4	0.0	9.5	0.0	0.0	0.0
JUL	30.0	60.1	0.0	34.7	69.4	0.0	103.5	0.0	93.2	0.0	9.8	0.0	0.0	0.0
AUG	29.2	58.3	0.0	34.5	68.9	0.0	105.6	0.0	87.1	0.0	9.8	0.0	0.0	0.0
SEP	28.0	56.0	0.0	33.9	67.8	0.0	122.3	0.0	80.0	0.0	10.0	0.0	0.0	0.0
OCT	24.4	48.8	0.0	30.8	61.7	0.0	107.1	0.0	59.5	0.0	8.8	0.0	0.0	0.0
NOV	17.0	33.9	0.0	21.7	43.4	0.0	79.3	0.0	37.0	0.0	6.6	0.0	0.0	0.0
DEC	14.4	28.8	0.0	18.6	37.1	0.0	47.7	0.0	21.5	0.0	5.0	0.0	0.0	0.0
ANNUAL	24.5	48.9	0.0	29.9	59.7	0.0	89.6	0.0	62.4	0.0	8.2	0.0	0.0	0.0

**LS-H Energy Reduction By Daylight <space name>**

For each daylit space this report gives the monthly lighting energy reduction due to daylighting for each hour of the day, and for all hours of the day combined (including nighttime hours). HOUR OF DAY is given in standard time, even if DAYLIGHT-SAVINGS = YES. Hour 1 is 12 midnight to 1 am, hour 2 is 1 am to 2 am, etc. The schedule DAYLIGHT-REP-SCH has no effect on this report. Task lighting energy, as determined by TASK-LIGHTING-KW or TASK-LT-W/AREA, is not considered. The daylighting report schedule has no affect on this report.

See Report LS-I for lighting energy reduction vs. hour of day for the entire building.

DAYLIGHTING EXAMPLE FLOOR OF OFFICE BUILDING IN CHICAGO DOE-2.2b-027 Fri Jan 30 14:26:19 1998BDL RUN 1  
 30-FT DEEP PERIM OFFS DAYLIT TO 15 FT AUTO SHADE MANAGEMENT FOR SUN CONTROL  
 REPORT- LS-H Energy Reduction By Daylight SOUTHZONE WEATHER FILE- TRY CHICAGO

SPACE SOUTHZONE

MONTH	HOUR OF DAY																								ALL HOURS
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
JAN	0	0	0	0	0	0	0	1	14	21	26	28	29	27	24	20	2	0	0	0	0	0	0	0	16
FEB	0	0	0	0	0	0	0	10	25	29	32	33	33	32	29	24	14	0	0	0	0	0	0	0	22
MAR	0	0	0	0	0	0	4	22	29	32	34	35	35	34	33	29	23	4	0	0	0	0	0	0	25
APR	0	0	0	0	0	2	18	29	34	35	35	35	35	35	35	33	27	12	0	0	0	0	0	0	28
MAY	0	0	0	0	0	10	26	31	34	35	35	35	35	35	35	34	28	18	3	0	0	0	0	0	29
JUN	0	0	0	0	1	13	25	34	35	35	35	35	35	35	35	35	30	24	9	0	0	0	0	0	30
JUL	0	0	0	0	0	10	29	33	35	35	35	35	35	35	35	35	33	26	9	0	0	0	0	0	30
AUG	0	0	0	0	0	3	23	32	34	35	35	35	35	35	35	34	31	20	2	0	0	0	0	0	29
SEP	0	0	0	0	0	0	17	31	33	35	35	35	35	35	35	32	28	5	0	0	0	0	0	0	28
OCT	0	0	0	0	0	0	5	27	30	33	34	35	34	33	30	27	7	0	0	0	0	0	0	0	24
NOV	0	0	0	0	0	0	0	12	23	27	28	30	29	26	22	12	0	0	0	0	0	0	0	0	17
DEC	0	0	0	0	0	0	0	2	16	21	25	26	27	23	20	10	0	0	0	0	0	0	0	0	14
ANNUAL	0	0	0	0	0	4	16	27	29	31	32	33	33	32	31	27	16	8	2	0	0	0	0	0	24

PERCENT LIGHTING ENERGY REDUCTION BY DAYLIGHT

NOTE- THE ENTRIES IN THIS REPORT ARE NOT  
 SUBJECT TO THE DAYLIGHTING REPORT SCHEDULE

## LS-I Energy Reduction By Daylight BUILDING

For the building as a whole this report gives the monthly lighting energy reduction due to daylighting for each hour of the day and for all hours of the day combined (including nighttime hours). HOUR OF DAY is given in standard time, even if DAYLIGHT-SAVINGS = YES. Hour 1 is 12 pm to 1 am, hour 2 is 1 am to 2 am, etc. All spaces in the building are included in this report, even those that are not daylit (i.e., have DAYLIGHTING = NO). This report is not affected by DAYLIGHT-REP-SCH. Task lighting energy, as determined by TASK-LIGHTING-KW or TASK-LT-W/AREA, is not considered. The daylighting report schedule has no affect on this report.

See Report LS-H for lighting energy reduction vs. hour of day for individual daylit spaces.

DAYLIGHTING EXAMPLE FLOOR OF OFFICE BUILDING IN CHICAGO DOE-2.2b-027 Fri Jan 30 14:26:19 1998BDL RUN 1  
 30-FT DEEP PERIM OFFS DAYLIT TO 15 FT AUTO SHADE MANAGEMENT FOR SUN CONTROL  
 REPORT- LS-I Energy Reduction By Daylight Building WEATHER FILE- TRY CHICAGO

\*\*\* BUILDING \*\*\*

MONTH	HOUR OF DAY																								ALL HOURS
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
JAN	0	0	0	0	0	0	0	0	6	9	11	12	12	12	10	7	1	0	0	0	0	0	0	0	7
FEB	0	0	0	0	0	0	0	4	10	11	14	14	15	14	12	10	6	0	0	0	0	0	0	0	9
MAR	0	0	0	0	0	0	2	9	12	14	15	16	16	15	15	12	9	2	0	0	0	0	0	0	11
APR	0	0	0	0	0	1	8	13	15	16	16	16	16	16	15	14	11	6	0	0	0	0	0	0	12
MAY	0	0	0	0	0	6	12	14	16	16	16	16	16	16	16	15	12	9	2	0	0	0	0	0	13
JUN	0	0	0	0	0	8	12	15	16	16	16	16	16	16	16	16	14	12	6	0	0	0	0	0	14
JUL	0	0	0	0	0	7	13	15	16	16	16	16	16	16	16	15	15	13	6	0	0	0	0	0	14
AUG	0	0	0	0	0	2	11	14	15	16	16	16	16	16	16	15	14	10	1	0	0	0	0	0	13
SEP	0	0	0	0	0	0	8	12	13	15	16	16	16	15	15	13	11	3	0	0	0	0	0	0	12
OCT	0	0	0	0	0	0	3	10	11	13	14	14	14	14	12	10	3	0	0	0	0	0	0	0	10
NOV	0	0	0	0	0	0	0	5	9	11	12	13	13	11	9	5	0	0	0	0	0	0	0	0	7
DEC	0	0	0	0	0	0	0	1	6	9	11	11	12	10	8	4	0	0	0	0	0	0	0	0	6
ANNUAL	0	0	0	0	0	3	8	11	12	14	14	15	15	14	13	11	7	4	1	0	0	0	0	0	11

PERCENT LIGHTING ENERGY REDUCTION BY DAYLIGHT

NOTE- THE ENTRIES IN THIS REPORT ARE NOT  
 SUBJECT TO THE DAYLIGHTING REPORT SCHEDULE

### LS-J Daylight Illuminance Frequency <space name>

For each daylit space this report gives the monthly daylight-illuminance frequency-of-occurrence distribution at each lighting reference point. If only one lighting reference point is specified, entries under REF-PT-2 will be zero. Note that the hours considered for this report are those with the sun up and the daylighting report schedule "on."

#### PERCENT OF HOURS IN ILLUMINANCE RANGE

gives the percentage of hours (with sun up and DAYLIGHT-REP-SCH value non-zero) that the daylight illuminance falls in the indicated range: 0-10, 10-20, ....., 70-80, and greater than 80 footcandles (or, for metric output, 0-100, 100-200, ....., 700-800, and greater than 800 lux). Note: because of roundoff, the sum of these percentages for any given month may not be exactly 100.

#### PERCENT OF HOURS ILLUMINANCE LEVEL EXCEEDED

gives the percentage of hours (with sun up and DAYLIGHT-REP-SCH value non-zero) that the daylight illuminance is higher than the indicated illuminance level.

DAYLIGHTING EXAMPLE FLOOR OF OFFICE BUILDING IN CHICAGO DOE-2.2b-027 Fri Jan 30 14:26:19 1998BDL RUN 1  
 30-FT DEEP PERIM OFFS DAYLIT TO 15 FT AUTO SHADE MANAGEMENT FOR SUN CONTROL  
 REPORT- LS-J Daylight Illuminance Frequency SOUTHZONE WEATHER FILE- TRY CHICAGO

SPACE SOUTHZONE		PERCENT OF HOURS IN ILLUMINANCE RANGE										PERCENT OF HOURS ILLUMINANCE LEVEL EXCEEDED									
ILLUMINANCE RANGE (FOOTCANDLES)		ILLUMINANCE LEVEL (FOOTCANDLES)																			
REF	PT	0	10	20	30	40	50	60	70	80	-ABOVE	0	10	20	30	40	50	60	70	80	
JAN	-1-	15	21	24	6	1	4	1	2	27	100	85	64	40	34	33	29	28	27		
	-2-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
FEB	-1-	4	10	20	21	6	5	2	2	31	100	96	86	66	45	39	35	32	31		
	-2-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
MAR	-1-	0	4	15	14	13	4	5	7	36	100	100	96	80	66	53	48	43	36		
	-2-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
APR	-1-	0	0	6	10	10	4	3	6	61	100	100	100	94	83	73	70	67	61		
	-2-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
MAY	-1-	0	0	2	8	6	5	6	12	60	100	100	100	97	90	84	78	72	60		
	-2-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
JUN	-1-	0	0	0	3	10	4	8	4	71	100	100	100	100	97	87	83	76	71		
	-2-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
JUL	-1-	0	0	0	2	4	5	8	7	73	100	100	100	99	97	93	88	80	73		
	-2-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
AUG	-1-	0	0	3	5	6	5	6	9	67	100	100	100	97	93	87	82	77	67		
	-2-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
SEP	-1-	0	1	7	6	6	1	4	7	68	100	100	99	92	86	80	79	75	68		
	-2-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
OCT	-1-	3	6	12	11	9	1	3	3	53	100	97	91	79	68	59	59	56	53		
	-2-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
NOV	-1-	17	13	23	10	0	1	3	2	31	100	83	70	48	37	37	36	33	31		
	-2-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
DEC	-1-	21	28	28	2	0	1	2	1	18	100	79	51	23	22	22	20	18	18		
	-2-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
ANNUAL	-1-	5	7	12	8	6	3	4	5	50	100	95	88	76	68	62	59	55	50		
	-2-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		

NOTE- THE HOURS CONSIDERED IN THIS REPORT ARE THOSE WITH SUN UP AND DAYLIGHTING REPORT SCHEDULE ON

## **LS-K Space Input Fuels Summary <space name>**

This report gives monthly summaries of the fuel inputs required by each space for lighting, equipment and processes. Following the reports for each space is a separate building level report that gives the sum of the input fuels for the building as a whole.

Lighting, equipment and process are the three major sections of this report, which is printed once for each space and once for the building as a whole.

### **TASK LIGHTING**

is the electricity used by the space for all task lighting.

### **TOTAL LIGHTING**

is the electricity used by the space for all lighting including task and overhead.

### **GENERAL EQUIPMENT**

is the electricity used by the space for running all equipment (i.e., computers, copy machines, etc.). For the building report, this includes building equipment such as elevators which may not be included in any space.

### **PROCESS ELECTRIC**

is all electricity used to maintain any of the processes in the space.

### **PROCESS GAS**

is all gas used to maintain any of the processes in the space.

### **PROCESS HOT WATER**

is the total hot water used in all processes in the space.

Simple Structure Run 3, Chicago                      Divide into zones; add plenum                      DOE-2.2b-027 Fri Jan 9 15:25:08 1998BDL RUN 1  
 Design-day sizing of VAV system                      Show All Reports  
 REPORT- LS-K Space Input Fuels Summary                      SPACE1-1                      WEATHER FILE- TRY CHICAGO

SPACE SPACE1-1

MONTH	L I G H T I N G		E Q U I P M E N T		P R O C E S S		
	TASK LIGHTING (KWH)	TOTAL LIGHTING (KWH)	GENERAL EQUIPMENT (KWH)	PROCESS ELECTRIC (KWH)	PROCESS GAS (MBTU)	PROCESS HOT WATER (MBTU)	
JAN	0.00	402.18	237.05	0.00	0.0000	0.0000	
FEB	0.00	349.67	210.95	0.00	0.0000	0.0000	
MAR	0.00	386.57	233.42	0.00	0.0000	0.0000	
APR	0.00	400.28	231.98	0.00	0.0000	0.0000	
MAY	0.00	386.57	233.42	0.00	0.0000	0.0000	
JUN	0.00	384.67	228.35	0.00	0.0000	0.0000	
JUL	0.00	402.18	237.05	0.00	0.0000	0.0000	
AUG	0.00	386.57	233.42	0.00	0.0000	0.0000	
SEP	0.00	384.67	228.35	0.00	0.0000	0.0000	
OCT	0.00	402.18	237.05	0.00	0.0000	0.0000	
NOV	0.00	337.87	217.45	0.00	0.0000	0.0000	
DEC	0.00	402.18	237.05	0.00	0.0000	0.0000	
ANNUAL	0.00	4625.43	2765.53	0.00	0.0000	0.0000	

## **LS-L Management and Solar Summary <space name>**

This report gives monthly summaries of window shade management and solar radiation into the space.

Column 1 is the count of the number of hours that window shade management would be employed in the space for each month. Management is employed under any of the following conditions:

- The shading schedule for an exterior window specifies management.
- If the transmitted direct solar gain through an exterior window exceeds a pre-specified value, MAX-SOLAR-SCH, then shades will be in effect with a probability of SUN-CTRL-PROB.
- If daylighting is requested (DAYLIGHTING=YES) and the daylight glare exceeds a pre-specified value MAX-GLARE, then the shades will be in effect.

Column 2 is the average solar radiation into the space through all glazing areas in Btu or Wh per day.

Column 3 is the maximum solar radiation into the space through all glazing areas for all hours in the month. The unit of measure is Btu/hr or W.

Note that the entries in this report are solar heat gains, not solar loads; i.e., weighting factors to convert heat gains into delayed loads have not been applied. The solar heat gain is due to solar radiation transmitted through windows plus solar radiation absorbed by the windows and re-conducted into the space.

```
Simple Structure Run 3, Chicago          Divide into zones; add plenum          DOE-2.2b-027  Fri Jan  9 15:25:08 1998BDL RUN  1
Design-day sizing of VAV system        Show All Reports
REPORT- LS-L Management and Solar Summary  SPACE1-1          WEATHER FILE- TRY  CHICAGO
```

```
-----
DATA FOR SPACE      SPACE1-1
      NUMBER OF HOURS      AVERAGE DAILY      MAXIMUM HOURLY
      MANAGEMENT          SOLAR RADIATION    SOLAR RADIATION
      WOULD BE             INTO SPACE         INTO SPACE
MONTH      EMPLOYED          (BTU/DAY )        (BTU/HR  )

JAN          0.          92725.312          45517.965
FEB          0.          107067.641          44765.695
MAR          0.          101555.164          41114.320
APR          0.          121276.719          32348.395
MAY          0.          113858.781          24972.248
JUN          0.          118545.953          19746.131
JUL          0.          123403.203          22385.572
AUG          0.          124248.797          28500.076
SEP          0.          141774.109          36847.043
OCT          0.          124876.234          41848.086
NOV          0.          92896.164           43870.461
DEC          0.          58697.254           43582.469
-----
ANNUAL      0.          110008.266          45517.965
```



**LS-M Daylight Illuminance Ref Pnt <1 or 2> <space name>**

This report provides monthly summaries of average footcandles of daylight illuminance, by month and solar time hour of the day, at the daylighting reference point within the space. This report will only be produced for each SPACE that has DAYLIGHTING=YES specified and only for defined daylighting reference points (either point 1, or both point 1 and point 2.)

Project 3 DOE-2.2-44d5 9/20/2006 17:06:43 BDL RUN 1  
 REPORT- LS-M Daylight Illuminance Ref Pnt 1 South Perim Spc (G.S1) DESIGN DAY WEATHER FILE- CZ06RV2 WYEC2

SPACE	Average Illuminance at Reference Point 1																								
	HOUR OF DAY																								
ALL MONTH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	HOURS
DEC	0	0	0	0	0	0	0	7	33	57	73	81	80	69	51	26	3	0	0	0	0	0	0	0	44
JUL	0	0	0	0	0	13	101	144	108	114	119	121	121	119	114	107	144	100	13	0	0	0	0	0	103
AUG	0	0	0	0	0	7	113	199	109	117	121	126	125	120	116	108	200	99	5	0	0	0	0	0	112
SEP	0	0	0	0	0	1	103	304	123	183	280	199	220	288	114	227	248	35	0	0	0	0	0	0	174
OCT	0	0	0	0	0	0	47	365	383	554	913	1189	984	685	335	422	134	2	0	0	0	0	0	0	492
NOV	0	0	0	0	0	0	12	302	589	823	1324	1856	1455	936	635	404	37	0	0	0	0	0	0	0	761
ANNUAL	0	0	0	0	0	5	77	276	249	344	532	658	555	421	244	259	165	53	6	0	0	0	0	0	296

AVERAGE FOOTCANDLES OF ILLUMINANCE BY DAYLIGHT

NOTE- The values on this report are for all hour the sun is up and are not subject to a specified daylighting report schedule

# SYSTEM-REPORT

## SV-A System Design Parameters for <system name>

This report echoes your input to the program for each system as interpreted by the SYSTEMS design routines. See "DESIGN-DAY Command" in the Topics Manual. The report is divided into three sections: System-Level Design Values, Fan Design Values and Zone-Level Design Values.

For systems having mixing sections (dual-duct and multizone systems) an additional section appears detailing the cold duct, hot duct, and total zonal air flows, as well as the minimum air flow ratios for these quantities.

Note: the quantities in this report have been adjusted for altitude even though DOE-2 requires that any flows you enter in SYSTEMS be at sea level.

Design-day sizing of VAV system											Show All Reports					
REPORT- SV-A System Design Parameters for											SYST-1		WEATHER FILE- TRY		CHICAGO	
SYSTEM TYPE	ALTITUDE FACTOR	FLOOR AREA (SQFT)	MAX PEOPLE	OUTSIDE AIR RATIO	COOLING CAPACITY (KBTU/HR)	SENSIBLE (SHR)	HEATING CAPACITY (KBTU/HR)	COOLING EIR (BTU/BTU)	HEATING EIR (BTU/BTU)	HEAT PUMP SUPP-HEAT (KBTU/HR)						
FAN TYPE	CAPACITY (CFM)	DIVERSITY FACTOR (FRAC)	POWER DEMAND (KW)	FAN DELTA-T (F)	STATIC PRESSURE (IN-WATER)	TOTAL EFF (FRAC)	MECH EFF (FRAC)	FAN PLACEMENT	FAN CONTROL	MAX FAN RATIO (FRAC)	MIN FAN RATIO (FRAC)					
VAVS	1.020	5000.0	52.	0.179	241.081	0.662	-50.000	0.000	0.000	0.000						
SUPPLY	5924.	1.00	6.817	3.63	5.5	0.55	0.72	DRAW-THRU	SPEED	1.10	0.30					
ZONE NAME	SUPPLY FLOW (CFM)	EXHAUST FLOW (CFM)	FAN FLOW (KW)	MINIMUM FLOW (FRAC)	OUTSIDE AIR FLOW (CFM)	COOLING CAPACITY (KBTU/HR)	SENSIBLE (FRAC)	EXTRACTION RATE (KBTU/HR)	HEATING CAPACITY (KBTU/HR)	ADDITION RATE (KBTU/HR)	ZONE MULT					
ZONE1-1	1623.	0.	0.000	0.300	224.	0.00	0.00	32.64	-87.91	-54.50	1.					
ZONE2-1	784.	0.	0.000	0.300	102.	0.00	0.00	15.78	-42.49	-26.34	1.					
ZONE3-1	1207.	0.	0.000	0.300	224.	0.00	0.00	24.28	-65.40	-40.55	1.					
ZONE4-1	765.	0.	0.000	0.300	102.	0.00	0.00	15.40	-41.46	-25.71	1.					
ZONE5-1	1545.	0.	0.000	0.300	408.	0.00	0.00	31.08	-83.72	-51.91	1.					
PLENUM-1-Z	0.	0.	0.000	0.000	0.	0.00	0.00	0.00	0.00	0.00	0.00					

## System-Level Design Values

### SYSTEM TYPE

is the code-word identifying the type of system.

### ALTITUDE FACTOR

is the altitude adjustment factor for air flows; it multiplies air flows at sea level to get air flows at the actual altitude of the building.

### FLOOR AREA

is the total floor area of all zones served by the system that have ZONE-TYPE = CONDITIONED or UNCONDITIONED, or, for ZONE-TYPE = PLENUM, that have non-zero occupancy.

### MAX PEOPLE

is the maximum number of people in all of the zones served by the system that have ZONE-TYPE = CONDITIONED or UNCONDITIONED, or, for ZONE-TYPE = PLENUM, that have non-zero occupancy. The maximum number of people in a zone is determined by the NUMBER-OF-PEOPLE or AREA/PERSON keywords in the SPACE command; any variation in occupancy resulting from PEOPLE-SCHEDULE is ignored in calculating MAX PEOPLE.

## **OUTSIDE AIR RATIO**

is the ratio of outside air flow to supply air flow at design conditions for central systems. Its value is either the user input value of MIN-OUTSIDE-AIR or is calculated by SYSTEMS from the ventilation or exhaust input at the zone level divided by the supply fan flow (as listed in the Fan Design Values section, below). This is a design quantity and so does not reflect values entered through the MIN-AIR-SCH keyword. For zonal systems, this value will be zero.

When OUTSIDE AIR RATIO is determined from zone ventilation rates, it is the sum of the values under OUTSIDE AIR FLOW (in the Zone-Level Design Values section, below) divided by the supply fan flow. This outside air ratio is what the program will use as the minimum outside air ratio. It is assumed that the outside air is brought in at the main system fan and is distributed to the individual zones in proportion to the supply air to each zone.

Note: The SYSTEMS design routine does not examine the values entered in schedules. Consequently, if you specify the outside air ratio through MIN-AIR-SCH but want SYSTEMS to size the equipment, you should also specify MIN-OUTSIDE-AIR.

## **COOLING CAPACITY**

is either the value you enter for the keyword COOLING-CAPACITY at the system level or is computed by SYSTEMS from the peak (sensible plus latent) cooling load.

## **SENSIBLE (SHR)**

is the sensible heat ratio, i.e., the fraction of the total cooling capacity that is sensible cooling capacity at the peak or design condition. If you have not entered COOL-SH-CAP at the system level for a central system, this value is calculated from a simulation of the conditions at peak loads.

## **HEATING CAPACITY**

is the maximum value for heating. It reflects either the user input or a calculation from peak loads. Like COOLING CAPACITY, this value will be zero for zonal systems, where the capacity is shown at the zone level.

## **COOLING EIR**

is the electric input ratios for cooling. Values are taken from user input or are default values.

## **HEATING EIR**

is the electric input ratios for heating. Values are taken from user input or are default values.

## **HEAT PUMP SUPP-HEAT**

is the heat pump supplemental heating capacity.

## **Fan Design Values**

This section gives the characteristics of the system supply and return fans. Given for each fan are: type, capacity, rated capacity, diversity factor ( $\text{capacity} * [\text{MAX-FAN-RATIO}] / [\text{sum of zone air flows}]$ ), power demand, fan temperature rise, static pressure, supply efficiency, supply mechanical efficiency, fan placement, type of fan control, and the maximum and minimum fan ratios.

Note that the static pressure may have a value of zero. This simply means that the static pressure was not specified and was not used to calculate fan power consumption.

## **Zone-Level Design Values**

The following quantities apply to the base zone and have not been multiplied by the number of identical zones (as given by the product of MULTIPLIER and FLOOR-MULTIPLIER).

### **SUPPLY FLOW**

is the calculated or user-specified supply flow for each zone. Only if you have specified a value for the ASSIGNED-FLOW keyword in the ZONE-AIR command will the value here correspond to your input. The ZONE keywords AIR-CHANGES/HR and FLOW/AREA will be accepted by SYSTEMS only if they are consistent with the user-supplied HEATING-CAPACITY and COOLING-CAPACITY and are equivalent to a flow larger than that of the exhaust from or the ventilation to the zone. The ALTITUDE FACTOR will be applied.

### **EXHAUST FLOW**

is the airflow exhausted directly from the zone via an exhaust fan.

### **FAN**

is the total of the zone supply and exhaust fan electrical consumption at design conditions. This is zero in the example because there are no zone fans.

### **MINIMUM FLOW**

reflects the your input for MIN-FLOW-RATIO, unless that input is in conflict with exhaust or ventilation requirements. In the absence of user input, SYSTEMS will calculate the minimum flow ratio for VAV systems from the minimum flow needed to meet the minimum ventilation requirements and the required heating capacity.

### **OUTSIDE AIR FLOW**

reflects the user-specified outside air quantity entered at the zone level. If OUTSIDE-AIR-FLOW is specified, its value is multiplied by the ALTITUDE FACTOR and reported here. Otherwise the reported value is the maximum of the flow-equivalent values of OA-CHANGES and OA-FLOW/PER, multiplied by ALTITUDE FACTOR. For the actual amount of outside air delivered to the zone for central systems, see OUTSIDE AIR RATIO above.

### **COOLING CAPACITY**

will be zero at the zone level for central systems. For zonal systems it will either be the value you specify for COOLING-CAPACITY or it will be calculated by SYSTEMS to meet the peak loads at the rated conditions for HP, PTAC, and FC systems or at any conditions for IU systems. This is done similarly for HEATING CAPACITY for the above-mentioned systems and for UVT and UHT systems.

### **SENSIBLE**

is the cooling sensible heat ratio for zonal systems.

### **EXTRACTION RATE**

is the cooling extraction rate at design conditions. This is not the value used in the simulation; that value is recalculated hourly and depends on the loads, the conditions, the thermostat type and the thermostat throttling range. ADDITION RATE (heating) is treated similarly.

### **HEATING CAPACITY**

is the design capacity of the zonal heating equipment, if any.

### **ZONE MULT**

is the user-specified number of identical zones (product of MULTIPLIER and FLOOR-MULTIPLIER for the zone).

For systems having mixing sections (dual-duct and multizone systems), an additional section details the cold duct, hot duct and total zonal air flows, as well as the minimum air flow ratios for these quantities.

## **SV-A System Design Parameters for <space name> (REFRIGERATED EQUIPMENT)**

When refrigerated equipment is input, an alternate SV-A report is printed. The top half of the report is identical to that as previously described. The bottom half, titled REFRIGERATED EQUIP IN <space name>, covers the design parameters for three categories: ZONE, COMPRESSOR and CONDENSER.

Report SV-A has been expanded to include a line for each fan detailing its capacity, rated capacity, diversity factor ( $\text{Capacity} \times [\text{MAX-FAN-RATIO}] / [\text{Sum of zone airflows}]$ ), power demand, fan temperature rise, static pressure, supply efficiency, supply mechanical efficiency, fan placement, type of fan control, and the maximum and minimum fan ratios. For systems having mixing sections, (dual-duct and multizone systems), an additional section has been added detailing the cold duct, hot duct, and total zonal airflows, as well as the minimum airflow ratios for these quantities. Note that the static pressure may have a value of 0. This simply means that the variable was not specified by the user, and was not used to calculate fan power consumption.

### **UNIT**

identifies the units input in the list of up to three entries of REFG-ZONE-LOAD.

### **DISCHARGE TEMP**

is the temperature inside the cases.

### **SENSIBLE LOADS TEMP**

is the sensible cooling effect at the constant temperature used in the LOADS module.

### **SENSIBLE HEAT TEMP**

is the sensible cooling effect at the zone's design heating temperature.

### **SENSIBLE COOL TEMP**

is the sensible cooling effect at the zone's design cooling temperature.

### **COMPRESSOR CAPACITY**

is the compressor capacity at the design operating conditions. Notice that when two or more compressors are multiplexed (using keyword REFG-COMP-GROUP), their combined capacity is indicated for the unit at the lowest evaporator temperature.

### **COMPRESSOR EFFICIENCY**

is the compressor EER (Energy Efficiency Ratio).

### **DESIGN HEAT REJ**

is the combined condenser heat rejection of all the compressors input.

### **FAN ENERGY**

is the tower fan or air cooled condenser fan rating.

### **PUMP ENERGY**

is the tower condenser pump rating; it is zero for air cooled applications.

OFFICE BUILDING & DELI/RESTAURANT ELECTROCHROMIC GLAZING IN ATRIUM  
 VAV SYSTEM IN OFFICE & PSZ IN ATRIUM GAS ENGINE DRIVEN CHILLER & HEAT RECY SAMP3.INP RUN 3  
 REPORT- SV-A SYSTEM DESIGN PARAMETERS FS-SYS1 WEATHER FILE- TRY CHICAGO

SYSTEM NAME	SYSTEM TYPE	ALTITUDE MULTIPLIER	FLOOR AREA (SQFT)	MAX PEOPLE								
FS-SYS1	PSZ	1.020	1800.0	6.								
	SUPPLY FAN (CFM)	ELEC (KW)	DELTA-T (F)	RETURN FAN (CFM)	ELEC (KW)	DELTA-T (F)	OUTSIDE AIR RATIO	COOLING CAPACITY (KBTU/HR)	SENSIBLE (SHR)	HEATING CAPACITY (KBTU/HR)	COOLING EIR (BTU/BTU)	HEATING EIR (BTU/BTU)
	1924.	1.476	2.4	0.	0.000	0.0	0.352	79.077	0.621	-112.077	0.36	0.37
ZONE NAME	SUPPLY FLOW (CFM)	EXHAUST FLOW (CFM)	FAN (KW)	MINIMUM FLOW RATIO	OUTSIDE AIR FLOW (CFM)	COOLING CAPACITY (KBTU/HR)	SENSIBLE (SHR)	EXTRACTION RATE (KBTU/HR)	HEATING CAPACITY (KBTU/HR)	ADDITION RATE (KBTU/HR)	MULTIPLIER	
ATZ1	1924.	0.	0.000	1.000	678.	0.00	0.00	39.49	0.00	-62.35	1.0	

REFRIGERATED EQUIP IN ATZ1

UNIT	Z O N E				C O M P R E S S O R		C O N D E N S E R		
	DISCHARGE TEMP (F)	SENSIBLE LOADS (KBTU/HR)	SENSIBLE HEAT TEMP (KBTU/HR)	SENSIBLE COOL TEMP (KBTU/HR)	COMPRESSOR CAPACITY (KBTU/HR)	COMPRESSOR EFFICIENCY (BTU/WATT)	DESIGN HEAT REJ (KBTU/HR)	FAN ENERGY (KW)	PUMP ENERGY (KW)
1	-10.0	-8.894	-8.471	-8.894	14.547	3.8	51.693	0.271	0.064
2	23.0	-3.923	-3.615	-3.923	16.390	7.0			
3	30.0	-5.280	-4.800	-5.280	0.000	7.3			

**SV-B Zone Fan Data <system name> (PIU systems only)**

This report is produced whenever a Powered Induction Unit (PIU) system is specified.

**U-name**

The U-name of the HVAC system is given after ZONE FAN DATA (PIU).

**ZONE NAME**

is the zone U-name.

**FAN FLOW**

is the calculated (or input) capacity of the PIU box fan.

**SUPPLY FLOW**

is the flow rate of air delivered by the central system.

**MIN FLOW RATIO**

is the minimum stop position of primary air supply to the PIU box.

**REHEAT-DELTA-T**

is the temperature rise of the reheat coil in the PIU box.

**FAN-DELTA-T**

is the temperature rise due to the PIU box's fan motor.

**FAN KW**

is the PIU box's fan motor electrical requirement.



31-STORY OFFICE BLDG, CHICAGO - LOAD2

RUN 5 POWERED INDUCTION UNITS

DOE-2.1E-092 Wed Oct 8 16:17:08 1997SDL RUN 5

REPORT- SV-B ZONE FAN DATA

SINGLE-ZONE UNIT IN BASEMENT  
MAIN

WEATHER FILE- TRY CHICAGO

```

-----
ZONE      FAN      SUPPLY      MIN      REHEAT      FAN
NAME      FLOW      FLOW      FLOW      DELTA-T      DELTA-T      FAN
          (CFM )    (CFM )    RATIO    (F)          (F)          KW
RZ1        0.      10924.     0.500    50.0         0.00         0.000
TZ1        0.      8497.      0.500    50.0         0.00         0.000
PLEN1      0.        0.         0.000    0.0          0.00         0.000
PLEN2      0.        0.         0.000    0.0          0.00         0.000
RZ2       687.     859.       0.200    50.0         1.02         0.227
RZ3       547.     498.       0.200    50.0         1.02         0.181
RZ4       675.     844.       0.200    50.0         1.02         0.223
RZ5       822.    1027.      0.200    50.0         1.02         0.271
TZ2       673.     842.       0.200    50.0         1.02         0.222
TZ3       483.     439.       0.200    50.0         1.02         0.159
TZ4       659.     824.       0.200    50.0         1.02         0.217
TZ5       799.     998.       0.200    50.0         1.02         0.264

```

## **SS-\* Overview of Report Family**

Report SS-A is always created for each system input. In the following, we describe the reports in alphabetical order (except for special report REFG for refrigerated casework, which is described last). However, we caution you to be aware that in a DOE-2.2 run, SYSTEMS reports are not printed alphabetically but are grouped according to a plant, system and zone hierarchy (see, for example, the output of sample run simstr3). The report hierarchy follows.

### **Plant Level:**

SS-D	Building HVAC Load Summary
SS-E	Building HVAC Load Hours
SS-M	Building HVAC Fan Elec Energy

### **System level:**

SS-A	System Loads Summary for
SS-B	System Loads Summary for
SS-C	System Load Hours for
SS-H	System Utility Energy Use for
SS-I	Sensible/Latent Summary for
SS-J	Peak Heating and Cooling for
SS-K	Space Temperature Summary for
SS-R	Zone Performance Summary for
SS-L	Fan Electric Energy Use for
SS-N	Relative Humidity Summary for
SS-P	Heating Performance Summary of
SS-P	Cooling Performance Summary of
SS-Q	Heat Pump Cooling Summary for
SS-Q	Heat Pump Cooling Summary for

### **Zone level:**

SS-G	Zone Loads Summary for
SS-F	Zone Demand Summary for
SS-O	Space Temperature Summary for

SS-P Heating Performance Summary of

SS-P Cooling Performance Summary of

The following reports are related and their formats are identical at the Plant, System and Zone levels:

<b>Plant</b>	<b>System</b>	<b>Zone</b>
SS-D	SS-A	SS-G
SS-E	SS-C	None
SS-M	SS-L	None

## **SS-A System Loads Summary for <system name>**

This report is always printed by the program for each HVAC system modeled. It shows monthly cooling, heating and electrical loads. The loads shown are the sum of zone-level loads and central air-handling-unit loads. (Zone-level loads are shown separately in Report SS-G.). This report is for comparison of monthly cooling and heating needs for the HVAC system. DX cooling loads are reported here (for PSZ, PMZS, PVAVS, PTAC, PVVT, RESVVT, RESYS and RESYS2 systems) but are not passed to the PLANT program.

### **Title**

The title of the report shows the user name of the HVAC system being summarized (SYST-1).

### **COOLING, HEATING and ELEC**

are the three sections of this system-level report.

### **COOLING ENERGY**

is the monthly sum of energy (sensible and latent) extracted by the HVAC system during the operation hours of the system and passed as a load to PLANT.

### **MAXIMUM COOLING LOAD**

includes sensible and latent space cooling loads, ventilation air and fan heat. The peak cooling load shown here is often the start-up load after the system has been shut down overnight. Notice, however, that when the system size is inadequate to meet the start-up load there is no indication of this problem on the report. You should first inspect the PLANT program BEPS or BEPU report, which shows the "Percent of Hours Any System Zone Outside of Throttling Range," for a macro view, and Report SS-O or SS-F for a zonal report of overheated or undercooled hours.

To the left of the MAXIMUM COOLING LOAD column are the day and hour (in standard time) of the peak cooling load along with the outside drybulb and wetbulb temperatures at the time of the peak.

### **HEATING ENERGY**

is the monthly sum of heat delivered by the secondary HVAC system during the operation hours of the system and passed as a load to PLANT.

### **MAXIMUM HEATING LOAD**

includes space heating loads, ventilation, and humidification. Again, the peak heating load is often due to start-up conditions after the system has been shut down overnight. To the left of this column are the day and hour of the peak heating load along with the outside drybulb and wetbulb temperatures at the time of the peak.

### **ELECTRICAL ENERGY**

is the monthly electrical consumption for lights, convenience outlets, supply and return fans, and energy consumed by packaged HVAC units (all electrical energy in the building except for central plant equipment (boilers, chillers, dw-heaters, cooling towers, pumps) and except electricity specified within an electric meter).

### **MAXIMUM ELEC LOAD**

is the monthly peak electrical consumption in a one-hour period for lights, convenience outlets, energy consumed by packaged HVAC units, and fans for the zones served by the HVAC system.

Simple Structure Run 3, Chicago                      Divide into zones; add plenum                      DOE-2.2b-027 Fri Jan 9 15:25:08 1998BDL RUN 1  
 Design-day sizing of VAV system                      Show All Reports  
 REPORT- SS-A System Loads Summary for                      SYST-1                      WEATHER FILE- TRY CHICAGO

- - - - - C O O L I N G - - - - -						- - - - - H E A T I N G - - - - -						- - - E L E C - - -	
MONTH	COOLING ENERGY (MBTU)	TIME OF MAX DY HR	DRY-BULB TEMP	WET-BULB TEMP	MAXIMUM COOLING LOAD (KBTU/HR)	HEATING ENERGY (MBTU)	TIME OF MAX DY HR	DRY-BULB TEMP	WET-BULB TEMP	MAXIMUM HEATING LOAD (KBTU/HR)	ELEC-TRICAL ENERGY (KWH)	MAXIMUM ELEC LOAD (KW)	
JAN	0.00000	31 24	22.F	19.F	0.000	-34.185	2 8	4.F	3.F	-302.628	3345.	12.808	
FEB	0.00000	28 24	31.F	28.F	0.000	-26.459	4 8	7.F	6.F	-282.776	2938.	12.813	
MAR	0.29252	3 17	78.F	61.F	38.440	-14.241	24 8	6.F	5.F	-288.753	3137.	12.817	
APR	2.21315	28 15	78.F	68.F	88.418	-3.037	8 8	31.F	28.F	-165.791	3165.	12.898	
MAY	5.73766	21 14	85.F	75.F	134.605	-0.417	9 8	43.F	39.F	-83.966	3126.	13.459	
JUN	13.74432	20 16	90.F	77.F	168.344	0.000	30 1	67.F	56.F	0.000	3206.	14.930	
JUL	26.51843	14 14	96.F	77.F	198.804	0.000	31 1	70.F	62.F	0.000	3540.	15.757	
AUG	20.47318	11 16	88.F	74.F	158.441	0.000	31 1	63.F	52.F	0.000	3322.	14.419	
SEP	9.37699	11 15	87.F	72.F	131.353	-0.239	23 8	36.F	34.F	-86.821	3140.	13.710	
OCT	2.91350	30 17	74.F	67.F	52.422	-2.618	20 8	42.F	36.F	-176.753	3193.	12.680	
NOV	0.00000	30 24	34.F	32.F	0.000	-11.372	28 8	24.F	22.F	-243.944	2802.	12.756	
DEC	0.00000	31 24	33.F	33.F	0.000	-25.084	26 8	15.F	15.F	-278.370	3313.	12.799	
TOTAL	81.270				198.804	-117.652				-302.628	38225.	15.757	
MAX													

## **SS-B System Loads Summary for <system name>**

This is a summary of the heating and cooling required by all the zones (combined) served by the HVAC system. The items summarized are zone-level cooling, zone-level heating, zone baseboard heating, and preheat energy. In addition, this report lists the preheat energy required and the peak preheat load. The preheat coils raise the temperature of the mixed air to a specified temperature. When you specify baseboard heating in a zone the heating supplied is reported under the heading BASEBOARD HEATING ENERGY.

### **Title**

The U-name of the HVAC system (SYST-1) is printed on the title line.

### **COOLING BY ZONE COILS OR NAT VENTIL, MAXIMUM COOLING BY ZONE COILS OR NAT VENTIL**

are, respectively, the monthly total and peak sensible plus latent cooling supplied by coils located in the zone(s) or by natural ventilation. (The cooling of the primary supply air in the system is summarized in Report SS-A.) Loads met by DX units are reported here and an electrical demand is passed to PLANT.

### **HEATING BY ZONE COILS OR FURNACE, MAXIMUM HEATING BY ZONE COILS OR FURNACE**

are the monthly total heating and peak heating, respectively, supplied by coils or a furnace (oil- or gas-fired) in the zones. The furnace loads, met here in SYSTEMS, are not passed to PLANT but rather a utility demand for oil or gas is passed to PLANT. Baseboard heating is not included. In this example, the zone coils are electric resistance coils and the electrical demand will be passed to PLANT. For RESYS and RESYS2 systems only, these columns report the heating load on the furnace.

### **BASEBOARD HEATING ENERGY, MAXIMUM BASEBOARD HEATING ENERGY**

are, respectively, the monthly total heating and peak heating supplied by baseboard heaters in all the zones served by the system. These loads are passed to PLANT unless BASEBOARD-SOURCE is set equal to ELECTRIC or FURNACE, in which case the load is met in SYSTEMS and a utility demand is passed to PLANT.

### **PREHEAT COIL ENERGY OR ELEC FOR FURN FAN (millions of Btu), MAXIMUM PREHEAT COIL ENERGY OR ELEC FOR FURN FAN**

are, respectively, the monthly total heating and peak heating supplied by the preheat coil(s) to raise the temperature of the mixed air (return air plus makeup air) to a specified value, PREHEAT-T, or, for RESYS and RESYS2 systems only, the monthly and peak electricity use by the furnace fan. The preheat loads are passed to PLANT unless PREHEAT-SOURCE is set equal to ELECTRIC or FURNACE, in which case the load is met in SYSTEMS and a utility demand is passed to PLANT.

Simple Structure Run 3, Chicago  
 Design-day sizing of VAV system  
 REPORT- SS-B System Loads Summary for

Divide into zones; add plenum  
 Show All Reports  
 SYST-1

DOE-2.2b-027 Fri Jan 9 15:25:08 1998BDL RUN 1

WEATHER FILE- TRY CHICAGO

MONTH	-- ZONE COOLING --		-- ZONE HEATING --		-- BASEBOARDS --	--PREHEAT OR FURN FAN ELEC--		
	COOLING BY ZONE COILS OR NAT VENTIL (MBTU)	MAXIMUM COOLING BY ZONE COILS OR NAT VENTIL (KBTU/HR)	HEATING BY ZONE COILS OR FURNACE (MBTU)	MAXIMUM HEATING BY ZONE COILS OR FURNACE (KBTU/HR)	BASEBOARD HEATING ENERGY (MBTU)	MAXIMUM BASEBOARD HEATING ENERGY (KBTU/HR)	PREHEAT COIL ENERGY OR ELEC FOR FURN FAN (MBTU)	MAXIMUM PREHEAT COIL ENERGY OR ELEC FOR FURN FAN (KBTU/HR)
JAN	0.00000	0.000	-16.01356	-220.092	0.00000	0.000	-9.02215	-60.000
FEB	0.00000	0.000	-12.72717	-215.489	0.00000	0.000	-6.00675	-52.242
MAR	0.00000	0.000	-8.64450	-214.292	0.00000	0.000	-1.63046	-45.949
APR	0.00000	0.000	-2.10624	-139.546	0.00000	0.000	-0.05452	-14.030
MAY	0.00000	0.000	-0.28904	-72.240	0.00000	0.000	-0.00123	-1.231
JUN	0.00000	0.000	0.00000	0.000	0.00000	0.000	0.00000	0.000
JUL	0.00000	0.000	0.00000	0.000	0.00000	0.000	0.00000	0.000
AUG	0.00000	0.000	0.00000	0.000	0.00000	0.000	0.00000	0.000
SEP	0.00000	0.000	-0.13039	-62.131	0.00000	0.000	-0.00219	-2.185
OCT	0.00000	0.000	-1.92327	-159.822	0.00000	0.000	-0.05401	-12.100
NOV	0.00000	0.000	-7.42374	-199.828	0.00000	0.000	-0.64055	-21.261
DEC	0.00000	0.000	-14.15183	-215.598	0.00000	0.000	-2.94054	-38.964
TOTAL	0.000		-63.410		0.000		-20.352	
MAX		0.000		-220.092		0.000		-60.000

## **SS-C System Load Hours for <system name>**

The number of cooling and heating hours and fan operating hours for each month are reported for the system. Included are the hours when both heating and cooling are required. In addition, this report gives the heating and electrical loads at the time of the cooling peak. Note: the hour counts in this report are incremented by 1.0 when the relevant condition (e.g., "fans on") applies for all or part of the hour.

### **HOURS COOLING LOAD, HOURS HEATING LOAD**

give the total hours in each month when the HVAC system is operating with a cooling load or a heating load, respectively.

### **HOURS COINCIDENT COOL-HEAT LOAD**

gives the number of hours in each month when the HVAC system is operating with simultaneous heating and cooling loads.

The above numbers do not include hours when the only load was from pilot lights or crankcase heating.

### **HOURS FLOATING**

is the total number of hours that no heating or cooling was provided (with the fans on or off).

### **HOURS HEATING AVAIL.**

is the number of hours that heating equipment is available, as determined by HEATING-SCHEDULE.

### **HOURS COOLING AVAIL.**

is the number of hours that cooling equipment is available, as determined by COOLING-SCHEDULE.

### **HOURS FANS ON**

is the number of hours that fans are in operation, including cycling of fans on to maintain night setback or setup temperature setpoint.

### **HOURS FANS CYCLE ON**

is the number of hours fans were cycled on to maintain night setback or setup temperature setpoint.

### **HOURS NIGHT VENTING**

is the number of hours fans were on to maintain the night venting setpoint.

### **HOURS FLOATING WHEN FANS ON**

is the number of hours that no heating or cooling was provided (with the fans on).

### **HEATING LOAD AT COOLING PEAK**

is the heating load at the time of maximum cooling. It provides an assessment of oversizing for simultaneous heating/cooling systems (e.g., reheat systems).

### **ELECTRIC LOAD AT COOLING PEAK**

is the demand of all electric equipment calculated in LOADS and SYSTEMS at the time of maximum cooling.



Simple Structure Run 3, Chicago  
 Design-day sizing of VAV system  
 REPORT- SS-C System Load Hours for

Divide into zones; add plenum  
 Show All Reports  
 SYST-1

DOE-2.2b-027 Fri Jan 9 15:25:08 1998BDL RUN 1

WEATHER FILE- TRY CHICAGO

----- N U M B E R   O F   H O U R S -----												
--COINCIDENT LOADS--												
MONTH	HOURS COOLING LOAD	HOURS HEATING LOAD	HOURS COINCIDENT COOL-HEAT LOAD	HOURS FLOATING	HOURS HEATING AVAIL.	HOURS COOLING AVAIL.	HOURS FANS ON	HOURS FANS CYCLE ON	HOURS NIGHT VENTING	HOURS FLOATING WHEN FANS ON	HEATING LOAD AT COOLING PEAK (KBTU/HR)	ELECTRIC LOAD AT COOLING PEAK (KW)
JAN	0	416	0	328	744	0	416	174	0	0	0.000	0.475
FEB	0	372	0	300	672	0	372	163	0	0	0.000	0.475
MAR	10	252	0	482	711	29	269	39	0	7	0.000	10.680
APR	67	107	1	547	504	204	234	0	0	61	0.000	12.889
MAY	116	31	0	597	452	259	213	0	0	66	0.000	13.089
JUN	209	0	0	511	147	549	217	0	0	8	0.000	13.523
JUL	245	0	0	499	2	737	245	5	0	0	0.000	15.013
AUG	224	0	0	520	30	701	226	0	0	2	0.000	13.827
SEP	152	16	0	552	314	374	215	0	0	47	0.000	13.710
OCT	96	94	1	555	494	233	234	0	0	45	0.000	10.680
NOV	0	224	0	496	676	34	232	35	0	8	-42.282	2.055
DEC	0	371	0	373	744	0	371	129	0	0	0.000	0.475
ANNUAL	1119	1883	2	5760	5490	3120	3244	545	0	244		

## **SS-D Building HVAC Load Summary**

The cooling, heating and electrical energy required by the systems and zones served by the central plant are reported monthly along with the peak cooling, heating and electrical loads for the combined systems, and the time of occurrence. Note that these peak loads may result from startup after the building has been shut down overnight. Cooling done in SYSTEMS by DX units is not included here in cooling loads but in electrical loads.

### **COOLING ENERGY**

is the sensible plus latent monthly cooling required by the HVAC systems from the central plant. For water loop heat pump systems the value reported here is the heat rejected to the plant's cooling tower.

### **TIME OF MAX**

gives the day and hour in local standard time that the maximum cooling load occurs.

### **DRY-BULB TEMP and WET-BULB TEMP**

are the outside drybulb wetbulb temperatures during the peak cooling load.

### **MAXIMUM COOLING LOAD**

gives the peak cooling load for each month and for the year.

### **HEATING ENERGY**

is the total monthly heating required by the HVAC systems from the central plant. For water loop heat pump systems the value reported here is the supplementary heat from the plant's hot water boiler.

### **TIME OF MAX**

shows the day and hour in local standard time of the maximum heating load.

### **DRY-BULB TEMP and WET-BULB TEMP**

are the outside drybulb wetbulb temperatures during the peak heating load.

### **MAXIMUM HEATING LOAD**

gives the peak heating load for each month and for the year.

### **ELECTRICAL ENERGY**

is the monthly electrical requirement for lights and convenience outlets for the building zones served by the plant. In addition, the electrical energy contains the fan energy requirement for the HVAC systems and electric energy for cooling and heating in packaged units. It does not include the electrical energy associated with central plant equipment such as pumps, cooling towers and chillers. These are reported in the PLANT program.

### **MAXIMUM ELEC LOAD**

is the monthly peak electrical demand for the items in (9), ELECTRICAL ENERGY, above.

### **Bottom of Report**

At the bottom of the report are the peak daily integrated cooling load for the design day (DES DAY) and for the annual run using the weather file (WTH FILE). These numbers are used by PLANT to size cold storage systems.

Simple Structure Run 3, Chicago  
 Design-day sizing of VAV system  
 REPORT- SS-D Building HVAC Load Summary

Divide into zones; add plenum  
 Show All Reports

DOE-2.2b-027 Fri Jan 9 15:25:08 1998BDL RUN 1

WEATHER FILE- TRY CHICAGO

C O O L I N G							H E A T I N G					E L E C		
MONTH	COOLING ENERGY (MBTU)	TIME OF MAX DY	TIME OF MAX HR	DRY-BULB TEMP	WET-BULB TEMP	MAXIMUM COOLING LOAD (KBTU/HR)	HEATING ENERGY (MBTU)	TIME OF MAX DY	TIME OF MAX HR	DRY-BULB TEMP	WET-BULB TEMP	MAXIMUM HEATING LOAD (KBTU/HR)	ELEC-TRICAL ENERGY (KWH)	MAXIMUM ELEC LOAD (KW)
JAN	0.00000	31	24	22.F	19.F	0.000	-34.185	2	8	4.F	3.F	-302.628	3345.	12.808
FEB	0.00000	28	24	31.F	28.F	0.000	-26.459	4	8	7.F	6.F	-282.776	2938.	12.813
MAR	0.29252	3	17	78.F	61.F	38.440	-14.241	24	8	6.F	5.F	-288.753	3137.	12.817
APR	2.21315	28	15	78.F	68.F	88.418	-3.037	8	8	31.F	28.F	-165.791	3165.	12.898
MAY	5.73766	21	14	85.F	75.F	134.605	-0.417	9	8	43.F	39.F	-83.966	3126.	13.459
JUN	13.74432	20	16	90.F	77.F	168.344	0.000	30	1	67.F	56.F	0.000	3206.	14.930
JUL	26.51843	14	14	96.F	77.F	198.804	0.000	31	1	70.F	62.F	0.000	3540.	15.757
AUG	20.47318	11	16	88.F	74.F	158.441	0.000	31	1	63.F	52.F	0.000	3322.	14.419
SEP	9.37699	11	15	87.F	72.F	131.353	-0.239	23	8	36.F	34.F	-86.821	3140.	13.710
OCT	2.91350	30	17	74.F	67.F	52.422	-2.618	20	8	42.F	36.F	-176.753	3193.	12.680
NOV	0.00000	30	24	34.F	32.F	0.000	-11.372	28	8	24.F	22.F	-243.944	2802.	12.756
DEC	0.00000	31	24	33.F	33.F	0.000	-25.084	26	8	15.F	15.F	-278.370	3313.	12.799
TOTAL	81.270						-117.652						38225.	
MAX						198.804						-302.628		15.757
MAXIMUM DAILY INTEGRATED COOLING LOAD (DES DAY )							0.000 (KBTU)							
MAXIMUM DAILY INTEGRATED COOLING LOAD (WTH FILE)							1997.705 (KBTU)							

## **SS-E Building HVAC Load Hours**

Just as the monthly load hours are reported for an HVAC system in Report SS-C, the combined load hours for all of the HVAC systems served by the central plant are shown in this report. Heating and electrical loads for the plant at the time of the cooling peak are also reported. Note: the hour counts in this report are incremented by 1.0 when the relevant condition (e.g., "fans on") applies for all or part of the hour.

### **HOURS COOLING LOAD**

### **HOURS HEATING LOAD**

are the required operation hours of the central plant for supplying cooling or heating, respectively, to the HVAC systems served.

### **HOURS COINCIDENT COOL-HEAT LOAD**

gives the number of hours in each month when the central plant is operating with simultaneous heating and cooling loads.

### **HOURS FLOATING**

is the total number of hours (with fans on or off) that space temperatures are not at thermostat set points.

### **HOURS HEATING AVAIL.**

is the number of hours that heating equipment is available, as determined by HEATING-SCHEDULE.

### **HOURS COOLING AVAIL.**

is the number of hours that cooling equipment is available, as determined by COOLING-SCHEDULE.

### **HOURS FANS ON**

is the number of fan operating hours. This includes times when fans cycle on at night to maintain the setback or setup temperature set point or to provide night ventilation.

### **HOURS FANS CYCLE ON**

is the number of hours fans were cycled on to satisfy night setback or setup temperature set point.

### **HOURS NIGHT VENTING**

is the number of hours fans were on to maintain the night ventilation set point.

### **HOURS FLOATING WHEN FANS ON**

is the number of hours (with the fans on) that no heating or cooling was provided.

### **HEATING LOAD AT COOLING PEAK**

is the heating load at the time of maximum cooling. It provides an assessment of oversizing for simultaneous heating/cooling systems (e.g., reheat systems).

### **ELECTRIC LOAD AT COOLING PEAK**

is the electric demand of all electric equipment calculated in LOADS and SYSTEMS at the time of maximum cooling.

Simple Structure Run 3, Chicago  
 Design-day sizing of VAV system  
 REPORT- SS-E Building HVAC Load Hours

Divide into zones; add plenum  
 Show All Reports

DOE-2.2b-027 Fri Jan 9 15:25:08 1998BDL RUN 1

WEATHER FILE- TRY CHICAGO

----- N U M B E R   O F   H O U R S -----												
--COINCIDENT LOADS--												
MONTH	HOURS COOLING LOAD	HOURS HEATING LOAD	HOURS COINCIDENT COOL-HEAT LOAD	HOURS FLOATING	HOURS HEATING AVAIL.	HOURS COOLING AVAIL.	HOURS FANS ON	HOURS FANS CYCLE ON	HOURS NIGHT VENTING	HOURS FLOATING WHEN FANS ON	HEATING LOAD AT COOLING PEAK (KBTU/HR)	ELECTRIC LOAD AT COOLING PEAK (KW)
JAN	0	416	0	328	744	0	416	174	0	0	0.000	0.475
FEB	0	372	0	300	672	0	372	163	0	0	0.000	0.475
MAR	10	252	0	482	715	29	269	39	0	7	0.000	10.680
APR	67	107	1	547	516	204	234	0	0	61	0.000	12.889
MAY	116	31	0	597	485	259	213	0	0	66	0.000	13.089
JUN	209	0	0	511	171	549	217	0	0	8	0.000	13.523
JUL	245	0	0	499	7	737	245	5	0	0	0.000	15.013
AUG	224	0	0	520	43	701	226	0	0	2	0.000	13.827
SEP	152	16	0	552	346	374	215	0	0	47	0.000	13.710
OCT	96	94	1	555	511	233	234	0	0	45	0.000	10.680
NOV	0	224	0	496	686	34	232	35	0	8	-42.282	2.055
DEC	0	371	0	373	744	0	371	129	0	0	0.000	0.475
ANNUAL	1119	1883	2	5760	5640	3120	3244	545	0	244		

## SS-F Zone Demand Summary for <zone name>

For a zone, this report gives monthly monthly sums for zone heating and cooling demands from the HVAC system, minimum and maximum zone air temperatures, and the number of hours the loads are not met in the zone.

### HEAT EXTRACTION ENERGY and HEAT ADDITION ENERGY

are the sensible cooling energy and heating energy requirements, respectively, of this zone during the HVAC system's operating hours. For the RESYS and RESYS2 systems, the heat extraction may include natural ventilation. For plenums, these values are for heat removed from or added to the return air. For unconditioned zones, these values should be zero.

### BASEBOARD ENERGY and MAXIMUM BASEBOARD LOAD

When the keyword BASEBOARD-RATIO is used, the zone heating is supplied by baseboards. Monthly heating energy requirements for these baseboards are reported in addition to the peak heating requirement.

### MAXIMUM ZONE TEMPERATURE and MINIMUM ZONE TEMPERATURE

The monthly maximum and minimum air temperatures in the zone when system fans are operating.

### HOURS UNDERHEATED and HOURS UNDERCOOLED

If the capacity of the HVAC system is less than the heat extraction or addition needed to hold the zone thermostat set point, a load-not-met condition occurs that is recorded as either an underheated or undercooled hour. These hours may include startups after a night shutdown of the HVAC system.

Simple Structure Run 3, Chicago                      Divide into zones; add plenum                      DOE-2.2b-027    Fri Jan 9 15:25:08 1998BDL RUN 1  
 Design-day sizing of VAV system                      Show All Reports  
 REPORT- SS-F Zone Demand Summary for                      ZONE1-1                      WEATHER FILE- TRY    CHICAGO

-----D E M A N D S----- B A S E B O A R D S----- T E M P E R A T U R E S----- L O A D S   N O T   M E T-----								
MONTH	HEAT EXTRACTION ENERGY (MBTU)	HEAT ADDITION ENERGY (MBTU)	BASEBOARD ENERGY (MBTU)	MAXIMUM BASEBOARD LOAD (KBTU/HR)	MAXIMUM ZONE TEMP (F)	MINIMUM ZONE TEMP (F)	HOURS UNDER HEATED	HOURS UNDER COOLED
JAN	0.39591	-2.314	0.00000	0.000	77.1	55.8	0	0
FEB	0.38562	-1.840	0.00000	0.000	76.4	55.8	0	0
MAR	0.91858	-0.989	0.00000	0.000	76.7	55.8	10	0
APR	1.85465	-0.221	0.00000	0.000	77.4	62.8	4	0
MAY	2.30360	-0.023	0.00000	0.000	77.8	62.9	2	0
JUN	3.10090	0.000	0.00000	0.000	77.9	72.6	0	0
JUL	4.22996	0.000	0.00000	0.000	89.5	73.5	0	0
AUG	3.67799	0.000	0.00000	0.000	78.2	73.6	0	0
SEP	3.12406	-0.011	0.00000	0.000	78.2	70.6	0	0
OCT	2.09386	-0.178	0.00000	0.000	78.0	63.0	1	0
NOV	0.56666	-0.712	0.00000	0.000	77.6	55.9	0	0
DEC	0.37838	-1.925	0.00000	0.000	77.1	55.8	0	0

## SS-G Zone Loads Summary for <zone name>

Zone cooling, heating and electrical requirements are reported in this monthly summary. The cooling and heating energy reported is supplied only at the zone level (such as for reheat coils). Often heating and cooling loads are reported as zero in this report when the central HVAC system (e.g., a dual-duct system) provides all the heating and cooling.

### COOLING ENERGY and HEATING ENERGY

The monthly cooling and heating energy, respectively, delivered by zone coils and baseboards during scheduled operation hours.

### MAXIMUM COOLING LOAD and MAXIMUM HEATING LOAD

The peak energy delivered by zone coils and baseboards for cooling and heating, respectively. Includes sensible and latent space cooling loads, ventilation air and fan heat. To the left of these columns are the day and hour (in local standard time) of the peak cooling load along with the outside drybulb and wetbulb temperatures at the time of the peak.

The peak cooling load shown here is often the start-up load after the system has been shut down overnight. Notice, however, that when the system size is inadequate to meet the start-up load there is no indication of this problem on the report. You should first inspect the PLANT program BEPS or BEPU report, which shows "Percent of Hours Any System Zone Outside of Throttling Range", for a macro view, and at SS-O (Space Temperature Summary) or SS-F (Zone Demand Summary) for a zonal report of where "loads not met" conditions prevail.

### ELECTRICAL ENERGY and MAXIMUM ELEC LOAD

The monthly total and peaks of electrical energy use in this zone, including lights, fans, and compressors and electric coils in packaged HVAC units.

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Design-day sizing of VAV system													Show All Reports							
REPORT- SS-G Zone Loads Summary for													ZONE1-1				WEATHER FILE- TRY		CHICAGO	
----- C O O L I N G -----													----- H E A T I N G -----				----- E L E C -----			
MONTH	COOLING ENERGY (MBTU)	TIME OF DY	MAX HR	DRY-BULB TEMP	WET-BULB TEMP	MAXIMUM COOLING LOAD (KBTU/HR)	HEATING ENERGY (MBTU)	TIME OF DY	MAX HR	DRY-BULB TEMP	WET-BULB TEMP	MAXIMUM HEATING LOAD (KBTU/HR)	ELEC-TRICAL ENERGY (KWH)	MAXIMUM ELEC LOAD (KW)						
JAN	0.00000	31	24	22.F	19.F	0.000	-3.459	13	8	7.F	6.F	-44.670	639.	2.534						
FEB	0.00000	28	24	31.F	28.F	0.000	-2.764	24	8	20.F	18.F	-44.503	561.	2.534						
MAR	0.00000	31	24	39.F	36.F	0.000	-1.779	24	8	6.F	5.F	-46.699	620.	2.534						
APR	0.00000	30	1	55.F	48.F	0.000	-0.551	8	8	31.F	28.F	-26.684	632.	2.534						
MAY	0.00000	31	1	54.F	49.F	0.000	-0.118	9	8	43.F	39.F	-17.443	620.	2.534						
JUN	0.00000	30	1	67.F	56.F	0.000	0.000	30	1	67.F	56.F	0.000	613.	2.534						
JUL	0.00000	31	1	70.F	62.F	0.000	0.000	31	1	70.F	62.F	0.000	639.	2.534						
AUG	0.00000	31	1	63.F	52.F	0.000	0.000	31	1	63.F	52.F	0.000	620.	2.534						
SEP	0.00000	30	1	46.F	40.F	0.000	-0.047	23	8	36.F	34.F	-16.880	613.	2.534						
OCT	0.00000	31	24	70.F	62.F	0.000	-0.475	20	8	42.F	36.F	-29.587	639.	2.534						
NOV	0.00000	30	24	34.F	32.F	0.000	-1.621	28	8	24.F	22.F	-39.539	555.	2.534						
DEC	0.00000	31	24	33.F	33.F	0.000	-3.099	22	8	15.F	15.F	-44.911	639.	2.53						
TOTAL	0.000						-13.913						7391.							
MAX						0.000							-46.699	2.534						





**SS-I Sensible/Latent Summary for <system name>**

This is a summary of the monthly cooling and heating energy provided by each HVAC system. The quantities shown are the sum of zone-level loads and central air-handling-unit loads.

**SENSIBLE COOLING ENERGY**

is the monthly sum of sensible energy extracted by the HVAC system.

**LATENT COOLING ENERGY**

is the monthly sum of latent energy extracted by the HVAC system. The sum of (1) and (2) should equal COOLING ENERGY in Report SS-A.

**MAX TOTAL COOLING ENERGY**

is the hourly peak energy (sensible plus latent) extracted by the system during the month.

**SENSIBLE HEAT RATIO AT MAX**

is the sensible heat ratio ( $[\text{sensible cooling}]/[\text{total cooling}]$ ) for the hour that the maximum total cooling occurs.

**TIME OF MAX**

is the day and hour (in local standard time) that the total peak cooling load occurred.

**SENSIBLE HEATING ENERGY**

is the monthly sum of sensible energy added by the HVAC system.

**LATENT HEATING ENERGY**

is the monthly sum of latent energy extracted by the HVAC system. The sum of (6) and (7) should equal HEATING ENERGY in Report SS-A.

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Design-day sizing of VAV system			Show All Reports					
REPORT- SS-I Sensible/Latent Summary for			SYST-1			WEATHER FILE- TRY CHICAGO		
MONTH	SENSIBLE COOLING ENERGY (MBTU)	LATENT COOLING ENERGY (MBTU)	MAX TOTAL COOLING ENERGY (KBTU/HR)	SENSIBLE HEAT RATIO AT MAX	TIME OF MAX DY HR	SENSIBLE HEATING ENERGY (MBTU)	LATENT HEATING ENERGY (MBTU)	MAX TOTAL HEATING ENERGY (KBTU/HR)
JAN	0.00000	0.00000	0.000			-34.18526	0.00000	-302.62750
FEB	0.00000	0.00000	0.000			-26.45858	0.00000	-282.77591
MAR	0.26943	0.02309	38.440	1.000	3 17	-14.24075	0.00000	-288.753
APR	1.96484	0.24831	88.418	0.805	28 15	-3.03746	0.00000	-165.791
MAY	4.91520	0.82246	134.605	0.739	21 14	-0.41691	0.00000	-83.966
JUN	12.11147	1.63286	168.344	0.749	20 16	0.00000	0.00000	0.000
JUL	22.16018	4.35825	198.804	0.800	14 14	0.00000	0.00000	0.000
AUG	17.12798	3.34520	158.441	0.781	11 16	0.00000	0.00000	0.000
SEP	8.36948	1.00751	131.353	0.803	11 15	-0.23907	0.00000	-86.821
OCT	2.66797	0.24553	52.422	0.788	30 17	-2.61819	0.00000	-176.753
NOV	0.00000	0.00000	0.000			-11.37247	0.00000	-243.94443
DEC	0.00000	0.00000	0.000			-25.08353	0.00000	-278.36969
TOTAL	69.587	11.683				-117.652	0.000	
MAX			198.804	0.800				-302.628

## **SS-J Peak Heating and Cooling for <system name>**

For each HVAC system, this report gives an hourly profile of three types of peak day that occur during the RUN-PERIOD:

1. Under --COOLING--, the day that contains the hour with the maximum (sensible plus latent) cooling energy.
2. Under --HEATING--, the day that contains the hour with the maximum heating energy.
3. Under DAY COOLING PEAK, the day whose integrated cooling load (i.e., load summed over 24 hours) is highest. This day can be used to size thermal energy storage systems; however, to insure that the peak integrated load shown here is truly represented, you should examine reports SS-O (Space Temperature Summary) or SS-F (Zone Demand Summary), which show the number of hours that cooling loads are not met.

### **HOUR**

gives the hour of the day, ranging from hour 1 (midnight to 1am) to hour 24 (11pm to midnight). The hour shown is in local standard time even if DAYLIGHT-SAVINGS = YES.

### **HOURLY COOLING LOAD**

is the total hourly energy, sensible plus latent, extracted by the HVAC system. The cooling load is followed by an asterisk (\*) when the system is unable to meet the cooling demand for that hour. This means that in at least one zone served by this system there is an unmet cooling load and the zone temperature is outside the throttling range.

### **SENSIBLE HEAT RATIO**

is the ratio of sensible to total cooling energy for the hour.

### **DRYBULB TEMP and WETBULB TEMP**

are the outside drybulb and wetbulb temperatures, respectively, for the given hour.

### **HOURLY HEATING LOAD**

is the hourly heating energy delivered by the HVAC system. For SYSTEM:TYPE = RESYS and RESVVT, this includes baseboard heating energy. The heating load is followed by an asterisk (\*) when the system is unable to meet the heating demand for that hour. This means that in at least one zone served by the system, there is an unmet heating load and the zone temperature is outside the throttling range.

A separate report is provided whenever DESIGN-DAY is input.

**Bottom of Report** - Some additional information is shown at the bottom of the report:

### **SYSTEM-TYPE**

is the DOE-2 code-word for the type of this HVAC system.

### **SQFT/TON**

is the area served by this system divided by the peak cooling in tons.

### **COOLING PEAK**

is the peak cooling divided by the area served by this system.

### **HEATING PEAK**

is the peak heating divided by the area served by this system.

**SUPPLY AIR PEAK FLOW**

is the design supply air flow divided by area served by this system.

**MIN-OA/PERSON**

is the design minimum outside air flow divided by the maximum number of people in all the zones served by this system.

**OA FRAC AT CLG PEAK**

is the outside air fraction (outside air flow divided by supply flow) at the peak cooling hour.

**OA FRAC AT HTG PEAK**

is the outside air fraction (outside air flow divided by supply flow) at the peak heating hour.

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 REPORT- SS-J Peak Heating and Cooling for    SYST-1                      WEATHER FILE- TRY    CHICAGO

- - - - - C O O L I N G - - - - -					- - - H E A T I N G - - - - -			D A Y C O O L I N G P E A K			
JUL 14					JAN 2			JUL 14			
HOURLY	COOLING	SENSIBLE	DRY-	WET-	HOURLY	DRY-	WET-	HOURLY	SENSIBLE	DRY-	WET-
LOAD	LOAD	HEAT	BULB	BULB	LOAD	BULB	BULB	LOAD	HEAT	BULB	BULB
HOURLY	COOLING	SENSIBLE	TEMP	TEMP	HEATING	TEMP	TEMP	COOLING	SENSIBLE	TEMP	TEMP
LOAD	LOAD	RATIO	TEMP	TEMP	LOAD	TEMP	TEMP	LOAD	RATIO	TEMP	TEMP
HOURLY	COOLING	SENSIBLE	TEMP	TEMP	HEATING	TEMP	TEMP	COOLING	SENSIBLE	TEMP	TEMP
LOAD	LOAD	RATIO	TEMP	TEMP	LOAD	TEMP	TEMP	LOAD	RATIO	TEMP	TEMP
1	0.000	0.000	83.F	72.F	-105.596	1.F	0.F	0.000	0.000	83.F	72.F
2	0.000	0.000	81.F	72.F	-106.951	1.F	0.F	0.000	0.000	81.F	72.F
3	0.000	0.000	80.F	71.F	-107.897	1.F	0.F	0.000	0.000	80.F	71.F
4	0.000	0.000	78.F	71.F	-107.401	2.F	1.F	0.000	0.000	78.F	71.F
5	0.000	0.000	77.F	70.F	-110.220	2.F	1.F	0.000	0.000	77.F	70.F
6	0.000	0.000	78.F	71.F	-107.897	2.F	1.F	0.000	0.000	78.F	71.F
7	142.068 *	0.890	79.F	71.F	-109.054	3.F	2.F	142.068 *	0.890	79.F	71.F
8	191.428 *	0.797	82.F	72.F	-302.628	4.F	3.F	191.428 *	0.797	82.F	72.F
9	177.026 *	0.778	86.F	74.F	-192.600	4.F	3.F	177.026 *	0.778	86.F	74.F
10	179.816 *	0.791	88.F	74.F	-157.094	5.F	4.F	179.816 *	0.791	88.F	74.F
11	185.444 *	0.781	91.F	76.F	-142.285	6.F	5.F	185.444 *	0.781	91.F	76.F
12	182.825	0.807	94.F	76.F	-125.894	8.F	7.F	182.825	0.807	94.F	76.F
13	198.804	0.800	96.F	77.F	-120.275	9.F	9.F	198.804	0.800	96.F	77.F
14	190.141	0.797	87.F	74.F	-106.301	11.F	11.F	190.141	0.797	87.F	74.F
15	175.715	0.778	76.F	71.F	-100.302	12.F	12.F	175.715	0.778	76.F	71.F
16	161.530	0.763	78.F	72.F	-95.847	14.F	13.F	161.530	0.763	78.F	72.F
17	151.517	0.753	78.F	72.F	-93.170	15.F	14.F	151.517	0.753	78.F	72.F
18	0.000	0.000	89.F	75.F	-91.288	15.F	15.F	0.000	0.000	89.F	75.F
19	0.000	0.000	87.F	75.F	0.000	17.F	16.F	0.000	0.000	87.F	75.F
20	0.000	0.000	84.F	74.F	0.000	17.F	16.F	0.000	0.000	84.F	74.F
21	0.000	0.000	84.F	74.F	0.000	18.F	18.F	0.000	0.000	84.F	74.F
22	0.000	0.000	82.F	74.F	0.000	17.F	17.F	0.000	0.000	82.F	74.F
23	0.000	0.000	80.F	72.F	0.000	17.F	17.F	0.000	0.000	80.F	72.F
24	0.000	0.000	78.F	72.F	0.000	17.F	17.F	0.000	0.000	78.F	72.F
SUM								1936.315			
MAX	198.804				-302.628						

SYSTEM-TYPE	VAVS	SQFT/TON	301.8
COOLING PEAK	39.76 (BTU/HR- SQFT)	HEATING PEAK	-60.53 (BTU/HR- SQFT)
SUPPLY AIR PEAK FLOW	1.18 (CFM/SQFT)	MIN-OA/PERSON	20.40 (CFM )
OA FRAC AT CLG PEAK	0.245	OA FRAC AT HTG PEAK	0.276

\* ASTERISKS INDICATE HOURS LOADS NOT MET

## **SS-K Space Temperature Summary for <system name>**

This report gives a monthly summary of various temperature quantities for the spaces served by an HVAC system. It can be used to determine the potential for night ventilation as a cooling strategy. Blank entries indicate that no hours existed in a particular category. The averages given are over all spaces served by the system.

### **AVERAGE SPACE TEMP ALL HOURS**

is the average space temperature for all hours in the run.

### **AVERAGE SPACE TEMP COOLING HOURS**

is the average space temperature for hours when cooling is required.

### **AVERAGE SPACE TEMP HEATING HOURS**

is the average space temperature for hours when heating is required.

### **AVERAGE SPACE TEMP FAN ON HOURS**

is the average space temperature when the fans are running.

### **AVERAGE SPACE TEMP FAN OFF HOURS**

is the average space temperature when the fans are not running.

### **AVERAGE TEMPERATURE DIFFERENCE BETWEEN OUTDOOR & ROOM AIR, ALL HOURS**

is the average value of [outdoor temperature minus space air temperature] over all hours.

### **AVERAGE TEMPERATURE DIFFERENCE BETWEEN OUTDOOR & ROOM AIR, FAN ON HOURS**

is the average value of [outdoor temperature minus space air temperature] when the fans are on.

### **AVERAGE TEMPERATURE DIFFERENCE BETWEEN OUTDOOR & ROOM AIR, FAN OFF HOURS**

is the average value of [outdoor temperature minus space air temperature] when the fans are off.

### **SUMMED TEMP DIFFERENCE BETWEEN OUTDOOR & ROOM AIR, HEATING HOURS**

is the sum of the absolute value of [outdoor temperature minus room air temperature] for hours when heating is required, divided by 24. This is a degree day-like quantity.

### **SUMMED TEMP DIFFERENCE BETWEEN OUTDOOR & ROOM AIR, ALL HOURS**

is the sum of the absolute value of [outdoor temperature minus room air temperature] for all hours, divided by 24. This is a degree day-like quantity.

### **HUMIDITY RATIO DIFFERENCE BETWEEN OUTDOOR & ROOM AIR**

is the average value of [outdoor humidity ratio minus return air humidity ratio] for all hours.

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 Design-day sizing of VAV system                      Show All Reports  
 REPORT- SS-K Space Temperature Summary for SYST-1                      WEATHER FILE- TRY CHICAGO

MONTH	AVERAGE SPACE TEMP					AVERAGE TEMPERATURE DIFFERENCE			SUMMED TEMP DIFFERENCE		HUMIDITY RATIO DIFFERENCE BETWEEN OUTDOOR AND ROOM AIR (FRAC.OR MULT. )
	ALL HOURS (F)	COOLING HOURS (F)	HEATING HOURS (F)	FAN ON HOURS (F)	FAN OFF HOURS (F)	BETWEEN OUTDOOR& ROOM AIR (F)	BETWEEN OUTDOOR& ROOM AIR FAN ON HOURS (F)	BETWEEN OUTDOOR& ROOM AIR FAN OFF HOURS (F)	BETWEEN OUTDOOR& ROOM AIR HEATING HOURS (F)	BETWEEN OUTDOOR& ROOM AIR ALL HOURS (F)	
JAN	61.63	0.00	62.66	62.66	60.33	-36.29	-41.03	-30.29	711.11	1125.03	-0.00080
FEB	61.66	0.00	62.66	62.66	60.41	-34.14	-36.24	-31.54	561.72	955.93	-0.00081
MAR	63.96	63.27	67.21	67.20	62.12	-25.59	-30.81	-22.63	342.62	802.70	-0.00052
APR	71.59	74.32	70.22	72.53	71.13	-20.00	-20.24	-19.88	120.10	601.15	-0.00071
MAY	75.52	76.87	70.62	75.21	75.65	-18.75	-15.24	-20.16	31.51	583.28	-0.00122
JUN	80.61	77.82	0.00	77.74	81.84	-13.51	-6.96	-16.34	0.00	417.12	-0.00002
JUL	83.80	78.93	0.00	78.93	86.19	-8.23	-0.53	-12.02	0.00	318.53	0.00231
AUG	82.10	78.19	0.00	78.18	83.81	-10.25	-2.18	-13.77	0.00	355.19	0.00167
SEP	77.30	77.26	70.62	76.14	77.80	-15.92	-9.84	-18.51	17.00	491.29	-0.00053
OCT	71.50	73.85	69.94	72.29	71.13	-17.85	-16.19	-18.61	92.55	553.79	-0.00060
NOV	64.72	0.00	67.12	67.33	63.48	-23.77	-28.55	-21.50	269.06	713.72	-0.00094
DEC	61.80	0.00	63.92	63.92	59.69	-30.07	-32.54	-27.61	503.05	932.13	-0.00083
ANNUAL	71.40	77.28	65.04	69.96	72.25	-21.12	-22.67	-20.21	2648.73	7849.84	-0.00024

**SS-L Fan Electric Energy Use for <system name>**

This report gives a breakdown of monthly electric energy for fans (central and zone-level) and fan part load operation for an HVAC system.

**FAN ELECTRIC ENERGY DURING HEATING**

is the total electric energy used by the fans for hours when only heating is required.

**FAN ELECTRIC ENERGY DURING COOLING**

is the total electric energy used by the fans for hours when only cooling is required.

**FAN ELECTRIC ENERGY DURING HEATING-COOLING**

is the total electric energy used by the fans for hours when both heating and cooling are required.

**FAN ELECTRIC ENERGY DURING FLOATING**

is the total electric energy used by the fans when neither heating nor cooling is provided.

The right-hand side of the report shows the part-load operation of the fans. The number of operating hours within each part load band (0-10 percent, 10-20 percent, etc.) is given as well as the total hours of operation. If the fan operates during an hour, its part load in percent is  $100 * (\text{total flow}) / (\text{design flow})$ .

**BREAKDOWN OF ANNUAL FAN POWER USAGE**

gives the annual electric energy for the system's supply, return and exhaust fans.

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 Design-day sizing of VAV system                      Show All Reports  
 REPORT- SS-L Fan Electric Energy Use for                      SYST-1                      WEATHER FILE- TRY CHICAGO

MONTH	FAN ELEC DURING HEATING (KWH)	FAN ELEC DURING COOLING (KWH)	FAN ELEC DURING HEAT & COOL (KWH)	FAN ELEC DURING FLOATING (KWH)	Number of hours within each PART LOAD range											TOTAL RUN HOURS
					00-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	100+	
JAN	318.090	0.000	0.000	0.000	0	0	0	395	10	4	7	0	0	0	0	416
FEB	283.986	0.000	0.000	0.000	0	0	0	356	5	3	8	0	0	0	0	372
MAR	190.102	6.798	0.000	4.759	0	0	0	254	10	3	2	0	0	0	0	269
APR	74.480	53.102	0.680	44.094	0	0	0	224	10	0	0	0	0	0	0	234
MAY	21.075	119.405	0.000	49.758	0	0	0	170	40	3	0	0	0	0	0	213
JUN	0.000	295.147	0.000	8.699	0	0	0	86	93	29	8	1	0	0	0	217
JUL	0.000	513.332	0.000	0.000	0	0	0	29	62	96	48	9	1	0	0	245
AUG	0.000	382.394	0.000	3.914	0	0	0	41	84	90	11	0	0	0	0	226
SEP	10.877	189.057	0.000	37.108	0	0	0	138	57	20	0	0	0	0	0	215
OCT	65.035	68.979	0.680	32.738	0	0	0	233	1	0	0	0	0	0	0	234
NOV	166.180	0.000	0.000	6.131	0	0	0	222	7	2	1	0	0	0	0	232
DEC	285.966	0.000	0.000	0.000	0	0	0	350	11	3	7	0	0	0	0	371
ANNUAL	1415.759	1628.213	1.360	187.201	0	0	0	2498	390	253	92	10	1	0	0	3244

BREAKDOWN OF ANNUAL FAN POWER USAGE

FAN TYPE SUPPLY	ANNUAL FAN ELEC (KWH)
TOTAL	3230.

## **SS-M Building HVAC Fan Elec Energy**

This report gives a breakdown of electric energy used by all fans in the building.

### **FAN ELECTRIC ENERGY DURING HEATING**

is the total electric energy used by the fans when only heating is required.

### **FAN ELECTRIC ENERGY DURING COOLING**

is the total electric energy used by the fans when only cooling is required.

### **FAN ELECTRIC ENERGY DURING HEATING-COOLING**

is the total electric energy used by the fans when both heating and cooling are required.

### **FAN ELECTRIC ENERGY DURING FLOATING**

is the total electric energy used by the fans when neither heating nor cooling is provided.

Simple Structure Run 3, Chicago                      Divide into zones; add plenum                      DOE-2.2b-027    Fri Jan 9 15:25:08 1998BDL RUN 1  
 Design-day sizing of VAV system                      Show All Reports  
 REPORT- SS-M Building HVAC Fan Elec Energy                      WEATHER FILE- TRY    CHICAGO

MONTH	FAN ELECTRIC ENERGY DURING HEATING (KWH)	FAN ELECTRIC ENERGY DURING COOLING (KWH)	FAN ELECTRIC ENERGY DURING HEATING-COOLING (KWH)	FAN ELECTRIC ENERGY DURING FLOATING (KWH)
JAN	318.090	0.000	0.000	0.000
FEB	283.986	0.000	0.000	0.000
MAR	190.102	6.798	0.000	4.759
APR	74.480	53.102	0.680	44.094
MAY	21.075	119.405	0.000	49.758
JUN	0.000	295.147	0.000	8.699
JUL	0.000	513.332	0.000	0.000
AUG	0.000	382.394	0.000	3.914
SEP	10.877	189.057	0.000	37.108
OCT	65.035	68.979	0.680	32.738
NOV	166.180	0.000	0.000	6.131
DEC	285.966	0.000	0.000	0.000
ANNUAL	1415.759	1628.213	1.360	187.201



### SS-N Relative Humidity Summary for <system name>

In this scatter plot, the vertical axis, at the left, shows relative humidity bins. The horizontal axis, at the top, shows hours of the day (in local standard time), where "1AM" is midnight to 1:00am, "2" is 1:00am to 2:00am, etc. The cells of the plot contain number of hours during the run period for which the relative humidity of the system return air was in the particular relative humidity bin for a particular hour of the day. Only hours for which the fans are on are counted in this plot, except that hours the fans are on due to NIGHT-CYCLE-CTRL are not counted.

The TOTAL column at the far right is the sum of the entries in each row. It shows the frequency of relative humidity values for the run period. (Because the relative humidity counts are made only for hours when the fans are on, the sum the values in this column will generally not be equal to the number of hours in the run.)

Simple Structure Run 3, Chicago                      Divide into zones; add plenum                      DOE-2.2b-027    Fri Jan 9 15:25:08 1998BDL RUN 1  
 Design-day sizing of VAV system                      Show All Reports  
 REPORT- SS-N Relative Humidity Summary for SYST-1                      WEATHER FILE- TRY CHICAGO

HOUR	TOTAL HOURS AT RELATIVE HUMIDITY LEVEL AND TIME OF DAY																								TOTAL
	1AM	2	3	4	5	6	7	8	9	10	11	12	1PM	2	3	4	5	6	7	8	9	10	11	12	
90-100	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
80-89	0	0	0	0	0	0	0	0	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	6
70-79	0	0	0	0	0	0	0	0	2	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	4
60-69	0	0	0	0	0	0	0	2	2	3	4	3	1	3	1	5	5	4	0	0	0	0	0	0	33
50-59	0	0	0	0	0	0	0	45	45	31	19	10	12	7	9	9	13	5	0	0	0	0	0	205	
40-49	0	0	0	0	0	0	0	46	60	70	74	77	78	81	73	77	77	6	0	0	0	0	0	719	
30-39	0	0	0	0	0	0	0	31	60	63	64	58	44	58	67	61	57	26	0	0	0	0	0	599	
20-29	0	0	0	0	0	0	0	17	65	64	65	64	75	72	72	72	70	49	0	0	0	0	0	685	
10-19	0	0	0	0	0	0	0	0	17	19	25	38	39	29	28	28	30	21	0	0	0	0	0	274	
0-09	0	0	0	0	0	0	0	0	0	0	0	1	2	1	0	0	0	0	0	0	0	0	0	14	

\*\*\*\*\*  
 \*  
 \* NOTE 1)THE RELATIVE HUMIDITY COUNTS ARE MADE ONLY FOR \*  
 \* THE HOURS WHEN THE FANS ARE ON \*  
 \*  
 \*\*\*\*\*

### SS-O Space Temperature Summary for <zone name>

In this scatter plot the vertical axis, at the left, shows temperature bins. The horizontal axis, at the top, gives hours of the day in local standard time, where "1AM" is midnight to 1:00am, "2" is 1:00am to 2:00am, etc. Entered in each cell of the plot is the number of hours during the run period for which the zone air temperature was in the particular bin for the particular hour of the day. Only hours for which the fans are on are counted in this plot, except that hours the fans are on due to NIGHT-CYCLE-CTRL are not counted.

The column at the far right labeled "TOTAL" is the sum of the entries in each row. It shows the frequency of temperature values for the run period. Because the temperature counts are only made for hours when the fans are on, summing the totals column will not sum to the number of hours in the run.

Simple Structure Run 3, Chicago                      Divide into zones; add plenum                      DOE-2.2b-027    Fri Jan 9 15:25:08 1998BDL RUN 1  
 Design-day sizing of VAV system                      Show All Reports  
 REPORT- SS-O Space Temperature Summary for ZONE1-1                      WEATHER FILE- TRY    CHICAGO

TOTAL HOURS AT TEMPERATURE LEVEL AND TIME OF DAY

TEMPERATURE BIN	1AM	2	3	4	5	6	7	8	9	10	11	12	1PM	2	3	4	5	6	7	8	9	10	11	12	TOTAL
ABOVE 85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80-85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
75-80	0	0	0	0	0	0	0	54	72	83	94	103	121	137	141	142	126	1	0	0	0	0	0	0	1074
70-75	0	0	0	0	0	0	0	85	176	168	157	148	130	114	110	108	125	108	0	0	0	0	0	0	1429
65-70	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	4
60-65	0	0	0	0	0	0	0	2	2	1	1	1	1	1	0	1	1	2	0	0	0	0	0	0	13
BELOW 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

====

\*\*\*\*\*  
 \*  
 \* NOTE 1)THE TEMPERATURE COUNTS ARE MADE ONLY FOR                      \*  
 \*                      THE HOURS WHEN THE FANS ARE ON    \*  
 \*  
 \*\*\*\*\*

## **SS-P Heating/Cooling Performance Summary of <zone or system name>**

Two SS-P reports are produced for each unit or system: one for heating operation and one for cooling operation. These reports are provided for:

- each PSZ, PVAVS, RESYS, RESVVT, or PVVT system if Report SS-H is requested;
- each zone in a PTAC, HP, FC, UHT, UVT system if Report SS-H or SS-L is requested in the SYSTEMS-REPORT command.

### **UNIT TYPE**

is the DOE-2 code-word for this HVAC system.

### **HEATING-CAPACITY and HEATING-EIR or COOLING-CAPACITY and COOLING-EIR and SUPPLY-FLOW**

are as reported on SV-A for this system.

### **UNIT LOAD**

gives the monthly sum and peak load on the unit and time of occurrence of peak in local standard time .

### **ENERGY USE**

gives the monthly sum and peak electric energy used by the unit and time of occurrence of peak. Energy use includes that from the compressor, outdoor fans, pumps, auxiliaries (specified by UNIT-AUX-KW), crankcase heat and evaporative precooler.

### **COMPRESSOR**

gives the monthly sum and peak electric energy used by the engine/motor, not including the crankcase heat, and time of occurrence of the peak.

### **FAN ENERGY**

gives the monthly sum and peak fan energy during the time the unit is in the heating/cooling mode, and the time of occurrence of the peak.

### **Number of hours within each PART LOAD range**

For each month, shows the number of hours that the unit (top line) or indoor fan (bottom line) spent in various part load ranges (0-10%, 10-20%, etc.). If the unit is on during the hour and the operation is within the specified range, the count of hours is incremented by 1.

DOE-2.2b-130 Wed Feb 12 14:57:23 1997BDL RUN 1

REPORT- SS-P Cooling Performance Summary of System 1

WEATHER FILE- LOS ANGELES, CA

UNIT TYPE is PSZ COOLING-CAPACITY = 110.949 (KBTU/HR) COOLING-EIR = 0.360 (BTU/BTU) SUPPLY-FLOW = 3895.  
(CFM)

MONTH	UNIT LOAD SUM (MBTU) PEAK (KBTU/HR) DAY/HR	ENERGY USE (KWH) (KW)	COMPRESSOR (KWH) (KW)	FAN ENERGY (KWH) (KW)	Number of hours within each PART LOAD range												TOTAL RUN HOURS	
					00	10	20	30	40	50	60	70	80	90	100			
					10	20	30	40	50	60	70	80	90	100	+			
JAN	SUM 1.527 PEAK 55.358 DAY/HR 11/15	140.908 4.737 11/15	135.708 4.737 11/15	1701.129 2.286 31/24	CMP 0 FAN 0	0	0	14	12	16	0	0	0	0	0	0	0	42
FEB	SUM 1.050 PEAK 60.188 DAY/HR 13/16	96.190 5.157 13/16	92.040 5.157 13/16	1536.501 2.286 28/24	CMP 0 FAN 0	0	0	3	6	8	6	0	0	0	0	0	0	23
MAR	SUM 2.074 PEAK 64.816 DAY/HR 6/16	183.247 5.565 6/16	179.647 5.565 6/16	1701.129 2.286 31/24	CMP 0 FAN 0	0	0	8	5	18	14	0	0	0	0	0	0	45
APR	SUM 5.323 PEAK 71.524 DAY/HR 22/16	469.032 6.317 22/16	468.832 6.317 22/16	1646.253 2.286 30/ 1	CMP 0 FAN 0	0	0	20	13	35	39	5	0	0	0	0	0	112
MAY	SUM 11.011 PEAK 78.657 DAY/HR 29/17	961.959 7.146 29/16	961.959 7.146 29/16	1701.129 2.286 31/ 1	CMP 0 FAN 0	0	0	23	31	57	76	22	2	0	0	0	0	211
JUN	SUM 12.232 PEAK 78.545 DAY/HR 20/17	1066.793 7.113 20/17	1066.793 7.113 20/17	1646.253 2.286 30/ 1	CMP 0 FAN 0	0	0	25	33	71	72	30	2	0	0	0	0	233
JUL	SUM 18.125 PEAK 80.497 DAY/HR 10/17	1610.477 7.844 10/17	1610.477 7.844 10/17	1701.129 2.286 31/ 1	CMP 0 FAN 0	0	0	52	46	82	85	71	9	0	0	0	0	345
AUG	SUM 20.744 PEAK 93.582 DAY/HR 31/17	1891.062 10.261 31/15	1891.062 10.261 31/15	1701.129 2.286 31/ 1	CMP 0 FAN 0	0	0	77	56	61	88	84	27	3	2	0	0	398
SEP	SUM 16.612 PEAK 78.350 DAY/HR 7/17	1492.149 7.418 7/16	1492.149 7.418 7/16	1646.253 2.286 30/ 1	CMP 0 FAN 0	0	0	56	51	66	92	56	4	0	0	0	0	325
OCT	SUM 9.943 PEAK 74.318 DAY/HR 1/16	880.284 6.866 1/15	879.984 6.866 1/15	1701.129 2.286 31/24	CMP 0 FAN 0	0	0	42	42	65	56	10	0	0	0	0	0	215
NOV	SUM 4.618 PEAK 58.215 DAY/HR 29/15	406.664 5.316 29/15	405.214 5.316 29/15	1646.253 2.286 30/24	CMP 0 FAN 0	0	0	21	25	56	6	0	0	0	0	0	0	108
DEC	SUM 2.950 PEAK 62.773 DAY/HR 19/15	277.788 6.122 19/15	269.190 6.122 19/15	1701.129 2.286 31/24	CMP 0 FAN 0	0	0	24	21	26	6	0	0	0	0	0	0	77
YR	SUM 106.208 PEAK 93.582 MON/DAY 8/31	9476.502 10.261 8/31	9453.041 10.261 8/31	20029.475 2.286 12/31	CMP 0 FAN 0	0	0	365	341	561	540	278	44	3	2	0	0	2134

## **SS-Q Heat Pump Cooling/Heating Summary for <system name>**

Two reports, one for cooling operation and one for heating operation, are produced for each system that contains an electric or gas heat pump. These reports are provided for each PSZ, PVAVS, RESYS, RESVVT and PTAC system if SS-A is requested.

### **UNIT RUN TIME**

is the total run time for all the gas heat pumps or the sum of the hourly part load ratios for all the electric heat pumps in the system. If a system serves several zones, each of which has a separate heat pump, the run time is the total run time of all the heat pumps. For example, if, in a particular hour, each of the heat pumps in three zones runs for 0.5 hours, then UNIT RUN TIME is incremented by  $3 \times 0.5 = 1.5$ .

### **TOTAL LOAD ON UNIT**

is the total load on all the units (including the defrost load for heat pumps in the heating mode) in the system.

### **ENERGY INTO UNIT**

is the electric or fuel energy into all of the units to provide heating or cooling. Does not include auxiliaries for the unit except those included in the base EIR or HIR.

### **AUXILIARY ENERGY**

is the energy for outdoor fans, evaporative precoolers, auxiliary electrical, or pumps for the units.

### **SUP UNIT LOAD**

is the total load on the supplemental heating units. This includes time when the supplemental unit is operating alone or in conjunction with the heat pump.

### **SUP UNIT ENERGY**

is the energy into the supplemental heating units.

### **WASTE HEAT GENERATED**

is the recoverable waste heat generated by the units.

### **WASTE HEAT USE**

is the amount of waste heat used to meet the domestic hot water loads.

### **DEFROST LOAD**

for heating summary only, is the heating load imposed when running in defrost mode.

### **INDOOR FAN ENERGY**

is the electric consumption of the indoor fans.

### **CSPF (WITH PARASITICS) and CSPF (WITHOUT PARASITICS), or HSPF (WITH PARASITICS) and HSPF (WITHOUT PARASITICS)**

are the cooling and heating season performance factors, respectively, as computed with and without parasitics. The value without parasitics is the total load (main and supplemental) divided by the total energy consumed (main plus supplemental). The value with parasitics adds all the auxiliaries (pumps, fans, etc.) to the energy consumed and subtracts the indoor fan heat from the load (which increases heating load and decreases cooling load).

DOE-2.2b-130 Wed Feb 12 14:57:23 1997BDL RUN 1

REPORT- SS-Q Heat Pump Cooling Summary for System 1

WEATHER FILE- LOS ANGELES, CA

UNIT RUN TIME (HOURS)	TOTAL LOAD ON UNIT (MBTU)	ENERGY IN TO UNIT (MBTU)	AUXILIARY ENERGY (MBTU)	SUP UNIT LOAD (MBTU)	SUP UNIT ENERGY (MBTU)	WASTE HEAT GENERATED (MBTU)	WASTE HEAT USE (MBTU)	INDOOR FAN ENERGY (MBTU)	
JAN	15.	1.527	0.463	0.018	0.000	0.000	0.000	0.000	1.545
FEB	10.	1.050	0.314	0.014	0.000	0.000	0.000	0.000	1.440
MAR	19.	2.074	0.613	0.012	0.000	0.000	0.000	0.000	1.744
APR	50.	5.323	1.600	0.001	0.000	0.000	0.000	0.000	2.185
MAY	100.	11.011	3.283	0.000	0.000	0.000	0.000	0.000	2.969
JUN	110.	12.232	3.641	0.000	0.000	0.000	0.000	0.000	3.192
JUL	166.	18.125	5.497	0.000	0.000	0.000	0.000	0.000	4.042
AUG	193.	20.744	6.454	0.000	0.000	0.000	0.000	0.000	4.272
SEP	152.	16.612	5.093	0.000	0.000	0.000	0.000	0.000	3.703
OCT	92.	9.943	3.003	0.001	0.000	0.000	0.000	0.000	2.903
NOV	42.	4.618	1.383	0.005	0.000	0.000	0.000	0.000	1.927
DEC	28.	2.950	0.919	0.029	0.000	0.000	0.000	0.000	1.810
ANNUAL	978.	106.208	32.263	0.080	0.000	0.000	0.000	0.000	31.733

CSPF (WITH PARASITICS) = 1.66 (KBTU/HR)  
 CSPF (WITHOUT PARASITICS) = 3.29 (BTU/BTU)

## **SS-R Zone Performance Summary for <system name>**

This report has been added to provide information on the part-load performance of VAV boxes in zones as well as to identify those zones that influence the WARMEST and COLDEST supply air reset controls.

### **ZONE OF MAXIMUM HTG DMND**

is the number of hours this zone has the highest heating demand of all the zones.

### **ZONE OF MAXIMUM CLG DMND**

is the number of hours this zone has the highest cooling demand of all the zones.

### **ZONE UNDER HEATED**

is the number of hours that the zone is being conditioned and the zone air temperature is below the heating thermostat throttling range.

### **ZONE UNDER COOLED**

is the number of hours that the zone is being conditioned and the zone air temperature is above the cooling thermostat throttling range.

### **Number of hours in each PART LOAD range**

is the number of hours the airflow part load ratio was in each bin, where the airflow part load ratio is defined as the hourly flow divided by the design flow as reported in SV-A

### **TOTAL RUN HOURS**

is the total number of hours in which there was a non-zero airflow into the zone.

Simple Structure Run 3, Chicago                      Divide into zones; add plenum                      DOE-2.2b-027    Fri Jan 9 15:25:08 1998BDL RUN 1  
Design-day sizing of VAV system                      Show All Reports  
REPORT- SS-R Zone Performance Summary for    SYST-1                      WEATHER FILE- TRY    CHICAGO

ZONE	ZONE OF MAXIMUM HTG DMND (HOURS)	ZONE OF MAXIMUM CLG DMND (HOURS)	ZONE UNDER HEATED (HOURS)	ZONE UNDER COOLED (HOURS)	Number of hours within each PART LOAD range											TOTAL RUN HOURS
					00 10	10 20	20 30	30 40	40 50	50 60	60 70	70 80	80 90	90 100	100 +	
ZONE1-1	0	0	17	0	0	0	0	2684	322	172	63	3	0	0	0	3244
ZONE2-1	0	0	17	0	0	0	0	2688	388	119	42	6	1	0	0	3244
ZONE3-1	0	0	21	0	0	0	0	2522	360	272	75	13	0	2	0	3244
ZONE4-1	0	0	35	0	0	0	0	2880	261	83	17	3	0	0	0	3244
ZONE5-1	0	0	31	12	0	0	0	2263	199	353	216	93	36	84	0	3244
<b>TOTAL</b>	0	0	121	12												

## SUPL Evap/ Desiccant Cooling for <system name>

This report is printed for each system that has a desiccant or evaporative cooling unit to supplement the mechanical cooling. These are systems for which the user has specified DESICCANT = LIQ-VENT-AIR-1, LIQ-VENT-AIR-2, or SOL-VENT-AIR-1; or EVAP-CL-TYPE = INDIRECT or INDIRECT-DIRECT. This report will not be printed for stand-alone desiccant or evaporative cooling systems (SYSTEM:TYPE = PTGSD or EVAP-COOL). In this case the usual SYSTEMS reports are used.

### TOTAL COOLING ENERGY

is the monthly sum of the energy (sensible and latent) removed by the supplemental unit from the supply air before it reaches the cooling coil.

### SENSIBLE COOLING ENERGY

is the monthly sum of the sensible energy removed by the supplemental unit.

### LATENT COOLING ENERGY

is the monthly sum of the latent energy removed by the supplemental unit.

### HOURS ON

is the total number of hours the unit was operating during the month.

### ELECTRIC ENERGY

is the monthly electrical consumption by the supplemental unit.

### GAS OIL ENERGY

is the fuel consumed by the supplemental unit for the month.

SMALL BAR/LOUGE DEMO DESICCANT & EVAPORATIVE COOLING DOE-2.1E-092 Wed Oct 8 16:41:48 1997SDL RUN 2  
 NEW FEATURES IN DOE2.1E RUN 2 SYSTEM 2: PKG ROOFTOP PSZ AC UNIT DESICCANT COOLING OF MIN OA  
 REPORT- SUPL SYSTEM SUPPLEMENTAL EVAPORATIVE OR DESICCANT COOLING FOR SYS1 WEATHER FILE- TRY CHICAGO

MONTH	TOTAL COOLING ENERGY (MBTU)	SENSIBLE COOLING ENERGY (MBTU)	LATENT COOLING ENERGY (MBTU)	HOURS ON	ELECTRIC ENERGY (KWH)	GAS OIL ENERGY (MBTU)
JAN	0.00000	0.00000	0.00000	0	0.	0.00000
FEB	0.00000	0.00000	0.00000	0	0.	0.00000
MAR	0.44183	0.12643	0.31541	29	17.	1.15190
APR	2.96209	1.60152	1.36056	204	116.	6.79351
MAY	3.90973	0.96668	2.94304	249	144.	9.95194
JUN	8.92682	2.58435	6.34247	533	307.	20.52970
JUL	13.88187	0.88956	12.99232	705	411.	31.03108
AUG	12.53177	0.90114	11.63064	671	391.	29.44838
SEP	5.70114	2.40156	3.29958	360	205.	12.66627
OCT	3.29700	1.76097	1.53603	226	128.	7.46790
NOV	0.52543	0.22485	0.30058	34	19.	1.22540
DEC	0.00000	0.00000	0.00000	0	0.	0.00000
TOTAL	52.17781	11.45708	40.72067	3011	1739.	120.26609



## **ERV Energy Recovery Summary for <system name>**

This report is printed for each system that has an energy recovery ventilator (ERV) that acts as a heat-recovery device between the the central exhaust and the outside air makeup. These are systems for which the user has specified RECOVER-EXHAUST = YES. The first set of items are design information:

### **AIRFLOW**

is the design airflow of the outdoor, exhaust, and purge airstreams.

### **POWER CONSUMPTION**

for ERVs with self-contained fans, is the electric energy used by the outside and exhaust fans. For heat wheels, is also the energy used by the motor that rotates the wheel.

### **PREHEAT**

is the capacity of the preheat coil, if any. Note that this preheat coil is not the same as the air-handler's preheat coil. This coil is used strictly to prevent frosting in the exhaust airstream.

The next set of items summarize performance:

### **SENSIBLE HEATING, COOLING**

is the sensible heating and cooling energy recovered.

### **TOTAL HEATING, COOLING**

is the total heating and cooling energy recovered, including latent.

### **EXCESS SENSIBLE HEATING, COOLING**

is the sensible heating and cooling energy recovered that is beyond that needed, and that results in overheating or overcooling of the mixed air.

### **POWER FANS&HX**

is the power of the fans and heat-wheel motor. If the ERV does not have self-contained fans, but instead relies upon the HVAC fans, this entry includes the HVAC fan energy penalty associated with the increased static pressure loss across the heat exchanger. *Note that other reports for HVAC fan energy do not include this penalty.*

### **PREHEAT HOT WATER, ELECTRIC**

is the preheat energy used to prevent condensation and/or frost build-up within the heat exchanger.

### **HOURS HEAT, COOL**

is the number of hours the ERV was operating in the heating mode (raising the mixed-air temperature), and in the cooling mode (lowering the mixed-air temperature). Note that, depending on the manner in which the ERV is controlled, the ERV may be in the heating mode while the air handler is in the cooling mode (using its cooling coil to lower the supply temperature). The opposite is also true.

### **EXHAUST OUTLET WET, FROSTED**

is the number of hours the exhaust air was cooled to the point where condensation or frost developed on the heat exchanger. For an enthalpy exchanger, moisture exchange may be contributing to this process.

**MAKE-UP OUTLET WET, FROSTED**

is the number of hours the outside air outlet was cooled to the point where condensation or frost developed on the heat exchanger. For an enthalpy exchanger, moisture exchange may be contributing to this process.

**CONDENSATE CONTROL**

is the number of hours that one of the condensate control mechanisms was active (preheat, outside-air bypass, or exhaust bypass).

ERV Example Report

DOE-2.2-42h 12/15/2003 16:44:20 BDL RUN 1

REPORT- ERV Energy Recovery Summary for: AHU-1

WEATHER FILE- Chicago IL TMY2

OUTDOOR (CFM)		AIR FLOW EXHAUST (CFM)		PURGE (CFM)		POWER CONSUMPTION OA FAN (KW)		EXH FAN (KW)		HT EXCH (KW)		PREHEAT (KBTU/HR)		
624.		624.		0.		0.191		0.191		0.053		0.		
SUM		SENSIBLE HEATING (MBTU)		COOLING (MBTU)		TOTAL HEATING (MBTU)		COOLING (MBTU)		EXCESS HEATING (MBTU)		SENSIBLE COOLING (MBTU)		
PEAK		(KBTU/HR)		(KBTU/HR)		(KBTU/HR)		(KBTU/HR)		(KBTU/HR)		(KBTU/HR)		
DAY/HR										POWER FANS&HX (KWH)		PREHEAT HOT WATER (MBTU)		
												ELECTRIC (KWH)		
												HOURS HEAT COOL		
JAN	SUM	-1.447	0.000	-1.972	0.000	0.000	0.000	0.000	0.000	69.166	0.000	0.000	172	0
	PEAK	-25.585	0.000	-38.649	0.000	0.000	0.000	0.000	0.000	0.434	0.000	0.000		
	DAY/HR	27/18	0/0	27/18	0/0	0/0	0/0	0/0	0/0	2/13	0/0	0/0		
FEB	SUM	-0.407	0.000	-0.482	0.000	0.000	0.000	0.000	0.000	45.812	0.000	0.000	116	0
	PEAK	-18.563	0.000	-18.651	0.000	0.000	0.000	0.000	0.000	0.424	0.000	0.000		
	DAY/HR	8/9	0/0	8/9	0/0	0/0	0/0	0/0	0/0	1/9	0/0	0/0		
MAR	SUM	-0.045	0.011	-0.052	0.003	0.000	0.000	0.000	0.000	20.515	0.000	0.000	49	3
	PEAK	-12.904	4.618	-13.329	2.515	0.000	0.000	0.000	0.000	0.434	0.000	0.000		
	DAY/HR	3/9	31/14	3/9	31/14	0/0	0/0	0/0	0/0	14/11	0/0	0/0		
APR	SUM	-0.044	0.010	-0.095	0.002	0.000	0.000	0.000	0.000	25.705	0.000	0.000	61	4
	PEAK	-5.095	3.125	-9.051	2.331	0.000	0.000	0.000	0.000	0.434	0.000	0.000		
	DAY/HR	1/11	7/14	18/18	3/14	0/0	0/0	0/0	0/0	1/11	0/0	0/0		
MAY	SUM	-0.050	0.169	-0.117	0.116	0.000	0.000	0.000	0.000	34.665	0.000	0.000	47	37
	PEAK	-5.576	7.531	-8.621	16.570	0.000	0.000	0.000	0.000	0.434	0.000	0.000		
	DAY/HR	15/11	5/14	13/16	30/18	0/0	0/0	0/0	0/0	3/12	0/0	0/0		
JUN	SUM	-0.007	0.439	-0.011	0.937	0.000	0.000	0.000	0.000	37.718	0.000	0.000	3	84
	PEAK	-3.483	7.717	-6.020	24.328	0.000	0.000	0.000	0.000	0.434	0.000	0.000		
	DAY/HR	24/11	6/17	24/11	20/15	0/0	0/0	0/0	0/0	3/13	0/0	0/0		
JUL	SUM	0.000	0.633	0.000	1.711	0.000	0.000	0.000	0.000	43.884	0.000	0.000	0	101
	PEAK	0.000	10.188	0.000	26.274	0.000	0.000	0.000	0.000	0.434	0.000	0.000		
	DAY/HR	0/0	9/17	0/0	2/15	0/0	0/0	0/0	0/0	1/11	0/0	0/0		
AUG	SUM	-0.001	0.276	0.000	1.010	0.000	0.000	0.000	0.000	29.463	0.000	0.000	2	66
	PEAK	-0.937	6.194	-0.343	31.642	0.000	0.000	0.000	0.000	0.434	0.000	0.000		
	DAY/HR	19/9	21/15	19/9	4/17	0/0	0/0	0/0	0/0	1/13	0/0	0/0		
SEP	SUM	-0.019	0.149	-0.030	0.249	0.000	0.000	0.000	0.000	22.103	0.000	0.000	23	30
	PEAK	-4.313	7.966	-7.154	14.486	0.000	0.000	0.000	0.000	0.434	0.000	0.000		
	DAY/HR	30/11	27/17	30/11	6/14	0/0	0/0	0/0	0/0	4/14	0/0	0/0		
OCT	SUM	-0.104	0.007	-0.174	0.008	0.000	0.000	0.000	0.000	34.130	0.000	0.000	84	2
	PEAK	-7.651	3.746	-12.112	4.233	0.000	0.000	0.000	0.000	0.434	0.000	0.000		
	DAY/HR	15/11	4/16	15/11	4/16	0/0	0/0	0/0	0/0	4/15	0/0	0/0		
NOV	SUM	-0.048	0.000	-0.076	0.000	0.000	0.000	0.000	0.000	25.519	0.000	0.000	65	0
	PEAK	-4.145	0.000	-7.031	0.000	0.000	0.000	0.000	0.000	0.399	0.000	0.000		
	DAY/HR	13/11	0/0	13/11	0/0	0/0	0/0	0/0	0/0	26/13	0/0	0/0		
PowerDOE Default Minimum Project										DOE-2.2-42h 12/15/2003 16:44:20 BDL RUN 1				
REPORT- ERV Energy Recovery Summary for: VAV AH#1										WEATHER FILE- Chicago IL TMY2				
----- (CONTINUED) -----														
DEC	SUM	-0.397	0.000	-0.470	0.000	0.000	0.000	0.000	0.000	39.035	0.000	0.000	99	0
	PEAK	-28.248	0.000	-31.666	0.000	0.000	0.000	0.000	0.000	0.418	0.000	0.000		
	DAY/HR	31/9	0/0	31/11	0/0	0/0	0/0	0/0	0/0	31/9	0/0	0/0		
YR	SUM	-2.569	1.693	-3.479	4.035	0.000	0.000	0.000	0.000	427.715	0.000	0.000	721	327
	PEAK	-28.248	10.188	-38.649	31.642	0.000	0.000	0.000	0.000	0.434	0.000	0.000		
	MON/DAY	12/31	7/9	1/27	8/4	0/0	0/0	0/0	0/0	1/2	0/0	0/0		
ANNUAL HOURS:		EXHAUST WET		OUTLET FROSTED		MAKE-UP WET		OUTLET FROSTED		CONDENSATE CONTROL				
		0		4		0		3		7				

## REFG Refrigeration Equipment Summary in <system name>

This report gives monthly energy use for each system in which there is refrigerated case work.

### ZONAL SENSIBLE ENERGY

is the sensible heat gain to the zone from the refrigerated case work.

### ZONAL LATENT ENERGY

is the latent heat gain to the zone from the refrigerated case work.

### CONDENSER RECOVERED ENERGY

is the energy recovered from the condensers and used for space heating in the heat recovery mode.

### CONDENSER REJECTED ENERGY

is the energy rejected from the condensers.

### ELECTRIC COMPRESSOR ENERGY

is the electrical energy consumed by the compressors.

### ELECTRIC DEFROST ENERGY

is the electrical energy consumed by the defrosters.

### ELECTRIC AUXILIARY ENERGY

is the electrical energy consumed by lights, fans, and anti-sweat heaters in the refrigerated cases.

### ELECTRIC TOTAL ENERGY

is the total electric energy used by the refrigerated case work.

OFFICE BUILDING & DELI/RESTAURANT		ELECTROCHROMIC GLAZING IN ATRIUM		DOE-2.1E-092 Wed Oct 8 16:27:41 1997SDL RUN 3				
VAV SYSTEM IN OFFICE & PSZ IN ATRIUM		GAS ENGINE DRIVEN CHILLER & HEAT RECY		SAMP3.INP RUN 3				
REPORT- REFG	REFRIGERATION EQUIPMENT	SUMMARY IN	FS-SYS1	FOR ATZ1	WEATHER FILE- TRY	CHICAGO		
----- Z O N A L -----		- C O N D E N S E R -		----- E L E C T R I C -----				
MONTH	SENSIBLE ENERGY (MBTU)	LATENT ENERGY (MBTU)	RECOVERED ENERGY (MBTU)	REJECTED ENERGY (MBTU)	COMPRESSOR ENERGY (KWH)	DEFROST ENERGY (KWH)	AUXILIARY ENERGY (KWH)	TOTAL ENERGY (KWH)
JAN	-8.044	-0.205	6.872	8.454	1793.721	35.586	424.873	2254.171
FEB	-7.333	-0.139	6.118	7.759	1623.323	28.050	363.958	2015.326
MAR	-8.388	-0.384	6.356	9.848	1876.455	58.974	507.071	2442.493
APR	-8.317	-0.608	2.966	13.260	1837.378	84.105	515.206	2436.680
MAY	-8.497	-0.895	1.886	15.085	1908.137	115.087	521.514	2544.724
JUN	-8.742	-1.101	0.099	17.615	1980.749	136.389	516.831	2633.956
JUL	-9.068	-1.266	0.000	18.899	2173.137	154.434	528.234	2855.792
AUG	-9.032	-1.291	0.000	18.752	2132.244	157.062	528.234	2817.528
SEP	-8.495	-0.887	0.678	16.155	1874.964	113.648	510.110	2498.710
OCT	-8.406	-0.701	2.733	13.758	1860.607	94.491	520.973	2476.060
NOV	-7.877	-0.458	5.338	9.977	1763.958	67.666	481.192	2312.804
DEC	-8.047	-0.262	6.928	8.507	1806.185	46.456	467.373	2320.006
TOTAL	-100.245	-8.196	39.975	158.068	22630.859	1091.948	5885.571	29608.250

# PLANT-REPORT

## PV-A Plant Design Parameters

This report summarizes the design information for each component simulated in the central plant(s)

Simple Structure Run 3, Chicago      Divide into zones; add plenum      DOE-2.2b-027    Fri Jan 9 15:25:08 1998BDL RUN 1  
 Design-day sizing of VAV system      Show All Reports  
 REPORT- PV-A Plant Design Parameters      WEATHER FILE- TRY    CHICAGO

### \*\*\* CIRCULATION LOOPS \*\*\*

HEATING CAPACITY (MBTU/HR)	COOLING CAPACITY (MBTU/HR)	LOOP FLOW (GAL/MIN )	TOTAL HEAD (FT)	SUPPLY UA PRODUCT (BTU/HR-F)	SUPPLY LOSS DT (F)	RETURN UA PRODUCT (BTU/HR-F)	RETURN LOSS DT (F)	LOOP VOLUME ( GAL )	FLUID HEAT CAPACITY (BTU/LB-F)
Heating-Loop -0.430	0.000	21.5	36.6	0.0	0.00	0.0	0.00	32.3	1.00
Cooling-Loop 0.000	0.244	48.2	56.6	0.0	0.00	0.0	0.00	72.3	1.00

### \*\*\* PUMPS \*\*\*

ATTACHED TO	FLOW (GAL/MIN )	HEAD (FT)	HEAD SETPOINT (FT)	CAPACITY CONTROL	POWER (KW)	MECHANICAL EFFICIENCY (FRAC)	MOTOR EFFICIENCY (FRAC)
Heating-Pump Heating-Loop PRIMARY LOOP	1 PUMP(s) 21.5	43.9	0.0	ONE-SPEED	0.331	0.770	0.700
Cooling-Pump Cooling-Loop PRIMARY LOOP	1 PUMP(s) 48.2	67.9	0.0	ONE-SPEED	1.001	0.770	0.800

### \*\*\* PRIMARY EQUIPMENT \*\*\*

EQUIPMENT TYPE	ATTACHED TO	CAPACITY (MBTU/HR)	FLOW (GAL/MIN )	EIR (FRAC)	HIR (FRAC)	AUXILIARY (KW)
Boiler-1 HW-BOILER	Heating-Loop	-0.430	21.5	0.000	1.250	0.000
Chiller-1 ELEC-HERM-REC	Cooling-Loop	0.244	48.7	0.274	0.000	0.000

## Circulation-Loops

For each circulation loop simulated, the report lists the loop's U-name, and:

### HEATING CAPACITY

reports the non-coincident heating capacity. Depending on the value of the loop's SIZING-OPTION, the value represents either the sum of all loop demanders (SECONDARY), or loop suppliers (PRIMARY).

### COOLING CAPACITY

reports the non-coincident heating capacity. Depending on the value of the loop's SIZING-OPTION, the value represents either the sum of all loop demanders (SECONDARY), or loop suppliers (PRIMARY).

### LOOP FLOW

is the flow at the larger of the HEATING-CAPACITY or COOLING-CAPACITY, at the design loop temperature change.

### TOTAL HEAD

is the sum of the maximum demander head (friction and static), the piping head (friction and static), and maximum primary equipment head (friction and static).

**SUPPLY UA PRODUCT**

is the loss coefficient of the supply piping.

**SUPPLY LOSS DT**

is the design temperature change of the supply piping due to thermal losses.

**RETURN UA PRODUCT**

is the loss coefficient of the return piping.

**RETURN LOSS DT**

is the design temperature change of the return piping due to thermal losses.

**LOOP VOLUME**

is the volume of fluid within the circulation loop

**FLUID HEAT CAPACITY**

is the heat capacity of the fluid within the circulation loop – used to calculate the thermal effect of a change in supply/return temperature.

**Pumps**

For each pump simulated, the report lists the pump's U-name, the number of identical pumps, and:

**ATTACHED TO**

lists the U-Name of the circulation loop or the primary equipment unit (boiler, chiller, etc.) to which this pump is attached. Also listed is the function of the pump.

**FLOW**

is the design flow of the pump,

**HEAD**

is the design head of the pump

**HEAD SETPOINT**

is the user-specified head setpoint for the pump; should be non-zero only if a loop is powered by more than one pump attached to equipment (instead of directly to the loop), and the pumps must operate at different heads.

**CAPACITY CONTROL**

specifies the capacity control mechanism for the pump. ONE-SPEED implies that the pump simply rides its curve. TWO-SPEED implies that the pump has two-speeds, but will also ride its curve as required at a given speed. If more than one pump is specified, pumps will also stage.

**POWER**

is the design electrical power of the pump.

**MECHANICAL EFFICIENCY**

is the mechanical efficiency of the impeller.

**MOTOR EFFICIENCY**

is the efficiency of the pump's motor.

**Primary Equipment**

For each boiler or chiller simulated, the report lists the component's U-name, and:

**EQUIPMENT TYPE**

lists the type of equipment which is identical to the TYPE code-word originally specified by the user.

**ATTACHED TO**

lists the circulation-loop(s) to which the equipment is attached. If a component is attached to more than one loop, each loop will be listed.

**CAPACITY**

is the nominal supply capacity or demand load of the equipment, relative to the loop(s) to which it is attached. For example, an absorption chiller has a given capacity it can supply to a chilled-water loop, a demand on a hot-water loop, and an additional demand on a condenser-water loop.

**FLOW**

is the nominal flow of the component on the given attachment.

**EIR**

is the electric input ratio.

**HIR**

is the heat input ratio

**AUXILIARY**

is any auxiliary power required by the component.

## **PS-A Plant Energy Utilization**

This report shows monthly site energy use and demand for the central plant disaggregated into various categories. It also gives the total source energy. Thermal quantities are given in MBtu (English) or MWh (metric). Electrical quantities are given in MWh.

### **TOTAL HEAT LOAD**

Total heating energy that the plant must provide. It is calculated as load from SYSTEMS + load from PLANT (absorption chillers + steam turbines + heat dissipated from storage tanks + domestic hot water + heat stored in tanks but not used) + circulation loop losses. The values here are identical to those under HEATING ENERGY in the SS-D report (Building HVAC Load Summary) except that the heat energy delivered to an absorption chiller, steam turbine, domestic hot water, circulation-loop thermal losses, and pump heat is included. Also included is the heat input to a storage tank from a boiler.

### **TOTAL COOLING LOAD**

Total cooling energy that the plant must provide. It is equal to the value shown under COOLING ENERGY in the SS-D report plus tank and circulation loop losses, and pump heat.

### **TOTAL ELECTR LOAD**

Total electrical energy consumed by lights, equipment and system fans plus the additional energy consumed by chiller motors, pumps, cooling towers, and any other electrical site use.

### **RECVRED ENERGY**

Recovered heat used to reduce heating loads. It includes waste heat from turbines, diesels and chillers. It does not include the superheat of DX units recovered directly to domestic water heaters.

### **WASTED RECVRABL ENERGY**

Heat that could have been recovered if had there been a need for it.

### **FUEL INPUT COOLING**

Fuel used to drive engine chillers and gas fired absorption chiller/heaters, and regeneration fuel for desiccant cooling systems.

### **ELEC INPUT COOLING**

Electric energy used to drive chillers and to supply power to heat rejection equipment. It excludes pumps.

### **FUEL INPUT HEATING**

Fuel used for heating by boilers, furnaces and domestic water heaters.

### **ELEC INPUT HEATING**

Electrical energy used in association with supplying heating, including the electrical consumption by draft fans, electric boilers and electric domestic water heaters. It excludes pumps.

### **FUEL INPUT ELEC**

Fuel used by diesel and gas turbine generators.

### **TOTAL FUEL INPUT**

Total fuel use.





## PS-B Utility and Fuel Use Summary

This report shows the monthly total consumption and peak hourly consumption (and associated time of occurrence) for all of the electric meters, fuel meters, etc., including submeters.

Usage is displayed in the actual units of consumption (kWh, therms, etc.).

```

Simple Structure Run 3, Chicago          Divide into zones; add plenum          DOE-2.2b-027  Fri Jan  9 15:25:08 1998BDL RUN  1
Design-day sizing of VAV system        Show All Reports
REPORT- PS-B Utility and Fuel Use Summary                                     WEATHER FILE- TRY  CHICAGO
-----

```

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
EM1 ELECTRICITY													
KWH	3482.	3061.	3272.	3574.	3919.	4864.	6367.	5592.	4333.	3721.	2878.	3435.	48498.
MAX KW	13.1	13.1	17.5	22.7	26.9	30.4	35.0	29.7	27.6	18.9	13.1	13.1	35.0
DAY/HR	13/11	24/11	3/15	28/15	21/14	20/16	14/14	19/16	11/15	31/15	17/11	22/11	7/14
FUEL NATURAL-GAS													
THERM	588.	471.	270.	74.	14.	0.	0.	0.	7.	66.	225.	453.	2168.
MAX THERM/HR	4.0	3.7	3.8	2.8	1.9	0.0	0.0	0.0	1.9	2.9	3.5	3.8	4.0
DAY/HR	2/ 8	4/ 8	24/ 8	8/ 8	9/ 8	0/ 0	0/ 0	0/ 0	23/ 8	20/ 8	12/ 8	10/ 8	1/ 2

## PS-C Equipment Loads and Energy Use

For each central plant component, this report lists the unit's yearly heating and/or cooling load, the electrical and fuel consumption, and performance information in a bin format. This report is for the central plant equipment components only; report PS-D summarizes the performance of circulation loops.

Bin information is presented in terms of the number of hours the load, fuel consumption, etc. fell into the appropriate part load bin. The part load is calculated in terms of the hourly load divided by the design capacity or consumption.

### COOL LOAD

is the total cooling load placed on the component during the run. For cooling towers, the cooling load is the heat-rejection load.

### HEAT LOAD

is the total heating load placed on the component during the run.

### ELEC USED

is the total electrical demand of the component during the run.

### FUEL USED

is the total fuel demand of the component during the run. For consistency across components, fuel consumption is reported in Btu's rather than units of consumption, unlike the meter-based reports.

Simple Structure Run 3, Chicago                      Divide into zones; add plenum                      DOE-2.2b-027    Fri Jan 9 15:25:08 1998BDL RUN 1  
Design-day sizing of VAV system                      Show All Reports  
REPORT- PS-C Equipment Loads and Energy Use                      WEATHER FILE- TRY CHICAGO

		COOL LOAD	HEAT LOAD	ELEC USE	FUEL USE	Number of hours within each PART LOAD range										TOTAL	
SUM		(MBTU)	(MBTU)	(KWH)	(MBTU)	00	10	20	30	40	50	60	70	80	90	100	RUN
MON	PEAK	(KBTU/HR)	(KBTU/HR)	(KW)	(KBTU/HR)	10	20	30	40	50	60	70	80	90	100	+	HOURS
-----																	
Boiler-1																	
SUM			-116.0		216.8	LOAD	713	765	235	50	41	30	13	0	0	0	1847
PEAK			-299.2		396.5	FUEL	231	741	568	177	35	46	45	4	0	0	1847
MON/DAY			1/ 2		1/ 2												
Chiller-1																	
SUM		84.3		8439.4		LOAD	166	234	195	198	161	98	40	26	1	0	1119
PEAK		201.3		18.9		ELEC	0	199	222	212	183	153	85	41	23	1	1119
MON/DAY		7/14		7/14													
Heating-Pump																	
SUM				713.3		FLOW	0	0	0	0	0	0	0	0	0	0	2158 2158
PEAK				0.3		RPM	0	0	0	0	0	0	0	0	0	0	2158 2158
MON/DAY				1/ 1		ELEC	0	0	0	0	0	0	0	0	0	0	2158 2158
Cooling-Pump																	
SUM				1119.8		FLOW	0	0	0	0	0	0	0	0	0	0	1119 1119
PEAK				1.0		RPM	0	0	0	0	0	0	0	0	0	0	1119 1119
MON/DAY				3/ 3		ELEC	0	0	0	0	0	0	0	0	0	0	1119 1119

## PS-D Circulation Loop Loads

This report summarizes the performance of all the circulation-loops. Only loop performance is reported here; report PS-C summarizes the performance of the primary equipment attached to the loops.

For each central plant component, this report lists the unit's yearly coil/process load (actual demands), the thermal heat gain of the piping, the net load including the effect of pump heat, and the overload, if any. Additional lines report the peaks of these quantities and the time the peak occurred.

Bin information is presented in terms of the number of hours the load, and flow fell into the appropriate part load bin. The part load ratio is calculated in terms of the hourly value divided by the design value.

Simple Structure Run 3, Chicago					Divide into zones; add plenum					DOE-2.2b-027 Fri Jan 9 15:25:08 1998BDL RUN 1							
Design-day sizing of VAV system					Show All Reports					WEATHER FILE- TRY CHICAGO							
REPORT- PS-D Circulation Loop Loads																	
		COIL LOAD	PIPE GAIN	NET LOAD	OVERLOAD	Number of hours within each PART LOAD range										TOTAL	
		(MBTU)	(MBTU)	(MBTU)	(MBTU)	00	10	20	30	40	50	60	70	80	90	100	RUN
MON	PEAK	(KBTU/HR)	(KBTU/HR)	(KBTU/HR)	(KBTU/HR)	10	20	30	40	50	60	70	80	90	100	+	HOURS
Heating-Loop																	
	SUM	-117.7	0.0	-116.0	0.0	HEAT	713	765	235	50	41	30	13	0	0	0	1847
	PEAK	-302.6	0.0	-299.2	0.0	FLOW	0	0	0	0	0	0	0	0	0	0	2158 2158
	MON/DAY	1/ 2	0/ 0	1/ 2	0/ 0												
Cooling-Loop																	
	SUM	81.3	0.0	84.3	0.0	COOL	156	217	191	207	166	115	50	16	1	0	1119
	PEAK	198.8	0.0	201.3	0.0	FLOW	0	0	0	0	0	0	0	0	0	0	1119 1119
	MON/DAY	7/14	0/ 0	7/14	0/ 0												

## **PS-E Energy End-Use Summary for all <Electric/Fuel> Meters**

There are up to four PS-E reports, one for electricity usage, one for fuel usage, one for steam utility usage (if one or more steam meters is defined), and one for chilled-water utility usage (if one or more chilled-water meters is defined). For each month, these reports list, for different end uses, the total usage, the peak usage, and the day/hour during which the peak occurred. Also listed, for each end-use, is that end-use's consumption at the time of the total peak consumption, and the percentage of the total peak that end-use represents.

No distinction is made between the various fuel types that may be present, or different electrical meters. However, the energy consumption of submeters is not double counted. In other words, this report summarizes the demands of meters that draw energy from utilities.

Fuel consumed by electric generators and consumed on-site is allocated to the building end-uses. However, the portion of fuel used to generate power that is sold to a utility, if any, is not allocated to any of these categories, but is included in the total. In this case, the total will not match the sum of the reported end-uses.

The end uses listed across the top of this report are as follows:

LIGHTS	Overhead lighting.
TASK LIGHTS	Task lighting.
MISC EQUIP	Plug loads.
SPACE HEATING	Space heating by boilers, furnaces, etc.)
SPACE COOLING	Space cooling by chillers, etc.
HEAT REJECT	Cooling towers and other heat rejection devices.
PUMPS & AUX	Circulation pumps and auxiliary power consumed by various components.
VENT FANS	Supply, return and exhaust fans.
REFRIG DISPLAY	Refrigerated display cases, and associated refrigeration systems.
HT PUMP SUPPLEM	Supplemental heat pump energy.
DOMESTIC HOT WTR	Domestic hot water.
EXT USAGE	Energy usage exterior to building, such as for exterior lighting.

The following descriptions are for electrical consumption. Identical descriptors apply to fuel, steam, and chilled-water meter reports.

### **kWh**

The total power consumed for each end-use during the month

### **Max kW**

The maximum power consumption for each end-use and total during the month. This is the peak consumption per end-use; the peak for a given end-use may not be coincident with the peak for the meter, or with the peaks for other end-uses. The meter's peak is in the last column.

## Day/Hr

The day and hour at which the peak and total end-use consumption occurred

## Peak Enduse

The power consumption of each end-use at the time of the meter's peak (coincident peak of all demands on the meter)

## Peak Pct

The percent of each end-use's consumption at the meter's peak.

Main Facility with shading

DOE-B2.2-031 7/03/2000 15:10:48 BDL RUN 1

REPORT- PS-E Energy End-Use Summary for all Electric Meters

WEATHER FILE- CZ10RV2 WYEC2

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
-----													
JAN													
KWH	141212.	0.	96675.	0.	51025.	568.	31795.	128810.	0.	0.	0.	0.	450087.
MAX KW	477.8	0.0	220.6	0.0	510.9	8.4	161.4	362.4	0.0	0.0	0.0	0.0	1740.7
DAY/HR	2/ 9	0/ 0	2/ 9	0/ 0	29/15	30/15	2/ 8	2/ 9	0/ 0	0/ 0	0/ 0	0/ 0	29/15
PEAK ENDUSE	477.8	0.0	220.6	0.0	510.9	8.2	161.4	361.9	0.0	0.0	0.0	0.0	
PEAK PCT	27.4	0.0	12.7	0.0	29.3	0.5	9.3	20.8	0.0	0.0	0.0	0.0	
FEB													
KWH	135851.	0.	91003.	0.	60000.	684.	33116.	113613.	0.	0.	0.	0.	434269.
MAX KW	477.8	0.0	220.6	0.0	468.2	6.9	161.4	362.5	0.0	0.0	0.0	0.0	1697.2
DAY/HR	1/ 9	0/ 0	1/ 9	0/ 0	7/14	6/12	1/ 9	7/17	0/ 0	0/ 0	0/ 0	0/ 0	7/14
PEAK ENDUSE	477.8	0.0	220.6	0.0	468.2	6.9	161.4	362.4	0.0	0.0	0.0	0.0	
PEAK PCT	28.2	0.0	13.0	0.0	27.6	0.4	9.5	21.4	0.0	0.0	0.0	0.0	
MAR													
KWH	186974.	0.	114574.	0.	65776.	754.	36467.	133184.	0.	0.	0.	0.	537729.
MAX KW	477.8	0.0	220.6	0.0	473.8	6.4	161.4	362.8	0.0	0.0	0.0	0.0	1702.5
DAY/HR	1/ 9	0/ 0	1/ 9	0/ 0	23/14	23/14	3/11	23/17	0/ 0	0/ 0	0/ 0	0/ 0	23/14
PEAK ENDUSE	477.8	0.0	220.6	0.0	473.8	6.4	161.4	362.6	0.0	0.0	0.0	0.0	
PEAK PCT	28.1	0.0	13.0	0.0	27.8	0.4	9.5	21.3	0.0	0.0	0.0	0.0	
APR													
KWH	156874.	0.	101780.	0.	78083.	1059.	37505.	123797.	0.	0.	0.	0.	499100.
MAX KW	477.8	0.0	220.6	0.0	498.0	8.1	161.4	363.2	0.0	0.0	0.0	0.0	1728.8
DAY/HR	2/ 9	0/ 0	2/ 9	0/ 0	27/15	25/15	2/ 7	5/17	0/ 0	0/ 0	0/ 0	0/ 0	27/15
PEAK ENDUSE	477.8	0.0	220.6	0.0	498.0	8.0	161.4	363.0	0.0	0.0	0.0	0.0	
PEAK PCT	27.6	0.0	12.8	0.0	28.8	0.5	9.3	21.0	0.0	0.0	0.0	0.0	
MAY													
KWH	141212.	0.	96675.	0.	103177.	1466.	46895.	128896.	0.	0.	0.	0.	518324.
MAX KW	477.8	0.0	220.6	0.0	523.6	9.3	161.4	363.7	0.0	0.0	0.0	0.0	1755.7
DAY/HR	1/ 9	0/ 0	1/ 9	0/ 0	7/16	11/15	1/ 6	7/16	0/ 0	0/ 0	0/ 0	0/ 0	7/16
PEAK ENDUSE	477.8	0.0	220.6	0.0	523.6	8.7	161.4	363.7	0.0	0.0	0.0	0.0	
PEAK PCT	27.2	0.0	12.6	0.0	29.8	0.5	9.2	20.7	0.0	0.0	0.0	0.0	
JUN													
KWH	136010.	0.	93209.	0.	138801.	2137.	52560.	128345.	0.	0.	0.	0.	551064.
MAX KW	477.8	0.0	220.6	0.0	598.8	9.4	161.4	365.9	0.0	0.0	0.0	0.0	1811.3
DAY/HR	1/ 9	0/ 0	1/ 9	0/ 0	25/19	25/14	1/10	25/16	0/ 0	0/ 0	0/ 0	0/ 0	25/14
PEAK ENDUSE	477.8	0.0	220.6	0.0	576.5	9.4	161.4	365.7	0.0	0.0	0.0	0.0	
PEAK PCT	26.4	0.0	12.2	0.0	31.8	0.5	8.9	20.2	0.0	0.0	0.0	0.0	
JUL													
KWH	137125.	0.	95478.	0.	157616.	2630.	51943.	124357.	0.	0.	0.	0.	569150.
MAX KW	477.8	0.0	220.6	0.0	649.8	12.0	161.4	368.1	0.0	0.0	0.0	0.0	1882.2
DAY/HR	2/ 9	0/ 0	2/ 9	0/ 0	27/10	13/17	2/ 8	9/16	0/ 0	0/ 0	0/ 0	0/ 0	27/10
PEAK ENDUSE	477.8	0.0	220.6	0.0	649.8	9.4	161.4	363.4	0.0	0.0	0.0	0.0	
PEAK PCT	25.4	0.0	11.7	0.0	34.5	0.5	8.6	19.3	0.0	0.0	0.0	0.0	
AUG													
KWH	123853.	0.	77579.	0.	166968.	2703.	57781.	134304.	0.	0.	0.	0.	563190.
MAX KW	477.8	0.0	157.6	0.0	749.4	11.6	161.4	366.9	0.0	0.0	0.0	0.0	1796.5
DAY/HR	1/15	0/ 0	1/13	0/ 0	7/12	14/15	1/ 6	13/16	0/ 0	0/ 0	0/ 0	0/ 0	14/15
PEAK ENDUSE	477.8	0.0	157.6	0.0	621.8	11.6	161.4	366.4	0.0	0.0	0.0	0.0	
PEAK PCT	26.6	0.0	8.8	0.0	34.6	0.6	9.0	20.4	0.0	0.0	0.0	0.0	

Main Facility with shading

DOE-B2.2-031 7/03/2000 15:10:48 BDL RUN 1

REPORT- PS-E Energy End-Use Summary for all Electric Meters

WEATHER FILE- CZ10RV2 WYEC2

----- (CONTINUED) -----

SEP													
KWH	127834.	0.	90814.	0.	125650.	1852.	48458.	118421.	0.	0.	0.	0.	513032.
MAX KW	477.8	0.0	220.6	0.0	620.0	10.8	161.4	368.5	0.0	0.0	0.0	0.0	1858.8
DAY/HR	4/ 9	0/ 0	4/ 9	0/ 0	24/15	24/15	1/ 7	24/14	0/ 0	0/ 0	0/ 0	0/ 0	24/15
PEAK ENDUSE	477.8	0.0	220.6	0.0	620.0	10.8	161.4	368.3	0.0	0.0	0.0	0.0	
PEAK PCT	25.7	0.0	11.9	0.0	33.4	0.6	8.7	19.8	0.0	0.0	0.0	0.0	
OCT													
KWH	141212.	0.	96675.	0.	110244.	1434.	46756.	129054.	0.	0.	0.	0.	525377.
MAX KW	477.8	0.0	220.6	0.0	600.4	7.8	161.4	365.4	0.0	0.0	0.0	0.0	1823.4
DAY/HR	1/ 9	0/ 0	1/ 9	0/ 0	3/18	18/15	1/ 9	15/15	0/ 0	0/ 0	0/ 0	0/ 0	2/17
PEAK ENDUSE	477.8	0.0	220.6	0.0	591.2	7.7	161.4	364.7	0.0	0.0	0.0	0.0	
PEAK PCT	26.2	0.0	12.1	0.0	32.4	0.4	8.9	20.0	0.0	0.0	0.0	0.0	
NOV													
KWH	131444.	0.	92012.	0.	68926.	853.	34454.	118747.	0.	0.	0.	0.	446438.
MAX KW	477.8	0.0	220.6	0.0	500.0	8.3	161.4	363.0	0.0	0.0	0.0	0.0	1719.0
DAY/HR	1/ 9	0/ 0	1/ 9	0/ 0	6/13	6/13	1/ 9	7/15	0/ 0	0/ 0	0/ 0	0/ 0	9/14
PEAK ENDUSE	477.8	0.0	220.6	0.0	489.9	6.7	161.4	362.7	0.0	0.0	0.0	0.0	
PEAK PCT	27.8	0.0	12.8	0.0	28.5	0.4	9.4	21.1	0.0	0.0	0.0	0.0	
DEC													
KWH	133515.	0.	94280.	0.	53490.	526.	32873.	123048.	0.	0.	0.	0.	437734.
MAX KW	477.8	0.0	220.6	0.0	454.1	5.9	161.4	362.5	0.0	0.0	0.0	0.0	1681.9
DAY/HR	3/ 9	0/ 0	3/ 9	0/ 0	28/15	28/15	1/10	26/ 9	0/ 0	0/ 0	0/ 0	0/ 0	28/15
PEAK ENDUSE	477.8	0.0	220.6	0.0	454.1	5.9	161.4	362.1	0.0	0.0	0.0	0.0	
PEAK PCT	28.4	0.0	13.1	0.0	27.0	0.4	9.6	21.5	0.0	0.0	0.0	0.0	
=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====
KWH	1693116.	0.	1140756.	0.	1179757.	16667.	510603.	1504578.	0.	0.	0.	0.	6045495.
MAX KW	477.8	0.0	220.6	0.0	749.4	12.0	161.4	368.5	0.0	0.0	0.0	0.0	1882.2
MON/DY	1/ 2	0/ 0	1/ 2	0/ 0	8/ 7	7/13	1/ 2	9/24	0/ 0	0/ 0	0/ 0	0/ 0	7/27
PEAK ENDUSE	477.8	0.0	220.6	0.0	649.8	9.4	161.4	363.4	0.0	0.0	0.0	0.0	
PEAK PCT	25.4	0.0	11.7	0.0	34.5	0.5	8.6	19.3	0.0	0.0	0.0	0.0	

## **TDV2 TDV Energy End-Use Summary for All <Electric/Fuel> Meters**

This report is a summation of the individual TDV3 reports that print for each electric and fuel meter. There are up to two TDV2 reports, one for electricity usage and one for fuel usage. This report prints automatically for electric and fuel meters whenever the PS-E reports are specified, and time-dependent valuation is enabled. Time-dependent valuation (TDV) is automatically enabled whenever the weather file is one of California's official compliance weather files; CZ01 thru CZ16 (See *Time-Dependent Valuation* in the Dictionary for more information). As California does not recognize steam or chilled-water utilities in compliance analysis, no reports are provided for those meter types.

No distinction is made between the various fuel types that may be present, or different electrical meters. However, the energy consumption of submeters is not double counted. In other words, this report summarizes the demands of meters that draw energy from utilities.

For each month, these reports list, for different TDV-weighted source end uses, the total usage, the peak usage, and the day/hour during which the peak occurred. Also listed, for each end-use, is the average load-weighted TDV multiplier for each end-use.

Fuel consumed by electric generators and consumed on-site is allocated to the building end-uses. However, the portion of fuel used to generate power that is sold to a utility, if any, is not allocated to any of these categories, but is included in the total. In this case, the total will not match the sum of the reported end-uses.

The end uses listed across the top of this report are as follows. By default, all exterior usage is excluded from this report, but end-use categories may be added or deleted via the MASTER-METERS:EXCLUDE-FROM-TDV keyword.

LIGHTS	Overhead lighting.
TASK LIGHTS	Task lighting.
MISC EQUIP	Plug loads.
SPACE HEATING	Space heating by boilers, furnaces, etc.)
SPACE COOLING	Space cooling by chillers, etc.
HEAT REJECT	Cooling towers and other heat rejection devices.
PUMPS & AUX	Circulation pumps and auxiliary power consumed by various components.
VENT FANS	Supply, return and exhaust fans.
REFRIG DISPLAY	Refrigerated display cases, and associated refrigeration systems.
HT PUMP SUPPLEM	Supplemental heat pump energy.
DOMESTIC HOT WTR	Domestic hot water.
EXT USAGE	Energy usage exterior to building, such as for exterior lighting.

The following descriptions are for electrical consumption. Identical descriptors apply to fuel reports.

### **TDV-MBTU**

The total site energy consumed for each end-use during the month, converted to 'TDV energy'. TDV energy is calculated hourly by taking the actual site energy consumed by an end-use, and multiplying by the hourly value of the California Energy Commission's 'TDV energy' multiplier. This multiplier roughly converts site energy to source energy, but takes into account the impact of season, outdoor temperature and time of day on the cost to produce and deliver the site energy.

### **Max TDV-MBtu**

The TDV energy for each end-use and total during the month. This is the peak consumption per end-use; the peak for a given end-use may not be coincident with the peak for the meter, or with the peaks for other end-uses. The meter's peak is in the last column.

### **Day/Hr**



The day and hour at which the peak and total end-use consumption occurred

### TDV-kBtu/kWh

The load-weighted average TDV energy factor for the month. This is calculated by summing the hourly site-energy consumption multiplied by the hourly TDV energy factor, and dividing by the sum of the site-energy consumption. Compared to the unweighted average value (next row), this value gives an indication of how heavily the power consumption of each end-use coincides with the time periods where the time-of-use penalty is the worst. For example, if the average monthly TDV factor is 18, and the load-weighted factor for the cooling end-use category is 35, this is an indication that the building is demanding the majority of its cooling energy during the on-peak times when the TDV factor is the greatest. Changes to the building and/or the HVAC system may be justified to reduce this impact.

Medium Office Building		Sample Output				DOE-2.2-44		9/24/2004		16:59:32		BDL RUN 1	
REPORT- TDV2 TDV Energy End-Use Summary for All Electric Meters											WEATHER FILE- CZ12RV2 WYEC2		
	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
JAN													
TDV-MBTU	189.1	0.0	94.6	0.0	10.2	0.0	13.5	33.1	0.0	0.0	0.0	0.0	340.5
MAX TDV-MBTU	0.75	0.00	0.38	0.00	0.15	0.00	0.07	0.23	0.00	0.00	0.00	0.00	1.41
DAY/HR	8/11	0/ 0	8/11	0/ 0	23/16	0/ 0	23/16	2/ 8	0/ 0	0/ 0	0/ 0	0/ 0	23/16
TDV-KBTU/KWH	17.07	0.00	17.07	0.00	17.13	0.00	17.11	17.07	0.00	0.00	0.00	0.00	17.07
FEB													
TDV-MBTU	164.2	0.0	82.1	0.0	17.4	0.0	13.4	28.2	0.0	0.0	0.0	0.0	305.3
MAX TDV-MBTU	0.72	0.00	0.36	0.00	0.32	0.00	0.08	0.14	0.00	0.00	0.00	0.00	1.54
DAY/HR	5/11	0/ 0	5/11	0/ 0	28/16	28/16	26/17	11/ 7	0/ 0	0/ 0	0/ 0	0/ 0	28/17
TDV-KBTU/KWH	16.33	0.00	16.33	0.00	16.46	16.30	16.40	16.35	0.00	0.00	0.00	0.00	16.34
MAR													
TDV-MBTU	170.0	0.0	85.0	0.0	22.0	0.0	14.8	29.1	0.0	0.0	0.0	0.0	320.9
MAX TDV-MBTU	0.67	0.00	0.34	0.00	0.31	0.00	0.08	0.12	0.00	0.00	0.00	0.00	1.46
DAY/HR	5/11	0/ 0	5/11	0/ 0	20/16	20/16	19/17	5/ 7	0/ 0	0/ 0	0/ 0	0/ 0	20/16
TDV-KBTU/KWH	15.24	0.00	15.24	0.00	15.35	15.48	15.29	15.27	0.00	0.00	0.00	0.00	15.25
APR													
TDV-MBTU	166.5	0.0	83.2	0.0	34.0	0.3	15.8	27.7	0.0	0.0	0.0	0.0	327.4
MAX TDV-MBTU	0.64	0.00	0.32	0.00	0.43	0.01	0.08	0.11	0.00	0.00	0.00	0.00	1.59
DAY/HR	1/14	0/ 0	1/14	0/ 0	30/17	30/17	30/14	30/17	0/ 0	0/ 0	0/ 0	0/ 0	30/17
TDV-KBTU/KWH	14.53	0.00	14.53	0.00	14.62	14.73	14.52	14.47	0.00	0.00	0.00	0.00	14.54
MAY													
TDV-MBTU	172.0	0.0	86.0	0.0	72.2	1.2	20.7	31.7	0.0	0.0	0.0	0.0	383.8
MAX TDV-MBTU	1.68	0.00	0.84	0.00	1.33	0.05	0.23	0.35	0.00	0.00	0.00	0.00	4.45
DAY/HR	30/17	0/ 0	30/17	0/ 0	30/17	30/17	31/16	30/17	0/ 0	0/ 0	0/ 0	0/ 0	30/17
TDV-KBTU/KWH	15.42	0.00	15.42	0.00	17.12	19.38	16.12	15.92	0.00	0.00	0.00	0.00	15.80
JUN													
TDV-MBTU	176.9	0.0	88.4	0.0	106.4	2.8	22.6	34.6	0.0	0.0	0.0	0.0	431.7
MAX TDV-MBTU	2.28	0.00	1.14	0.00	2.10	0.07	0.28	0.57	0.00	0.00	0.00	0.00	6.44
DAY/HR	17/17	0/ 0	17/17	0/ 0	17/17	17/17	17/17	17/17	0/ 0	0/ 0	0/ 0	0/ 0	17/17
TDV-KBTU/KWH	16.04	0.00	16.04	0.00	18.23	19.79	16.76	16.81	0.00	0.00	0.00	0.00	16.65
JUL													
TDV-MBTU	260.4	0.0	130.2	0.0	191.8	6.5	33.9	55.0	0.0	0.0	0.0	0.0	677.9
MAX TDV-MBTU	2.80	0.00	1.40	0.00	2.96	0.14	0.36	0.76	0.00	0.00	0.00	0.00	8.41
DAY/HR	24/17	0/ 0	24/17	0/ 0	24/17	24/16	24/17	24/17	0/ 0	0/ 0	0/ 0	0/ 0	24/17
TDV-KBTU/KWH	22.62	0.00	22.62	0.00	26.55	29.64	23.42	24.30	0.00	0.00	0.00	0.00	23.85
AUG													
TDV-MBTU	319.5	0.0	159.8	0.0	227.9	7.2	42.1	68.2	0.0	0.0	0.0	0.0	824.7
MAX TDV-MBTU	3.50	0.00	1.75	0.00	3.55	0.15	0.44	0.97	0.00	0.00	0.00	0.00	10.33
DAY/HR	20/17	0/ 0	20/17	0/ 0	20/17	20/17	20/17	7/17	0/ 0	0/ 0	0/ 0	0/ 0	20/17
TDV-KBTU/KWH	28.64	0.00	28.64	0.00	34.81	39.77	29.81	30.94	0.00	0.00	0.00	0.00	30.45
SEP													
TDV-MBTU	274.1	0.0	137.1	0.0	146.5	3.7	33.3	51.7	0.0	0.0	0.0	0.0	646.4
MAX TDV-MBTU	2.84	0.00	1.42	0.00	2.63	0.11	0.35	0.68	0.00	0.00	0.00	0.00	8.02
DAY/HR	4/17	0/ 0	4/17	0/ 0	4/17	4/17	4/17	4/17	0/ 0	0/ 0	0/ 0	0/ 0	4/17
TDV-KBTU/KWH	24.86	0.00	24.86	0.00	28.39	31.36	25.91	25.74	0.00	0.00	0.00	0.00	25.74



## **PS-F Energy End-Use Summary for <meter name>**

There is one PS-F report for each meter defined, whether electricity, fuel, steam, and/or chilled-water. For each month, these reports list, for different end uses, the total usage, the peak usage, and the day/hour during which the peak occurred. Also listed, for each end-use, is that end-use's consumption at the time of the total peak consumption, and the percentage of the total peak that end-use represents.

Fuel consumed by electric generators and consumed on-site is allocated to the building end-uses. However, the portion of fuel used to generate power that is sold to a utility, if any, is not allocated to any of these categories, but is included in the total. In this case, the total will not match the sum of the reported end-uses.

The end uses listed across the top of this report are as follows:

LIGHTS	Overhead lighting.
TASK LIGHTS	Task lighting.
MISC EQUIP	Plug loads.
SPACE HEATING	Space heating by boilers, furnaces, etc.)
SPACE COOLING	Space cooling by chillers, etc.
HEAT REJECT	Cooling towers and other heat rejection devices.
PUMPS & AUX	Circulation pumps and auxiliary power consumed by various components.
VENT FANS	Supply, return and exhaust fans.
REFRIG DISPLAY	Refrigerated display cases, and associated refrigeration systems.
HT PUMP SUPPLEM	Supplemental heat pump energy.
DOMESTIC HOT WTR	Domestic hot water.
EXT USAGE	Energy usage exterior to building, such as for exterior lighting.

The following descriptions are for electrical consumption. Identical descriptors apply to fuel, steam, and chilled-water meter reports.

### **kWh**

The total power consumed for each end-use during the month

### **Max kW**

The maximum power consumption for each end-use and total during the month. This is the peak consumption per end-use; the peak for a given end-use may not be coincident with the peak for the meter, or with the peaks for other end-uses. The meter's peak is in the last column.

### **Day/Hr**

The day and hour at which the peak and total end-use consumption occurred

### **Peak Enduse**

The power consumption of each end-use at the time of the meter's peak (coincident peak of all demands on the meter)

### **Peak Pct**

The percent of each end-use's consumption at the meter's peak.

### **Yearly Transformer Losses**

The electric power lost due to the transformer inefficiency.

Main Facility with shading

DOE-B2.2-031 7/03/2000 15:10:48 BDL RUN 1

REPORT- PS-F Energy End-Use Summary for EMI

WEATHER FILE- CZ10RV2 WYEC2

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
-----													
JAN													
KWH	141212.	0.	96675.	0.	51025.	568.	31795.	128810.	0.	0.	0.	0.	450087.
MAX KW	477.8	0.0	220.6	0.0	510.9	8.4	161.4	362.4	0.0	0.0	0.0	0.0	1740.7
DAY/HR	2/ 9	0/ 0	2/ 9	0/ 0	29/15	30/15	2/ 8	2/ 9	0/ 0	0/ 0	0/ 0	0/ 0	29/15
PEAK ENDUSE	477.8	0.0	220.6	0.0	510.9	8.2	161.4	361.9	0.0	0.0	0.0	0.0	
PEAK PCT	27.4	0.0	12.7	0.0	29.3	0.5	9.3	20.8	0.0	0.0	0.0	0.0	
FEB													
KWH	135851.	0.	91003.	0.	60000.	684.	33116.	113613.	0.	0.	0.	0.	434269.
MAX KW	477.8	0.0	220.6	0.0	468.2	6.9	161.4	362.5	0.0	0.0	0.0	0.0	1697.2
DAY/HR	1/ 9	0/ 0	1/ 9	0/ 0	7/14	6/12	1/ 9	7/17	0/ 0	0/ 0	0/ 0	0/ 0	7/14
PEAK ENDUSE	477.8	0.0	220.6	0.0	468.2	6.9	161.4	362.4	0.0	0.0	0.0	0.0	
PEAK PCT	28.2	0.0	13.0	0.0	27.6	0.4	9.5	21.4	0.0	0.0	0.0	0.0	
MAR													
KWH	186974.	0.	114574.	0.	65776.	754.	36467.	133184.	0.	0.	0.	0.	537729.
MAX KW	477.8	0.0	220.6	0.0	473.8	6.4	161.4	362.8	0.0	0.0	0.0	0.0	1702.5
DAY/HR	1/ 9	0/ 0	1/ 9	0/ 0	23/14	23/14	3/11	23/17	0/ 0	0/ 0	0/ 0	0/ 0	23/14
PEAK ENDUSE	477.8	0.0	220.6	0.0	473.8	6.4	161.4	362.6	0.0	0.0	0.0	0.0	
PEAK PCT	28.1	0.0	13.0	0.0	27.8	0.4	9.5	21.3	0.0	0.0	0.0	0.0	
APR													
KWH	156874.	0.	101780.	0.	78083.	1059.	37505.	123797.	0.	0.	0.	0.	499100.
MAX KW	477.8	0.0	220.6	0.0	498.0	8.1	161.4	363.2	0.0	0.0	0.0	0.0	1728.8
DAY/HR	2/ 9	0/ 0	2/ 9	0/ 0	27/15	25/15	2/ 7	5/17	0/ 0	0/ 0	0/ 0	0/ 0	27/15
PEAK ENDUSE	477.8	0.0	220.6	0.0	498.0	8.0	161.4	363.0	0.0	0.0	0.0	0.0	
PEAK PCT	27.6	0.0	12.8	0.0	28.8	0.5	9.3	21.0	0.0	0.0	0.0	0.0	
MAY													
KWH	141212.	0.	96675.	0.	103177.	1466.	46895.	128896.	0.	0.	0.	0.	518324.
MAX KW	477.8	0.0	220.6	0.0	523.6	9.3	161.4	363.7	0.0	0.0	0.0	0.0	1755.7
DAY/HR	1/ 9	0/ 0	1/ 9	0/ 0	7/16	11/15	1/ 6	7/16	0/ 0	0/ 0	0/ 0	0/ 0	7/16
PEAK ENDUSE	477.8	0.0	220.6	0.0	523.6	8.7	161.4	363.7	0.0	0.0	0.0	0.0	
PEAK PCT	27.2	0.0	12.6	0.0	29.8	0.5	9.2	20.7	0.0	0.0	0.0	0.0	
JUN													
KWH	136010.	0.	93209.	0.	138801.	2137.	52560.	128345.	0.	0.	0.	0.	551064.
MAX KW	477.8	0.0	220.6	0.0	598.8	9.4	161.4	365.9	0.0	0.0	0.0	0.0	1811.3
DAY/HR	1/ 9	0/ 0	1/ 9	0/ 0	25/19	25/14	1/10	25/16	0/ 0	0/ 0	0/ 0	0/ 0	25/14
PEAK ENDUSE	477.8	0.0	220.6	0.0	576.5	9.4	161.4	365.7	0.0	0.0	0.0	0.0	
PEAK PCT	26.4	0.0	12.2	0.0	31.8	0.5	8.9	20.2	0.0	0.0	0.0	0.0	
JUL													
KWH	137125.	0.	95478.	0.	157616.	2630.	51943.	124357.	0.	0.	0.	0.	569150.
MAX KW	477.8	0.0	220.6	0.0	649.8	12.0	161.4	368.1	0.0	0.0	0.0	0.0	1882.2
DAY/HR	2/ 9	0/ 0	2/ 9	0/ 0	27/10	13/17	2/ 8	9/16	0/ 0	0/ 0	0/ 0	0/ 0	27/10
PEAK ENDUSE	477.8	0.0	220.6	0.0	649.8	9.4	161.4	363.4	0.0	0.0	0.0	0.0	
PEAK PCT	25.4	0.0	11.7	0.0	34.5	0.5	8.6	19.3	0.0	0.0	0.0	0.0	
AUG													
KWH	123853.	0.	77579.	0.	166968.	2703.	57781.	134304.	0.	0.	0.	0.	563190.
MAX KW	477.8	0.0	157.6	0.0	749.4	11.6	161.4	366.9	0.0	0.0	0.0	0.0	1796.5
DAY/HR	1/15	0/ 0	1/13	0/ 0	7/12	14/15	1/ 6	13/16	0/ 0	0/ 0	0/ 0	0/ 0	14/15
PEAK ENDUSE	477.8	0.0	157.6	0.0	621.8	11.6	161.4	366.4	0.0	0.0	0.0	0.0	
PEAK PCT	26.6	0.0	8.8	0.0	34.6	0.6	9.0	20.4	0.0	0.0	0.0	0.0	
SEP													
KWH	127834.	0.	90814.	0.	125650.	1852.	48458.	118421.	0.	0.	0.	0.	513032.
MAX KW	477.8	0.0	220.6	0.0	620.0	10.8	161.4	368.5	0.0	0.0	0.0	0.0	1858.8
DAY/HR	4/ 9	0/ 0	4/ 9	0/ 0	24/15	24/15	1/ 7	24/14	0/ 0	0/ 0	0/ 0	0/ 0	24/15
PEAK ENDUSE	477.8	0.0	220.6	0.0	620.0	10.8	161.4	368.3	0.0	0.0	0.0	0.0	
PEAK PCT	25.7	0.0	11.9	0.0	33.4	0.6	8.7	19.8	0.0	0.0	0.0	0.0	

Main Facility with shading

DOE-B2.2-031 7/03/2000 15:10:48 BDL RUN 1

REPORT- PS-F Energy End-Use Summary for

EM1

WEATHER FILE- CZ10RV2 WYEC2

----- (CONTINUED) -----

OCT

KWH	141212.	0.	96675.	0.	110244.	1434.	46756.	129054.	0.	0.	0.	0.	525377.
MAX KW	477.8	0.0	220.6	0.0	600.4	7.8	161.4	365.4	0.0	0.0	0.0	0.0	1823.4
DAY/HR	1/ 9	0/ 0	1/ 9	0/ 0	3/18	18/15	1/ 9	15/15	0/ 0	0/ 0	0/ 0	0/ 0	2/17
PEAK ENDUSE	477.8	0.0	220.6	0.0	591.2	7.7	161.4	364.7	0.0	0.0	0.0	0.0	
PEAK PCT	26.2	0.0	12.1	0.0	32.4	0.4	8.9	20.0	0.0	0.0	0.0	0.0	

NOV

KWH	131444.	0.	92012.	0.	68926.	853.	34454.	118747.	0.	0.	0.	0.	446438.
MAX KW	477.8	0.0	220.6	0.0	500.0	8.3	161.4	363.0	0.0	0.0	0.0	0.0	1719.0
DAY/HR	1/ 9	0/ 0	1/ 9	0/ 0	6/13	6/13	1/ 9	7/15	0/ 0	0/ 0	0/ 0	0/ 0	9/14
PEAK ENDUSE	477.8	0.0	220.6	0.0	489.9	6.7	161.4	362.7	0.0	0.0	0.0	0.0	
PEAK PCT	27.8	0.0	12.8	0.0	28.5	0.4	9.4	21.1	0.0	0.0	0.0	0.0	

DEC

KWH	133515.	0.	94280.	0.	53490.	526.	32873.	123048.	0.	0.	0.	0.	437734.
MAX KW	477.8	0.0	220.6	0.0	454.1	5.9	161.4	362.5	0.0	0.0	0.0	0.0	1681.9
DAY/HR	3/ 9	0/ 0	3/ 9	0/ 0	28/15	28/15	1/10	26/ 9	0/ 0	0/ 0	0/ 0	0/ 0	28/15
PEAK ENDUSE	477.8	0.0	220.6	0.0	454.1	5.9	161.4	362.1	0.0	0.0	0.0	0.0	
PEAK PCT	28.4	0.0	13.1	0.0	27.0	0.4	9.6	21.5	0.0	0.0	0.0	0.0	

KWH	1693116.	0.	1140756.	0.	1179757.	16667.	510603.	1504578.	0.	0.	0.	0.	6045495.
MAX KW	477.8	0.0	220.6	0.0	749.4	12.0	161.4	368.5	0.0	0.0	0.0	0.0	1882.2
MON/DY	1/ 2	0/ 0	1/ 2	0/ 0	8/ 7	7/13	1/ 2	9/24	0/ 0	0/ 0	0/ 0	0/ 0	7/27
PEAK ENDUSE	477.8	0.0	220.6	0.0	649.8	9.4	161.4	363.4	0.0	0.0	0.0	0.0	
PEAK PCT	25.4	0.0	11.7	0.0	34.5	0.5	8.6	19.3	0.0	0.0	0.0	0.0	

YEARLY TRANSFORMER LOSSES = 0.0 KWH

## **TDV3 TDV End-Use Summary for <meter name>**

This report is created automatically for each electric and fuel meter whenever the PS-F reports are specified, and time-dependent valuation is enabled. Time-dependent valuation (TDV) is automatically enabled whenever the weather file is one of California's official compliance weather files; CZ01 thru CZ16 (See *Time-Dependent Valuation* in the Dictionary for more information). As California does not recognize steam or chilled-water utilities in compliance analysis, no reports are provided for those meter types.

For each month, these reports list, for different TDV-weighted source end uses, the total usage, the peak usage, and the day/hour during which the peak occurred. Also listed, for each end-use, is the average load-weighted TDV multiplier for each end-use, and the unweighted maximum, minimum, and average TDV multiplier for the month. Fuel consumed by electric generators and consumed on-site is allocated to the building end-uses. However, the portion of fuel used to generate power that is sold to a utility, if any, is not allocated to any of these categories, but is included in the total. In this case, the total will not match the sum of the reported end-uses.

The end uses listed across the top of this report are as follows. By default, all exterior usage is excluded from this report, but end-use categories may be added or deleted via the MASTER-METERS:EXCLUDE-FROM-TDV keyword.

LIGHTS	Overhead lighting.
TASK LIGHTS	Task lighting.
MISC EQUIP	Plug loads.
SPACE HEATING	Space heating by boilers, furnaces, etc.)
SPACE COOLING	Space cooling by chillers, etc.
HEAT REJECT	Cooling towers and other heat rejection devices.
PUMPS & AUX	Circulation pumps and auxiliary power consumed by various components.
VENT FANS	Supply, return and exhaust fans.
REFRIG DISPLAY	Refrigerated display cases, and associated refrigeration systems.
HT PUMP SUPPLEM	Supplemental heat pump energy.
DOMESTIC HOT WTR	Domestic hot water.
EXT USAGE	Energy usage exterior to building, such as for exterior lighting.

The following descriptions are for electrical consumption. Identical descriptors apply to fuel reports.

### **TDV-MBTU**

The total site energy consumed for each end-use during the month, converted to 'TDV energy'. TDV energy is calculated hourly by taking the actual site energy consumed by an end-use, and multiplying by the hourly value of the California Energy Commission's 'TDV energy' multiplier. This multiplier roughly converts site energy to source energy, but takes into account the impact of season, outdoor temperature and time of day on the cost to produce and deliver the site energy.

### **Max TDV-MBtu**

The TDV energy for each end-use and total during the month. This is the peak consumption per end-use; the peak for a given end-use may not be coincident with the peak for the meter, or with the peaks for other end-uses. The meter's peak is in the last column.

### **Day/Hr**

The day and hour at which the peak and total end-use consumption occurred

### **TDV-kBtu/kWh**

The load-weighted average TDV energy factor for the month. This is calculated by summing the hourly site-energy consumption multiplied by the hourly TDV energy factor, and dividing by the sum of the site-energy consumption.

Compared to the unweighted average value (next row), this value gives an indication of how heavily the power consumption of each end-use coincides with the time periods where the time-of-use penalty is the worst. For example, if the average monthly TDV factor is 18, and the load-weighted factor for the cooling end-use category is 35, this is an indication that the building is demanding the majority of its cooling energy during the on-peak times when the TDV factor is the greatest. Changes to the building and/or the HVAC system may be justified to reduce this impact.

### **Unweighted Max/Min/Avg**

The maximum, minimum, and average TDV energy factor for the month. While the average reported in the row above is weighted by the actual loads, this average is simply the unweighted average per month. Comparing the load-weighted average with these values can give the user an idea of how heavily the consumption is weighted toward the on-peak times.

### **Yearly Transformer Losses**

The electric power lost due to the transformer inefficiency, converted to TDV energy.

Medium Office Building

Sample Output

DOE-2.2-44

9/20/2004

16:44:30 BDL RUN 1

REPORT- TDV3 TDV End-Use Summary for

EM1

WEATHER FILE- CZ12RV2 WYEC2

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
-----													
JAN													
TDV-MBTU	0.0	0.0	94.6	0.0	0.0	0.0	13.5	33.1	0.0	0.0	0.0	0.0	141.2
MAX TDV-MBTU	0.00	0.00	0.38	0.00	0.00	0.00	0.07	0.23	0.00	0.00	0.00	0.00	0.56
DAY/HR	0/ 0	0/ 0	8/11	0/ 0	0/ 0	0/ 0	23/16	2/ 8	0/ 0	0/ 0	0/ 0	0/ 0	2/ 9
TDV-KBTU/KWH	0.00	0.00	17.07	0.00	0.00	0.00	17.11	17.07	0.00	0.00	0.00	0.00	7.08
UNWEIGHTED													
MAX/MIN/AVG	19.36	13.33	16.26										
FEB													
TDV-MBTU	0.0	0.0	82.1	0.0	0.0	0.0	13.4	28.2	0.0	0.0	0.0	0.0	123.7
MAX TDV-MBTU	0.00	0.00	0.36	0.00	0.00	0.00	0.08	0.14	0.00	0.00	0.00	0.00	0.54
DAY/HR	0/ 0	0/ 0	5/11	0/ 0	0/ 0	28/16	26/17	11/ 7	0/ 0	0/ 0	0/ 0	0/ 0	26/17
TDV-KBTU/KWH	0.00	0.00	16.33	0.00	0.00	16.30	16.40	16.35	0.00	0.00	0.00	0.00	6.62
UNWEIGHTED													
MAX/MIN/AVG	18.44	12.92	15.57										
MAR													
TDV-MBTU	0.0	0.0	85.0	0.0	0.0	0.0	14.8	29.1	0.0	0.0	0.0	0.0	128.9
MAX TDV-MBTU	0.00	0.00	0.34	0.00	0.00	0.00	0.08	0.12	0.00	0.00	0.00	0.00	0.51
DAY/HR	0/ 0	0/ 0	5/11	0/ 0	0/ 0	20/16	19/17	5/ 7	0/ 0	0/ 0	0/ 0	0/ 0	19/17
TDV-KBTU/KWH	0.00	0.00	15.24	0.00	0.00	15.48	15.29	15.27	0.00	0.00	0.00	0.00	6.13
UNWEIGHTED													
MAX/MIN/AVG	17.14	12.35	14.61										
APR													
TDV-MBTU	0.0	0.0	83.2	0.0	0.0	0.3	15.8	27.7	0.0	0.0	0.0	0.0	126.9
MAX TDV-MBTU	0.00	0.00	0.32	0.00	0.00	0.01	0.08	0.11	0.00	0.00	0.00	0.00	0.52
DAY/HR	0/ 0	0/ 0	1/14	0/ 0	0/ 0	30/17	30/14	30/17	0/ 0	0/ 0	0/ 0	0/ 0	30/17
TDV-KBTU/KWH	0.00	0.00	14.53	0.00	0.00	14.73	14.52	14.47	0.00	0.00	0.00	0.00	5.64
UNWEIGHTED													
MAX/MIN/AVG	15.27	11.25	13.84										
MAY													
TDV-MBTU	0.0	0.0	86.0	0.0	0.0	1.2	20.7	31.7	0.0	0.0	0.0	0.0	139.6
MAX TDV-MBTU	0.00	0.00	0.84	0.00	0.00	0.05	0.23	0.35	0.00	0.00	0.00	0.00	1.43
DAY/HR	0/ 0	0/ 0	30/17	0/ 0	0/ 0	30/17	31/16	30/17	0/ 0	0/ 0	0/ 0	0/ 0	30/17
TDV-KBTU/KWH	0.00	0.00	15.42	0.00	0.00	19.38	16.12	15.92	0.00	0.00	0.00	0.00	5.75
UNWEIGHTED													
MAX/MIN/AVG	46.15	9.15	13.85										
JUN													
TDV-MBTU	0.0	0.0	88.4	0.0	0.0	2.8	22.6	34.6	0.0	0.0	0.0	0.0	148.4
MAX TDV-MBTU	0.00	0.00	1.14	0.00	0.00	0.07	0.28	0.57	0.00	0.00	0.00	0.00	2.06
DAY/HR	0/ 0	0/ 0	17/17	0/ 0	0/ 0	17/17	17/17	17/17	0/ 0	0/ 0	0/ 0	0/ 0	17/17
TDV-KBTU/KWH	0.00	0.00	16.04	0.00	0.00	19.79	16.76	16.81	0.00	0.00	0.00	0.00	5.73
UNWEIGHTED													
MAX/MIN/AVG	54.08	8.88	14.17										
JUL													
TDV-MBTU	0.0	0.0	130.2	0.0	0.0	6.5	33.9	55.0	0.0	0.0	0.0	0.0	225.7
MAX TDV-MBTU	0.00	0.00	1.40	0.00	0.00	0.14	0.36	0.76	0.00	0.00	0.00	0.00	2.65
DAY/HR	0/ 0	0/ 0	24/17	0/ 0	0/ 0	24/16	24/17	24/17	0/ 0	0/ 0	0/ 0	0/ 0	24/17
TDV-KBTU/KWH	0.00	0.00	22.62	0.00	0.00	29.64	23.42	24.30	0.00	0.00	0.00	0.00	7.94
UNWEIGHTED													
MAX/MIN/AVG	66.52	11.05	18.52										
AUG													
TDV-MBTU	0.0	0.0	159.8	0.0	0.0	7.2	42.1	68.2	0.0	0.0	0.0	0.0	277.3
MAX TDV-MBTU	0.00	0.00	1.75	0.00	0.00	0.15	0.44	0.97	0.00	0.00	0.00	0.00	3.27
DAY/HR	0/ 0	0/ 0	20/17	0/ 0	0/ 0	20/17	20/17	7/17	0/ 0	0/ 0	0/ 0	0/ 0	20/17
TDV-KBTU/KWH	0.00	0.00	28.64	0.00	0.00	39.77	29.81	30.94	0.00	0.00	0.00	0.00	10.24
UNWEIGHTED													
MAX/MIN/AVG	83.07	13.36	23.05										





## **PS-H Loads and Energy Usage for <loop name>**

For each circulation loop, this report summarizes relevant design information as well as monthly and yearly performance. This report is an expansion of the information provided in PV-A and PS-D; most of the information will be identical with the exception of the monthly performance. For this report to print, PS-H must be specified in PLANT-REPORTS, and the circulation loop's EQUIPMENT-REPORTS = YES.

The design information are the first entries in the report:

### **HEATING CAPACITY**

reports the non-coincident heating capacity. Depending on the value of the loop's SIZING-OPTION, the value represents either the sum of all loop demanders (SECONDARY), or loop suppliers (PRIMARY).

### **COOLING CAPACITY**

reports the non-coincident heating capacity. Depending on the value of the loop's SIZING-OPTION, the value represents either the sum of all loop demanders (SECONDARY), or loop suppliers (PRIMARY).

### **LOOP FLOW**

is the flow at the larger of the HEATING-CAPACITY or COOLING-CAPACITY, at the design loop temperature change.

### **TOTAL HEAD**

is the sum of the maximum demander head (friction and static), the piping head (friction and static), and maximum primary equipment head (friction and static).

### **SUPPLY UA PRODUCT**

is the loss coefficient of the supply piping.

### **SUPPLY LOSS DT**

is the design temperature change of the supply piping due to thermal losses.

### **RETURN UA PRODUCT**

is the loss coefficient of the return piping.

### **RETURN LOSS DT**

is the design temperature change of the return piping due to thermal losses.

### **LOOP VOLUME**

is the volume of fluid within the circulation loop

### **FLUID HEAT CAPACITY**

is the heat capacity of the fluid within the circulation loop. It is used to calculate the thermal effect of a change in supply/return temperature.

Following the design data is the monthly and yearly performance summary:

### **COIL LOAD**

is the total load of all demanders on the loop, including coils, primary equipment loads, and process loads.

**PIPE GAIN**

is the heat gain/loss of the piping.

**NET LOAD**

is the net load on the primary equipment, including the effects of thermal losses and pump heat.

**OVERLOAD**

is the load the circulation loop was unable to meet. Note that, even if the loop is highly overloaded, the overload reported here may not be very large. This is because the circulation loops feed overload information back up to the coils, so that the coil capacities (and supply air temperatures) become limited in subsequent hours (the program is not yet fully capable of iterating over the entire system to solve the problem in a single hour). This feedback to subsequent hours causes the zone temperatures to rise, which reduces the load, thereby reducing the “overload” on the central plant. As a result, it is important to review the performance data on the air-side of the HVAC system, particularly zone temperatures, to verify the overall performance of the HVAC system.

For each month and for the year, information is presented on the category total, peak monthly or yearly value, and the time when the peak occurred. Bin information is presented in terms of the number of hours the load, and flow fell into the appropriate part load bin. The part load bin is calculated in terms of the hourly value divided by the design value.

Simple Structure Run 3, Chicago      Divide into zones; add plenum      DOE-2.2b-027    Fri Jan 9 15:25:08 1998BDL RUN 1  
 Design-day sizing of VAV system      Show All Reports  
 REPORT- PS-H Loads and Energy Usage for      Heating-Loop      WEATHER FILE- TRY CHICAGO

		HEATING CAPACITY (MBTU/HR)	COOLING CAPACITY (MBTU/HR)	LOOP FLOW (GAL/MIN)	TOTAL HEAD (FT)	SUPPLY UA PRODUCT (BTU/HR-F)	SUPPLY LOSS DT (F)	RETURN UA PRODUCT (BTU/HR-F)	RETURN LOSS DT (F)	LOOP VOLUME (GAL)	FLUID HEAT CAPACITY (BTU/LB-F)							
		-0.430	0.000	21.5	36.6	0.0	0.00	0.0	0.00	32.3	1.00							
		COIL LOAD (MBTU)	PIPE GAIN (MBTU)	NET LOAD (MBTU)	OVERLOAD (MBTU)	----- Number of hours within each PART LOAD range -----										TOTAL RUN HOURS		
MON	PEAK	(KBTU/HR)	(KBTU/HR)	(KBTU/HR)	(KBTU/HR)	00	10	20	30	40	50	60	70	80	90	100	+	
JAN	SUM	-34.185	0.000	-33.886	0.000	HEAT 88	177	114	14	11	7	5	0	0	0	0	0	416
	PEAK	-302.628	0.000	-299.176	0.000	FLOW 0	0	0	0	0	0	0	0	0	0	0	0	416
	DAY/HR	2/ 8	0/ 0	2/ 8	0/ 0													
FEB	SUM	-26.459	0.000	-26.165	0.000	HEAT 78	221	45	12	4	8	4	0	0	0	0	0	372
	PEAK	-282.776	0.000	-279.307	0.000	FLOW 0	0	0	0	0	0	0	0	0	0	0	0	372
	DAY/HR	4/ 8	0/ 0	4/ 8	0/ 0													
MAR	SUM	-14.241	0.000	-14.036	0.000	HEAT 131	77	18	9	10	3	1	0	0	0	0	0	249
	PEAK	-288.752	0.000	-285.343	0.000	FLOW 0	0	0	0	0	0	0	0	0	0	0	0	259
	DAY/HR	24/ 8	0/ 0	24/ 8	0/ 0													
APR	SUM	-3.037	0.000	-2.912	0.000	HEAT 73	16	3	4	0	0	0	0	0	0	0	0	96
	PEAK	-165.791	0.000	-163.064	0.000	FLOW 0	0	0	0	0	0	0	0	0	0	0	0	170
	DAY/HR	8/ 8	0/ 0	8/ 8	0/ 0													
MAY	SUM	-0.417	0.000	-0.340	0.000	HEAT 23	2	0	0	0	0	0	0	0	0	0	0	25
	PEAK	-83.966	0.000	-82.054	0.000	FLOW 0	0	0	0	0	0	0	0	0	0	0	0	104
	DAY/HR	9/ 8	0/ 0	9/ 8	0/ 0													
JUN	SUM	0.000	0.000	0.000	0.000	HEAT 0	0	0	0	0	0	0	0	0	0	0	0	0
	PEAK	0.000	0.000	0.000	0.000	FLOW 0	0	0	0	0	0	0	0	0	0	0	0	17
	DAY/HR	0/ 0	0/ 0	0/ 0	0/ 0													
JUL	SUM	0.000	0.000	0.000	0.000	HEAT 0	0	0	0	0	0	0	0	0	0	0	0	0
	PEAK	0.000	0.000	0.000	0.000	FLOW 0	0	0	0	0	0	0	0	0	0	0	0	0
	DAY/HR	0/ 0	0/ 0	0/ 0	0/ 0													
AUG	SUM	0.000	0.000	0.000	0.000	HEAT 0	0	0	0	0	0	0	0	0	0	0	0	0
	PEAK	0.000	0.000	0.000	0.000	FLOW 0	0	0	0	0	0	0	0	0	0	0	0	4
	DAY/HR	0/ 0	0/ 0	0/ 0	0/ 0													
SEP	SUM	-0.239	0.000	-0.162	0.000	HEAT 9	1	0	0	0	0	0	0	0	0	0	0	10
	PEAK	-86.821	0.000	-80.548	0.000	FLOW 0	0	0	0	0	0	0	0	0	0	0	0	69
	DAY/HR	23/ 8	0/ 0	23/ 8	0/ 0													
OCT	SUM	-2.618	0.000	-2.499	0.000	HEAT 65	13	5	2	0	0	0	0	0	0	0	0	85
	PEAK	-176.753	0.000	-171.187	0.000	FLOW 0	0	0	0	0	0	0	0	0	0	0	0	144
	DAY/HR	20/ 8	0/ 0	20/ 8	0/ 0													
NOV	SUM	-11.372	0.000	-11.187	0.000	HEAT 127	69	15	3	4	5	0	0	0	0	0	0	223
	PEAK	-243.944	0.000	-240.548	0.000	FLOW 0	0	0	0	0	0	0	0	0	0	0	0	232
	DAY/HR	28/ 8	0/ 0	28/ 8	0/ 0													
DEC	SUM	-25.084	0.000	-24.791	0.000	HEAT 119	189	35	6	12	7	3	0	0	0	0	0	371
	PEAK	-278.370	0.000	-274.909	0.000	FLOW 0	0	0	0	0	0	0	0	0	0	0	0	371
	DAY/HR	26/ 8	0/ 0	26/ 8	0/ 0													
=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====
YR	SUM	-117.652	0.000	-115.978	0.000	HEAT 713	765	235	50	41	30	13	0	0	0	0	0	1847
	PEAK	-302.628	0.000	-299.176	0.000	FLOW 0	0	0	0	0	0	0	0	0	0	0	0	2158
	MON/DAY	1/ 2	0/ 0	1/ 2	0/ 0													

## **PS-H Loads and Energy Usage for <泵名>**

For each pump, this report summarizes relevant design information as well as monthly and yearly performance. This report is an expansion of the information provided in PV-A and PS-C; most of the information will be identical with the exception of the monthly performance. For this report to print, PS-H must be specified in PLANT-REPORTS, and the pump's EQUIPMENT-REPORTS = YES.

The first entry lists the number of pumps this component represents. All quantities are for the sum of all pumps represented by this component. The next entries are design information:

### **ATTACHED TO**

lists the U-Name of the circulation loop or the primary equipment unit (boiler, chiller, etc.) to which this pump is attached. Also listed is the function of the pump.

### **FLOW**

is the design flow of the pump,

### **HEAD**

is the design head of the pump

### **SETPOINT**

is the user-specified head setpoint for the pump; should be non-zero only if a loop is powered by more than one pump attached to equipment (instead of directly to the loop), and the pumps must operate at different heads.

### **CAPACITY CONTROL**

specifies the capacity control mechanism for the pump. ONE-SPEED implies that the pump simply rides its curve. TWO-SPEED implies that the pump has two-speeds, but will also ride its curve as required at a given speed. If more than one pump is specified, pumps will also stage.

### **POWER**

is the design electrical power of the pump.

### **MECHANICAL EFFICIENCY**

is the mechanical efficiency of the impeller.

### **MOTOR EFFICIENCY**

is the efficiency of the pump's motor.

Following the design data is the monthly and yearly performance summary:

### **HEAT GAIN**

is the heat gain to the pumped fluid caused by the action of the pump. All of the pump's energy is assumed to heat the fluid, other than the energy consumed in the motor inefficiency.

### **ENERGY USE**

is the electrical consumption of the pump's motor.

For each month and for the year, information is presented on the category total, peak monthly or yearly value, and the time when the peak occurred. Bin information is presented in terms of the number of hours the flow and power consumption fell into the appropriate part load bin. The part load bin is calculated in terms of the hourly value divided by the design value.

The final entry reports the number of hours the pump could not meet the flow requirement. Usually, this value will be non-zero only if the pump encounters an unexpectedly large head. The most common cause of this will be when a component such as a chiller is allocated more than its design flow. In this case, the head loss through the chiller may be substantially higher than design, and the pump may not be able to deliver the required flow at the resulting head. Refer to the Topics Manual for more information on allocating flow to primary equipment units.

Simple Structure Run 3, Chicago Divide into zones; add plenum DOE-2.2b-027 Fri Jan 9 15:25:08 1998BDL RUN 1  
 Design-day sizing of VAV system Show All Reports  
 REPORT- PS-H Loads and Energy Usage for Heating-Pump WEATHER FILE- TRY CHICAGO

NOTE: DATA BELOW IS FOR THE SUM OF 1 PUMP(S)

ATTACHED TO		FLOW (GAL/MIN )	HEAD (FT)	SETPPOINT (FT)	CAPACITY CONTROL	POWER (KW)	MECHANICAL EFFICIENCY (FRAC)	MOTOR EFFICIENCY (FRAC)	PART LOAD range							TOTAL RUN HOURS						
Heating-Loop PRIMARY LOOP		21.5	43.9	0.0	ONE-SPEED	0.331	0.770	0.700	00	10	20	30	40	50	60	70	80	90	100	+		
MON	SUM	HEAT GAIN (MBTU) (KBTU/HR)	ENERGY USE (KWH) (KW)						10	20	30	40	50	60	70	80	90	100				
JAN	SUM	0.3	137.5	FLOW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	416	416
	PEAK	0.790	0.331	RPM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	416	416
	DAY/HR	1/ 1	1/ 1	ELEC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	416	416
FEB	SUM	0.3	123.0	FLOW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	372	372
	PEAK	0.790	0.331	RPM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	372	372
	DAY/HR	1/16	1/16	ELEC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	372	372
MAR	SUM	0.2	85.6	FLOW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	259	259
	PEAK	0.790	0.331	RPM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	259	259
	DAY/HR	4/ 8	4/ 8	ELEC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	259	259
APR	SUM	0.1	56.2	FLOW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	170	170
	PEAK	0.790	0.331	RPM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	170	170
	DAY/HR	1/ 8	1/ 8	ELEC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	170	170
MAY	SUM	0.1	34.4	FLOW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	104	104
	PEAK	0.790	0.331	RPM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	104	104
	DAY/HR	1/ 9	1/ 9	ELEC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	104	104
JUN	SUM	0.0	5.6	FLOW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	17
	PEAK	0.790	0.331	RPM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	17
	DAY/HR	2/ 9	2/ 9	ELEC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	17
JUL	SUM	0.0	0.0	FLOW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	PEAK	0.000	0.000	RPM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	DAY/HR	0/ 0	0/ 0	ELEC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AUG	SUM	0.0	1.3	FLOW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4
	PEAK	0.790	0.331	RPM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4
	DAY/HR	4/ 9	4/ 9	ELEC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4
SEP	SUM	0.1	22.8	FLOW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	69	69
	PEAK	0.790	0.331	RPM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	69	69
	DAY/HR	2/ 9	2/ 9	ELEC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	69	69
OCT	SUM	0.1	47.6	FLOW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	144	144
	PEAK	0.790	0.331	RPM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	144	144
	DAY/HR	1/ 8	1/ 8	ELEC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	144	144
NOV	SUM	0.2	76.7	FLOW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	232	232
	PEAK	0.790	0.331	RPM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	232	232
	DAY/HR	3/ 9	3/ 9	ELEC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	232	232
DEC	SUM	0.3	122.6	FLOW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	371	371
	PEAK	0.790	0.331	RPM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	371	371
	DAY/HR	1/ 1	1/ 1	ELEC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	371	371
YR	SUM	1.7	713.3	FLOW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2158	2158
	PEAK	0.790	0.331	RPM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2158	2158
	MON/DAY	1/ 1	1/ 1	ELEC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2158	2158

Hours pump could not meet flow requirements: 0

## **PS-H Loads and Energy Usage for <equipment name>**

This report summarizes the performance of primary equipment components such as boilers, chillers, cooling towers, etc. The reports vary by component, but are very similar in format. This presentation uses a boiler as the example. For the component, this report summarizes relevant design information as well as monthly and yearly performance. This report is an expansion of the information provided in PV-A and PS-C; most of the information will be identical with the exception of the monthly performance. For this report to print, PS-H must be specified in PLANT-REPORTS, and the component's EQUIPMENT-REPORTS = YES.

The first set of data is design information:

### **EQUIPMENT TYPE**

lists the type of equipment which is identical to the TYPE code-word originally specified by the user.

### **ATTACHED TO**

lists the circulation-loop(s) to which the equipment is attached. If the component is attached to more than one loop, each loop will be listed.

### **CAPACITY**

is the nominal supply capacity or demand load of the equipment, relative to the loop(s) to which it is attached.

### **FLOW**

is the nominal flow of the component on the given attachment.

### **EIR**

is the electric input ratio.

### **HIR**

is the heat input ratio

### **AUXILIARY**

is any auxiliary power required by the component.

Following the design data is the monthly and yearly performance summary:

### **HEAT LOAD**

is the heating load this component supplies.

### **ELEC USE**

is the electrical use of an electric boiler element, or the draft fan, fuel pump, etc. of a fuel boiler.

### **FUEL USE**

is the fuel consumed by a fuel boiler.

### **AUX ENERGY**

is any energy specified by the component's AUX-KW keyword



For each month and for the year, information is presented on the category total, peak monthly or yearly value, and the time when the peak occurred. Bin information is presented in terms of the number of hours the load, electric, and fuel consumption fell into the appropriate part load bin. The part load bin is calculated in terms of the hourly value divided by the design value.

Simple Structure Run 3, Chicago                      Divide into zones; add plenum                      DOE-2.2b-027    Fri Jan 9 15:25:08 1998BDL RUN 1  
 Design-day sizing of VAV system                      Show All Reports  
 REPORT- PS-H Loads and Energy Usage for              Boiler-1                      WEATHER FILE- TRY CHICAGO

EQUIPMENT TYPE		ATTACHED TO		CAPACITY (MBTU/HR)		FLOW (GAL/MIN)		EIR (FRAC)		HIR (FRAC)		AUXILIARY (KW)					
HW-BOILER		Heating-Loop		-0.430		21.5		0.000		1.250		0.000					
		HEAT LOAD (MBTU)	ELEC USE (KW)	FUEL USE (MBTU)	AUX ENERGY (KW)	Number of hours within each PART LOAD range										TOTAL RUN HOURS	
MON	SUM PEAK	(KBTU/HR)	(KW)	(KBTU/HR)	(KW)	00	10	20	30	40	50	60	70	80	90	100	+
JAN	SUM	-33.886	0.000	58.804	0.000	LOAD 88	177	114	14	11	7	5	0	0	0	0	416
	PEAK	-299.176	0.000	396.535	0.000	ELEC 0	0	0	0	0	0	0	0	0	0	0	0
	DAY/HR	2/ 8	0/ 0	2/ 8	0/ 0	FUEL 10	108	182	84	9	10	10	3	0	0	0	416
FEB	SUM	-26.165	0.000	47.102	0.000	LOAD 78	221	45	12	4	8	4	0	0	0	0	372
	PEAK	-279.307	0.000	374.429	0.000	ELEC 0	0	0	0	0	0	0	0	0	0	0	0
	DAY/HR	4/ 8	0/ 0	4/ 8	0/ 0	FUEL 22	132	159	34	7	5	13	0	0	0	0	372
MAR	SUM	-14.036	0.000	27.007	0.000	LOAD 131	77	18	9	10	3	1	0	0	0	0	249
	PEAK	-285.343	0.000	381.164	0.000	ELEC 0	0	0	0	0	0	0	0	0	0	0	0
	DAY/HR	24/ 8	0/ 0	24/ 8	0/ 0	FUEL 41	113	59	16	2	13	4	1	0	0	0	249
APR	SUM	-2.912	0.000	7.377	0.000	LOAD 73	16	3	4	0	0	0	0	0	0	0	96
	PEAK	-163.064	0.000	282.962	0.000	ELEC 0	0	0	0	0	0	0	0	0	0	0	0
	DAY/HR	8/ 8	0/ 0	8/ 8	0/ 0	FUEL 51	27	8	3	5	2	0	0	0	0	0	96
MAY	SUM	-0.340	0.000	1.418	0.000	LOAD 23	2	0	0	0	0	0	0	0	0	0	25
	PEAK	-82.054	0.000	187.941	0.000	ELEC 0	0	0	0	0	0	0	0	0	0	0	0
	DAY/HR	9/ 8	0/ 0	9/ 8	0/ 0	FUEL 15	7	2	1	0	0	0	0	0	0	0	25
JUN	SUM	0.000	0.000	0.000	0.000	LOAD 0	0	0	0	0	0	0	0	0	0	0	0
	PEAK	0.000	0.000	0.000	0.000	ELEC 0	0	0	0	0	0	0	0	0	0	0	0
	DAY/HR	0/ 0	0/ 0	0/ 0	0/ 0	FUEL 0	0	0	0	0	0	0	0	0	0	0	0
JUL	SUM	0.000	0.000	0.000	0.000	LOAD 0	0	0	0	0	0	0	0	0	0	0	0
	PEAK	0.000	0.000	0.000	0.000	ELEC 0	0	0	0	0	0	0	0	0	0	0	0
	DAY/HR	0/ 0	0/ 0	0/ 0	0/ 0	FUEL 0	0	0	0	0	0	0	0	0	0	0	0
AUG	SUM	0.000	0.000	0.000	0.000	LOAD 0	0	0	0	0	0	0	0	0	0	0	0
	PEAK	0.000	0.000	0.000	0.000	ELEC 0	0	0	0	0	0	0	0	0	0	0	0
	DAY/HR	0/ 0	0/ 0	0/ 0	0/ 0	FUEL 0	0	0	0	0	0	0	0	0	0	0	0
SEP	SUM	-0.162	0.000	0.653	0.000	LOAD 9	1	0	0	0	0	0	0	0	0	0	10
	PEAK	-80.548	0.000	186.145	0.000	ELEC 0	0	0	0	0	0	0	0	0	0	0	0
	DAY/HR	23/ 8	0/ 0	23/ 8	0/ 0	FUEL 5	4	0	1	0	0	0	0	0	0	0	10
OCT	SUM	-2.499	0.000	6.582	0.000	LOAD 65	13	5	2	0	0	0	0	0	0	0	85
	PEAK	-171.187	0.000	292.324	0.000	ELEC 0	0	0	0	0	0	0	0	0	0	0	0
	DAY/HR	20/ 8	0/ 0	20/ 8	0/ 0	FUEL 45	24	5	7	2	2	0	0	0	0	0	85
NOV	SUM	-11.187	0.000	22.500	0.000	LOAD 127	69	15	3	4	5	0	0	0	0	0	223
	PEAK	-240.548	0.000	354.393	0.000	ELEC 0	0	0	0	0	0	0	0	0	0	0	0
	DAY/HR	28/ 8	0/ 0	12/ 8	0/ 0	FUEL 38	128	33	8	6	5	5	0	0	0	0	223
DEC	SUM	-24.791	0.000	45.314	0.000	LOAD 119	189	35	6	12	7	3	0	0	0	0	371
	PEAK	-274.909	0.000	375.958	0.000	ELEC 0	0	0	0	0	0	0	0	0	0	0	0
	DAY/HR	26/ 8	0/ 0	10/ 8	0/ 0	FUEL 4	198	120	23	4	9	13	0	0	0	0	371
=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====
YR	SUM	-115.978	0.000	216.756	0.000	LOAD 713	765	235	50	41	30	13	0	0	0	0	1847
	PEAK	-299.176	0.000	0.397	0.000	ELEC 0	0	0	0	0	0	0	0	0	0	0	0
	MON/DAY	1/ 2	0/ 0	1/ 2	0/ 0	FUEL 231	741	568	177	35	46	45	4	0	0	0	1847

## **PS-H Loads and Energy Usage for <GLHX name>**

This report summarizes the performance of ground-loop heat-exchangers. For the component, this report summarizes relevant design information as well as monthly and yearly performance. This report is an expansion of the information provided in PV-A and PS-C; most of the information will be identical with the exception of the monthly performance. For this report to print, PS-H must be specified in PLANT-REPORTS, and the component's EQUIPMENT-REPORTS = YES.

### **U-TUBE FLOW**

is the nominal flow of fluid through a single well.

### **U-TUBE VELOCITY**

is the fluid velocity through a single well. Applies only to types that allow the inside pipe diameter to be specified.

### **U-TUBE HEAD**

is the head of the heat-exchanger

### **BOREHOLE RESISTANCE**

is the resistance between the fluid and the far ground. Applies only to types that calculate this parameter.

Following the design data is the monthly and yearly performance summary:

### **COOL LOAD**

is the cooling load this component supplies.

### **HEAT LOAD**

is the heating load this component supplies.

For each month and for the year, information is presented on the category total, peak monthly or yearly value, and the time when the peak occurred.

Temperature bin information is presented in terms of the number of hours the leaving fluid temperature fell into the appropriate temperature bin, for operation in the cooling mode and heating mode respectively. Maximum/minimum temperatures encountered are also reported.

Demonstration GLHX system

DOE-2.2-44d6 4/13/2007 16:17:37 BDL RUN 1

REPORT- PS-H Loads and Energy Usage for GLHX (VertWell-CM) WEATHER FILE- Chicago IL TMY2

		U-TUBE FLOW (GPM)	U-TUBE VELOCITY (FT/S)	U-TUBE HEAD (FT)	BOREHOLE RESISTANCE (HR-FT-F/BTU)		Number of hours within each temperature range										TOTAL RUN HOURS	MAX SUPPLY (F)	MIN SUPPLY (F)	
		7.57	2.67	30.00	0.17365		20.0	30.0	40.0	50.0	60.0	70.0	80.0	90.0	100.0	110.0	120.0			
	SUM	0.808	-41.727	COOL	0	0	0	0	0	93	0	0	0	0	0	0	93	65.3	64.1	
	PEAK	38.011	-175.602	HEAT	0	0	0	0	0	651	0	0	0	0	0	0	651	64.8	60.8	
	DAY/HR	22/16	7/ 4																	
FEB	SUM	2.815	-23.399	COOL	0	0	0	0	0	183	0	0	0	0	0	0	183	66.4	63.6	
	PEAK	99.111	-135.047	HEAT	0	0	0	0	0	489	0	0	0	0	0	0	489	64.9	61.5	
	DAY/HR	22/17	11/ 4																	
MAR	SUM	13.025	-6.170	COOL	0	0	0	0	0	459	0	0	0	0	0	0	459	69.5	64.4	
	PEAK	244.424	-83.971	HEAT	0	0	0	0	0	285	0	0	0	0	0	0	285	65.3	63.1	
	DAY/HR	31/18	4/ 4																	
APR	SUM	56.879	0.000	COOL	0	0	0	0	0	663	57	0	0	0	0	0	720	72.7	65.7	
	PEAK	365.234	0.000	HEAT	0	0	0	0	0	0	0	0	0	0	0	0	0	-888.0	888.0	
	DAY/HR	27/17	0/ 0																	
MAY	SUM	143.443	0.000	COOL	0	0	0	0	0	220	524	0	0	0	0	0	744	79.1	67.4	
	PEAK	542.752	0.000	HEAT	0	0	0	0	0	0	0	0	0	0	0	0	0	-888.0	888.0	
	DAY/HR	22/18	0/ 0																	
JUN	SUM	208.664	0.000	COOL	0	0	0	0	0	0	680	40	0	0	0	0	720	82.0	72.0	
	PEAK	605.786	0.000	HEAT	0	0	0	0	0	0	0	0	0	0	0	0	0	-888.0	888.0	
	DAY/HR	15/17	0/ 0																	
JUL	SUM	247.058	0.000	COOL	0	0	0	0	0	0	530	214	0	0	0	0	744	84.5	73.5	
	PEAK	667.993	0.000	HEAT	0	0	0	0	0	0	0	0	0	0	0	0	0	-888.0	888.0	
	DAY/HR	13/18	0/ 0																	
AUG	SUM	218.676	0.000	COOL	0	0	0	0	0	0	551	193	0	0	0	0	744	84.5	75.4	
	PEAK	628.077	0.000	HEAT	0	0	0	0	0	0	0	0	0	0	0	0	0	-888.0	888.0	
	DAY/HR	2/18	0/ 0																	
SEP	SUM	157.436	0.000	COOL	0	0	0	0	0	0	635	85	0	0	0	0	720	83.4	72.8	
	PEAK	565.435	0.000	HEAT	0	0	0	0	0	0	0	0	0	0	0	0	0	-888.0	888.0	
	DAY/HR	5/17	0/ 0																	
OCT	SUM	70.854	0.000	COOL	0	0	0	0	0	0	743	0	0	0	0	0	743	78.9	71.2	
	PEAK	413.942	0.000	HEAT	0	0	0	0	0	0	0	0	0	0	0	0	0	-888.0	888.0	
	DAY/HR	4/17	0/ 0																	
NOV	SUM	16.988	-2.440	COOL	0	0	0	0	0	0	540	0	0	0	0	0	540	78.1	70.0	
	PEAK	362.050	-36.038	HEAT	0	0	0	0	0	96	84	0	0	0	0	0	180	70.9	69.5	
	DAY/HR	2/16	22/ 3																	
DEC	SUM	0.686	-32.617	COOL	0	0	0	0	0	86	9	0	0	0	0	0	95	70.1	68.8	
	PEAK	22.793	-163.741	HEAT	0	0	0	0	0	648	0	0	0	0	0	0	648	69.9	65.6	
	DAY/HR	12/14	31/24																	

Demonstration GLHX system DOE-2.2-44d6 4/13/2007 16:17:37 BDL RUN 1

REPORT- PS-H Loads and Energy Usage for GLHX (VertWell-CM) WEATHER FILE- Chicago IL TMY2

		(CONTINUED)																	
YR	SUM	1137.331	-106.353	COOL	0	0	0	0	0	1704	4269	532	0	0	0	0	6505	84.5	63.6
	PEAK	667.993	-175.602	HEAT	0	0	0	0	0	2169	84	0	0	0	0	0	2253	70.9	60.8
	MON/DAY	7/13	1/ 7																

NOTE: THE TEMPERATURE COUNTS ARE MADE ONLY FOR THE HOURS WHEN THE FANS AND HEAT PUMPS ARE ON

## **BEPS Building Energy Performance**

This report makes it possible to quickly review annual building energy use according to energy type (ELECTRICITY, NATURAL-GAS, etc.) and category of use (LIGHTS, SPACE HEATING, etc.). The energy types shown are those that you have specified with the ELEC-METER, FUEL-METER, STEAM-METER, and CHW-METER commands in PLANT. The categories of use (also called energy end uses) are defined under the description of Report PS-E.

The energy values in this report are all in the same units (MBtu in English units or MWh in metric units). This allows a direct comparison of end-use intensities. Report BEPU provides the same information as BEPS, but in “utility units,” such as kWh, therms, etc. Energy is reported only for meters that draw or supply power across the building boundary. The consumption of submeters is excluded, so that energy is not double-counted.

### **TOTAL SITE ENERGY**

is the overall energy use at the building site for all energy types and categories of use.

### **TOTAL SOURCE ENERGY**

is the energy use at point of production. It is obtained by dividing site energy use by the user-specified value of SOURCE-SITE-EFF in the FUEL-METER, ELEC-METER, STEAM-METER and CHW-METER commands.

Site and source energy are given per unit of net area (the sum of the floor areas of conditioned zones) and per unit of gross area (the value of GROSS-AREA in the BUILD-PARAMETERS command in LOADS, which defaults to net area).

When a hot or cold storage tank is present, a note is printed on the BEPS report stating that the hot water storage tank can get energy from many sources. Any time there is residual energy in the storage tanks, the totals in the BEPS report will not agree with those in report PS-B, because the BEPS report includes only the energy used for the above categories, whereas PS-B includes the energy that is left in the tanks as well.

### **PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE**

is the percentage of hours when the temperature in any conditioned zone is outside of the zone thermostat’s throttling range. This is a measure of the HVAC systems’ability to hold zone thermostat set points.

### **PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED**

is the percentage of hours that the central plant cannot meet the demand on the plant from the secondary systems. A large percentage here usually means that one or more pieces of primary equipment (boiler, chiller, etc.) is undersized.

Simple Structure Run 3, Chicago                      Divide into zones; add plenum                      DOE-2.2b-027    Fri Jan 9 15:25:08 1998BDL RUN 1  
 Design-day sizing of VAV system                      Show All Reports  
 REPORT- BEPS Building Energy Performance                      WEATHER FILE- TRY CHICAGO

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1 ELECTRICITY													
MBTU	74.7	0.0	44.7	0.0	28.8	0.0	6.3	11.0	0.0	0.0	0.0	0.0	165.5
FUEL NATURAL-GAS													
MBTU	0.0	0.0	0.0	216.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	216.8
MBTU	74.7	0.0	44.7	216.8	28.8	0.0	6.3	11.0	0.0	0.0	0.0	0.0	382.3

TOTAL SITE ENERGY                      382.28 MBTU                      76.5 KBTU/SQFT-YR GROSS-AREA                      76.5 KBTU/SQFT-YR NET-AREA  
 TOTAL SOURCE ENERGY                      713.33 MBTU                      142.7 KBTU/SQFT-YR GROSS-AREA                      142.7 KBTU/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 2.2  
 PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.0

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

## **TDV1 TDV Energy Performance Summary**

This report prints automatically whenever the BEPS report is specified, and time-dependent valuation is enabled. Time-dependent valuation (TDV) is automatically enabled whenever the weather file is one of California's official compliance weather files; CZ01 thru CZ16 (See *Time-Dependent Valuation* in the Dictionary for more information).

This report makes it possible to quickly review annual TDV energy use according to energy type (ELECTRICITY, NATURAL-GAS, or PROPANE) and category of use (LIGHTS, SPACE HEATING, etc.). The energy types shown are those that you have specified with the ELEC-METER and FUEL-METER commands. As California does not recognize steam or chilled-water in compliance analysis, no entries are provided for those meter types. Fuels other than natural gas or propane are recognized as being equivalent to propane. The categories of use (called energy end uses) are defined under the description of Report PS-E.

The energy values in this report are all in the same units (TDV-MBtu in English units or TDV-MWh in metric units). This allows a direct comparison of end-use intensities. Report BEPS provides the same information as TDV1, but in site units, and BEPU reports energy usage in "utility units," such as kWh, therms, etc. Energy is reported only for meters that draw or supply power across the building boundary. The consumption of submeters is excluded, so that energy is not double-counted.

### **TOTAL SITE ENERGY**

is the overall energy use at the building site for all energy types and categories of use.

### **TOTAL TDV SOURCE ENERGY**

The total site energy consumed for each end-use during the month, converted to 'TDV energy'. TDV energy is calculated hourly by taking the actual site energy consumed by an end-use, and multiplying by the hourly value of the California Energy Commission's 'TDV energy' multiplier. This multiplier roughly converts site energy to source energy, but takes into account the impact of season, outdoor temperature and time of day on the cost to produce and deliver the site energy.

Site and TDV energy are given per unit of net area (the sum of the floor areas of conditioned zones) and per unit of gross area (the value of GROSS-AREA in the BUILD-PARAMETERS command in LOADS, which defaults to net area).

### **PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE**

is the percentage of hours when the temperature in any conditioned zone is outside of the zone thermostat's throttling range. This is a measure of the HVAC systems' ability to hold zone thermostat set points.

### **PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED**

is the percentage of hours that the central plant cannot meet the demand on the plant from the secondary systems. A large percentage here usually means that one or more pieces of primary equipment (boiler, chiller, etc.) is undersized.

Medium Office Building

Sample Output

DOE-2.2-44

9/20/2004

16:44:30

BDL RUN 1

REPORT- TDV1 TDV Energy Performance Summary

WEATHER FILE- CZ12RV2 WYEC2

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1 ELECTRICITY													
TDV-MBTU	0.0	0.0	1241.6	0.0	0.0	22.9	262.3	461.0	0.0	0.0	0.0	0.0	1987.8
FM1 NATURAL-GAS													
TDV-MBTU	0.0	0.0	0.0	471.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	471.3
TDV-MBTU	0.0	0.0	1241.6	471.3	0.0	22.9	262.3	461.0	0.0	0.0	0.0	0.0	2459.1

TOTAL SITE ENERGY 779.95 MBTU 25.0 KBTU/SQFT-YR GROSS-AREA 25.0 KBTU/SQFT-YR NET-AREA  
TOTAL TDV ENERGY 2459.14 MBTU 78.8 KBTU/SQFT-YR GROSS-AREA 78.8 KBTU/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 3.3  
PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.0

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

## **BEPU Building Utility Performance**

This report is identical to the BEPS report, except that the end use breakdown for each of the energy types is given in the actual units of consumption, such as kWh or therms. In addition, the total site energy consumption (TOTAL ELECTRICITY, TOTAL NATURAL-GAS, etc.) is given for each energy type.

Note that report PS-A groups heat rejection energy with cooling, while BEPS, BEPU, PS-E, and PS-F report heat rejection energy as a separate category.

Simple Structure Run 3, Chicago                      Divide into zones; add plenum                      DOE-2.2b-027    Fri Jan 9 15:25:08 1998BDL RUN 1  
 Design-day sizing of VAV system                      Show All Reports  
 REPORT- BEPU Building Utility Performance                      WEATHER FILE- TRY CHICAGO

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1 ELECTRICITY													
KWH	21902.	0.	13094.	0.	8439.	0.	1833.	3230.	0.	0.	0.	0.	48498.
FUEL NATURAL-GAS													
THERM	0.	0.	0.	2168.	0.	0.	0.	0.	0.	0.	0.	0.	2168.

TOTAL ELECTRICITY	48498. KWH	9.700 KWH /SQFT-YR GROSS-AREA	9.700 KWH /SQFT-YR NET-AREA
TOTAL NATURAL-GAS	2168. THERM	0.434 THERM /SQFT-YR GROSS-AREA	0.434 THERM /SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 2.2  
 PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.0

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.



# ECONOMICS-REPORT

## EV-A Life-Cycle Costing Parameters

SIMPLE STRUCTURE RUN 3A, CHICAGO      INCREASED ROOF INSULATION  
 DESIGN-DAY SIZING OF VAV SYSTEM      SHOW ALL REPORTS  
 REPORT- EV-A LIFE-CYCLE COSTING PARAMETERS

### LIFE-CYCLE COSTING PARAMETERS

DISCOUNT RATE (PERCENT)	LABOR INFLATION RATE (PERCENT)	MATERIALS INFLATION RATE (PERCENT)	PROJECT LIFE (YRS)
5.0	0.0	0.0	25.0

### BUILDING COMPONENT COST INPUT DATA (CURRENT DOLLARS)

COST NAME	NUMBER OF UNITS	UNIT NAME	LIFE (YRS)	UNIT FIRST COST (\$)	UNIT INSTALL -ATION COST (\$)	UNIT ANNUAL MAINT COST (\$)	UNIT MINOR OVERHAUL COST (\$)	MINOR OVERHAUL INTERVAL (YRS)	UNIT MAJOR OVERHAUL COST (\$)	MAJOR OVERHAUL INTERVAL (YRS)
ROOF-INSUL	5000.0	SQFT	999.0	0.80	0.30	0.00	0.00	999.00	0.00	999.00

## LIFE-CYCLE COSTING PARAMETERS

This section echoes data entered in the BASELINE command. For a discussion of life-cycle costing methods and associated terminology see "Life-Cycle Costing" in the DOE-2.2 Topics Manual.

### DISCOUNT RATE

is the rate in percent used in calculating present value.

### LABOR INFLATION RATE

is the annual inflation rate (relative to general inflation) of labor cost, in percent. Installation, maintenance, and overhaul costs are inflated at this rate in calculating present values.

### MATERIALS INFLATION RATE

is the annual inflation rate (relative to general inflation) of material costs, in percent. Capital replacement costs are inflated at this rate in calculating present values.

### PROJECT LIFE

is the period, in years, over which the life-cycle cost analysis is performed. This number can range from 1 to 25 years.

## BUILDING COMPONENT COST INPUT DATA

This section echoes building (nonplant) component cost data input with each COMPONENT-COST command. The costs here are in current dollars, i.e., they correspond to the prices that apply at the start of the life-cycle analysis period.

**COST NAME**

is the U-name of the component.

**NUMBER OF UNITS**

multiplies all costs. Defaults to 1.0 if not specified.

**UNIT NAME**

is the name you assigned to the unit (such as SQFT or CUFT) to identify the size or type of the unit. This name is arbitrary and optional and is for user convenience only.

**LIFE**

is the life expectancy of the component, in years. It is used in calculating replacement costs. Defaults to 999 years if not specified.

**UNIT FIRST COST**

is the purchase price of each unit of the component, in dollars, exclusive of installation.

**UNIT INSTALLATION COST**

is the installation cost for each unit of the component, in dollars.

**UNIT ANNUAL MAINT COST**

is the yearly maintenance cost of each unit of the component, in dollars.

**UNIT MINOR OVERHAUL COST**

is the cost, in dollars, of a minor overhaul for each unit of the component.

**MINOR OVERHAUL INTERVAL**

is the number of years between minor overhauls.

**UNIT MAJOR OVERHAUL COST**

is the cost, in dollars, of a major overhaul for each unit of the component.

**MAJOR OVERHAUL INTERVAL**

is the number of years between major overhauls.

## **ES-A Annual Costs and Savings**

This report gives the present value of energy and operations costs for each year of the project lifetime. Costs are given both for the baseline and for the building being analyzed in the present run. Operations include costs of annual maintenance and major and minor overhauls. For the building being analyzed in this run, operations costs are given separately for plant equipment and for the building (non-plant) components specified using COMPONENT-COST instructions.

### **ENERGY COST BASELINE**

is the present value of the yearly baseline energy cost. These values echo those input using the BASELINE command.

### **ENERGY COST THIS RUN**

is the present value of the yearly energy cost for the building being analyzed in this run.

### **ENERGY COST SAVINGS**

is the difference between the above two quantities (1 minus 2).

### **OPRNS COST BASELINE**

is the present value of the yearly baseline operations cost.

### **OPRNS COST--THIS RUN**

gives the present value of the yearly operations cost for plant equipment and building components, and for the sum, for the building being analyzed in this run.

### **OPRNS COST SAVINGS**

is OPRNS COST BASELINE minus OPRNS COST--THIS RUN, TOTAL.

### **TOTAL SAVINGS-ENERGY PLUS OPRNS**

is the sum of ENERGY COST SAVINGS and OPRNS COST SAVINGS.

The bottom line of this report (TOTALS) gives the present value of the life cycle energy and operations costs and savings.

Note: You must enter baseline cost data using the BASELINE command. Otherwise, the "savings" values in this report will not be meaningful.

Simple Structure Run 3, Chicago  
 Design-day sizing of VAV system  
 REPORT- ES-A Annual Costs and Savings

Divide into zones; add plenum  
 Show All Reports

DOE-2.2-44a2 9/24/2004 18:18:14 BDL RUN 1

WEATHER FILE- TRY CHICAGO

YEAR	ENERGY ( \$ )			OPERATIONS ( \$ )				TOTAL SAVINGS- ENERGY PLUS OPRNS	
	ENERGY COST BASELINE	ENERGY COST THIS RUN	ENERGY COST SAVINGS	OPRNS COST BASELINE	OPRNS COST -- PLANT	THIS RUN BUILDING	OPRNS COST TOTAL		
1	4369.	4115.	254.	249.	249.	0.	249.	0.	254.
2	4431.	4177.	254.	238.	238.	0.	238.	0.	255.
3	4493.	4240.	253.	314.	226.	0.	226.	88.	341.
4	4557.	4305.	252.	216.	215.	0.	215.	1.	253.
5	4622.	4370.	252.	205.	205.	0.	205.	0.	251.
6	4688.	4437.	251.	272.	195.	0.	195.	77.	327.
7	4756.	4506.	250.	186.	186.	0.	186.	0.	250.
8	4824.	4575.	249.	412.	177.	0.	177.	235.	483.
9	4894.	4646.	248.	236.	169.	0.	169.	67.	315.
10	4966.	4718.	248.	161.	161.	0.	161.	0.	248.
11	5038.	4792.	246.	212.	153.	0.	153.	59.	305.
12	5113.	4867.	246.	146.	146.	0.	146.	0.	246.
13	5188.	4944.	244.	139.	139.	0.	139.	0.	245.
14	5265.	5022.	243.	828.	132.	0.	132.	696.	939.
15	5344.	5101.	243.	126.	126.	0.	126.	0.	243.
16	5424.	5182.	242.	279.	120.	0.	120.	159.	401.
17	5505.	5264.	241.	159.	114.	0.	114.	45.	285.
18	5588.	5348.	240.	109.	109.	0.	109.	0.	240.
19	5673.	5434.	239.	104.	104.	0.	104.	0.	239.
20	5759.	5521.	238.	531.	99.	0.	99.	432.	670.
21	5847.	5610.	237.	94.	94.	0.	94.	0.	237.
22	5936.	5701.	235.	124.	90.	0.	90.	34.	270.
23	6027.	5793.	234.	85.	85.	0.	85.	0.	234.
24	6120.	5887.	233.	189.	81.	0.	81.	108.	341.
25	6215.	5983.	232.	108.	77.	0.	77.	31.	263.
TOTALS(\$)	130642.	124539.	6103.	5722.	3691.	0.	3691.	2031.	8134.

## **ES-B Life-Cycle Non-Energy Costs**

This report summarizes life cycle costs (other than for energy) for plant equipment and for each building component.

### **FIRST COST**

is the initial purchase price, including installation.

### **REPLACEMENTS**

is the present value of the life-cycle replacement costs.

### **OPERATIONS**

is the present value of the life-cycle cost for annual maintenance and major and minor overhauls.

### **TOTAL**

gives the sum of the previous three quantities.

### **INVESTMENT**

is the sum of the first two quantities, FIRST COST and REPLACEMENTS. Note that the investment does not include operations or energy costs.

Simple Structure Run 3, Chicago      Divide into zones; add plenum      DOE-2.2-44a2    9/24/2004    18:18:14    BDL RUN 1  
 Design-day sizing of VAV system      Show All Reports  
 REPORT- ES-B Life-Cycle Non-Energy Costs      WEATHER FILE- TRY    CHICAGO

#### LIFE-CYCLE BUILDING AND PLANT NON-ENERGY COSTS (\$)

COST NAME	FIRST COST (INCLUDING INSTALLATION)	REPLACEMENTS	OPERATIONS	TOTAL	INVESTMENT (FIRST COST PLUS REPLACEMENTS)
ROOF-INSUL	5500.	0.	0.	5500.	5500.
PLANT EQUIPMENT	29273.	0.	3691.	32964.	29273.
TOTALS	34773.	0.	3691.	38464.	34773.

## **ES-C Life-Cycle Investment Savings**

### **ENERGY SAVINGS**

This section summarizes the annual energy use at the site and at the source for the baseline building and for the present building.

### **INVESTMENT STATISTICS:**

#### **INVESTMENT THIS RUN**

is the total investment associated with the present building. This number is the same as the total investment in building components and plant equipment given in Report ES-B.

The following quantities are meaningful only if baseline costs and energy use have been specified.

#### **BASELINE REPLACEMENT COSTS**

gives the present value of life-cycle replacement costs for the baseline. This quantity is specified by the keyword REPLACE-COST of the BASELINE command.

#### **INCREMENTAL INVESTMENT**

is the INVESTMENT THIS RUN minus the sum of BASELINE REPLACEMENT COSTS and BASELINE FIRST COST (as given below under OVERALL LIFE-CYCLE COSTS).

#### **COST SAVINGS**

is the present value of the life cycle savings in energy and operations costs. This number is also given in Report ES-A.

#### **RATIO OF SAVINGS TO INCREMENTAL INVESTMENT (SIR)**

gives dollars saved per dollar invested. It is the ratio of COST SAVINGS and INCREMENTAL INVESTMENT. If this ratio is greater than 1.0, the investment may be cost effective.

#### **DISCOUNTED PAYBACK PERIOD**

is the number of years it takes for the accumulated cost savings to equal the incremental investment. The shorter the payback period, the more cost effective is the investment.

#### **RATIO OF LIFE CYCLE ENERGY SAVINGS (AT SITE) TO INCREMENTAL INVESTMENT**

gives the life-cycle site energy saved per incremental investment dollar.

#### **RATIO OF LIFE CYCLE ENERGY SAVINGS (AT SOURCE) TO INCREMENTAL INVESTMENT**

gives the life-cycle source energy saved (in units of per incremental investment dollar).

### **OVERALL LIFE-CYCLE COSTS**

This section summarizes the life cycle costs and savings for the following categories: first cost (including installation), operations, replacements, energy, and sum of all these.

Simple Structure Run 3, Chicago                      Divide into zones; add plenum                      DOE-2.2-44a2    9/24/2004    18:18:14    BDL RUN 1  
 Design-day sizing of VAV system                      Show All Reports  
 REPORT- ES-C Life-Cycle Investment Savings                      WEATHER FILE- TRY    CHICAGO

ENERGY SAVINGS

	ANNUAL ENERGY USE BASELINE		ANNUAL ENERGY USE THIS RUN		ANNUAL ENERGY SAVINGS		ANNUAL ENERGY SAVINGS (PCT)
	(MBTU)	(MWH)	(MBTU)	(MWH)	(MBTU)	(MWH)	
AT SITE	363.93	106.63	318.47	93.31	45.46	13.32	12.5
AT SOURCE	709.67	207.93	671.09	196.63	38.58	11.30	5.4

INVESTMENT STATISTICS

PROJECT LIFE 25.0 YEARS

INVESTMENT THIS RUN (\$)	BASELINE REPLACEMENT COSTS (\$)	INCREMENTAL INVESTMENT (\$)	COST SAVINGS (\$)	RATIO OF SAVINGS TO INCREMENTAL INVESTMENT (SIR)	DISCOUNTED PAYBACK PERIOD (YEARS)	RATIO OF LIFE CYCLE ENERGY SAVINGS (AT SITE) TO INCREMENTAL INVESTMENT		RATIO OF LIFE-CYCLE ENERGY SAVINGS (AT SOURCE) TO INCREMENTAL INVESTMENT	
						(MBTU/\$)	(MWH/\$)	(MBTU/\$)	(MWH/\$)
34773.	0.	5475.	8134.	1.49	16.42	0.21	0.06	0.18	0.05

OVERALL LIFE-CYCLE COSTS (\$)

	FIRST COST	OPRNS COST	REPLACEMENTS	ENERGY COST	T O T A L
BASELINE	29298.	5722.	0.	130642.	165662.
THIS RUN	34773.	3691.	0.	124539.	163003.
SAVINGS (\$)	-5475.	2031.	0.	6103.	2659.
(PCT)	-18.7	35.5	0.0	4.7	1.6

## **ES-D Energy Cost Summary**

This report summarizes the yearly energy consumption and cost for all UTILITY-RATEs that have been defined.

### **UTILITY-RATE**

lists the U-name of each UTILITY-RATE.

### **RESOURCE**

lists the RESOURCE.

### **METERS**

lists the meter names for each UTILITY-RATE.

### **METERED ENERGY**

is the actual metered energy of the meters, not adjusted for any minimum energy requirements.

### **TOTAL CHARGE**

is the total yearly charge.

### **VIRTUAL RATE**

is the total yearly charge divided by the metered energy.

### **RATE USED ALL YEAR?**

If NO, the rate was not used for all 12 billing cycles, either because the rate did not qualify all months, the QUAL-SCH was not active all months, or the run period was less than 12 months.

### **ENERGY COST/ GROSS BLDG AREA**

### **ENERGY COST/ NET BLDG AREA**

give the energy cost per unit area. Here, gross building area is the value of the keyword GROSS-AREA in the BUILD-PARAMETERS command in LOADS. NET BLDG AREA is the sum of the floor areas of the conditioned zones. If not specified, GROSS-AREA defaults to NET BDLG AREA.

The program does a check to ensure that all energy passed from PLANT is accounted for in one or more UTILITY-RATEs. If not, or if double counting of energy has occurred, a warning will be printed at the bottom of this report.

```

Simple Structure Run 3, Chicago          Divide into zones; add plenum          DOE-2.2b-027  Fri Jan  9 15:25:08 1998BDL RUN  1
Design-day sizing of VAV system        Show All Reports
REPORT- ES-D Energy Cost Summary
                                         WEATHER FILE- TRY  CHICAGO
-----

```

UTILITY-RATE	RESOURCE	METERS	METERED ENERGY UNITS/YR	TOTAL CHARGE (\$)	VIRTUAL RATE (\$/UNIT)	RATE USED ALL YEAR?
ELEC-TARIFF	ELECTRICITY	EM1	48498. KWH	3059.	0.0631	YES
GAS-RATE	NATURAL-GAS	FUEL	2168. THERM	1301.	0.6000	YES
				=====		
				4360.		
				ENERGY COST/GROSS BLDG AREA:	0.87	
				ENERGY COST/NET BLDG AREA:	0.87	



## **ES-E Summary of Utility-Rate: <utility rate name>**

This report summarizes the key costs for each UTILITY-RATE. The top of the report contains general information regarding the UTILITY-RATE as input by the user or defaulted (see description of UTILITY-RATE keywords in the Command/Keyword Dictionary). The remainder of the report summarizes costs by month.

Note that the values listed here for consumption and demand will be the summed consumption and maximum demand passed through the meters (METERED ENERGY and DEMAND columns) with any minimums and ratchets applied (BILLING ENERGY and BILLING DEMAND columns) for this billing period. These may not represent the value used to calculate the billing periods energy or demand charge (ENERGY CHARGE and DEMAND CHARGE columns) due to TOU or SEASONAL schedules associated with charges. See Report ES-F for details on components of the energy and demand charge.

### **MONTH**

is the billing period ending with the BILLING-DAY.

### **METERED ENERGY**

is the energy in the meters as consumed in the building.

### **BILLING ENERGY**

is the energy used for billing purposes. This amount may be greater than the metered energy if a minimum energy qualifier is used. This amount will be 0.0 if the UTILITY-RATE did not qualify for this month.

### **METERED DEMAND**

is the maximum demand in the meters in this billing period as consumed in the building. The value will be either the hourly or daily demand as specified by the DEMAND-WINDOW.

### **BILLING DEMAND**

is the demand used for billing purposes. This amount may be either greater or less than the metered demand depending on the minimum demand qualifier and/or ratchets. This value will be 0.0 if the UTILITY-RATE did not qualify for this month.

### **ENERGY CHARGE**

are all energy charges, including BLOCK-CHARGES.

### **DEMAND CHARGE**

are all demand charges, including BLOCK-CHARGES.

### **ENERGY CST ADJ**

are the energy cost adjustments.

### **TAXES**

are the sum of per unit and percentage taxes.

### **SURCHRG**

are the sum of per unit and percentage surcharges.

### **FIXED CHARGE**



## **ES-F Block-Charges and Ratchets for <utility rate name>**

For each UTILITY-RATE this report summarizes the costs associated with each BLOCK-CHARGE, and the monthly RATCHET values. The summary varies somewhat for energy and demand BLOCK-CHARGEs.

### **BLOCK-CHARGES**

lists the U-name of each BLOCK-CHARGE.

### **JAN, FEB, etc.**

is the billing period ending at the BILLING-DAY of the parent UTILITY-RATE.

### **METERED ENERGY**

is the metered energy as passed to the BLOCK-CHARGE from the parent UTILITY-RATE for each billing period, and as modified by any BLOCK-SCH for actual activity. This value will be less than the value shown for the parent UTILITY-RATE in report ES-E if the BLOCK-CHARGE was not active the whole billing period.

### **BILLING ENERGY**

is the energy used for billing calculations. This value may be larger than the metered energy if a minimum energy qualifier is used. In addition, when costs are to be prorated between two blocks sharing the same billing period (i.e., when the season changes), this value is the total energy for the billing period.

### **PRORATE FACTOR**

is shown only if a block is not used for an entire billing period. It is the multiplier used to split the costs between two BLOCK-CHARGEs sharing the same billing period. For seasonal changes, it is the ratio of the total hours this BLOCK-CHARGE was active to the total hours in the billing period. For seasonal changes involving seasonal or time of use charges, it is the ratio of the total hours this BLOCK-CHARGE was active to the sum of these hours plus the active hours of the other BLOCK-CHARGE.

### **METERED DEMAND**

is the metered demand as passed to the BLOCK-CHARGE from the parent UTILITY-RATE for each billing period, and as modified by any BLOCK-SCH for actual activity.

### **BILLING DEMAND**

is the demand used for billing calculations. This value includes any minimum demands and also ratchets. For time of use blocks sharing a TOU-SEASON-LINK, the demand will be the maximum demand of either block when both share the same billing period.

### **ENERGY CHGS**

are the charges for the billing period. These charges are based on the billing energy, multiplied by any prorate factor shown.

### **TOTAL ENERGY**

is the total billing energy accounted for in all BLOCK-CHARGEs. If this value does not match the quantity shown in report ES-E for the parent UTILITY-RATE, a warning will be printed indicating whether the BLOCK-CHARGEs are undercounting or double counting energy.

### **TOTAL CHARGES**

are the total charges for energy and demand BLOCK-CHARGEs.

**RATCHETS**

is the U-name of each RATCHET.

**TYPE**

is the type of peak load calculation defined; the value is either PEAK or AVERAGE.

**JAN, FEB, etc.**

is the billing period ending on the BILLING-DAY. For each billing period, the value of the ratchet is listed. The user should review these values carefully to ensure that the ratchet is functioning as intended.

SIMPLE STRUCTURE RUN 3A, CHICAGO INCREASED ROOF INSULATION DOE-2.2b-027 Fri Jan 9 13:55:16 1998BDL RUN 1

REPORT- ES-F Block-Charges and Ratchets for ELEC-RATE

WEATHER FILE- Chicago IL TMY2

```

-----
UTILITY-RATE: ELEC-RATE
RESOURCE: ELECTRICITY
ENERGY-UNITS: KWH
DEMAND-UNITS: KW
DEMAND-WINDOW: 15
-----
BLOCK-CHARGES          JAN    FEB    MAR    APR    MAY    JUN    JUL    AUG    SEP    OCT    NOV    DEC    YEAR
-----
-
WINTER-OFF-PK          USE: TIME-OF-USE
METERED ENERGY:      297    248    241    200    96     0     0     0    126    205    234    263
BILLING ENERGY:      297    248    241    200    96     0     0     0    126    205    234    263    1909
METERED DEMAND:        9.7    9.5    7.1    3.0    1.4    0.0    0.0    0.0    17.2    2.7    4.5    9.2
BILLING DEMAND:        0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
ENERGY CHGS($):        12     10     10     8      4      0      0      0     5      8      9      11     76

WINTER-SHLDR           USE: TIME-OF-USE
METERED ENERGY:      1804   1554   1717   1820   999    0     0     0    1165   1978   1593   1723
BILLING ENERGY:      1804   1554   1717   1820   999    0     0     0    1165   1978   1593   1723   14352
METERED DEMAND:       14.3   14.1   15.4   20.2   24.9    0.0    0.0    0.0    25.4   21.1   14.1   14.1
BILLING DEMAND:        0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
ENERGY CHGS($):        81     70     77     82     45     0     0     0     52     89     72     78     646

WINTER-ON-PK           USE: TIME-OF-USE
METERED ENERGY:      1326   1145   1273   1417   869    0     0     0    1068   1665   1145   1266
BILLING ENERGY:      1326   1145   1273   1417   869    0     0     0    1068   1665   1145   1266   11174
METERED DEMAND:       13.6   13.6   16.6   19.2   25.5    0.0    0.0    0.0    27.2   21.7   13.6   13.6
BILLING DEMAND:        0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
ENERGY CHGS($):        66     57     64     71     43     0     0     0     53     83     57     63     559

SUMMER-OFF-PK          USE: TIME-OF-USE
METERED ENERGY:        0     0     0     0    119    326    445    385    148     0     0     0
BILLING ENERGY:        0     0     0     0    119    326    445    385    148     0     0     0    1423
METERED DEMAND:        0.0    0.0    0.0    0.0    18.2   25.5   27.8   26.9   13.8     0.0    0.0    0.0
BILLING DEMAND:        0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0     0.0    0.0    0.0
ENERGY CHGS($):        0     0     0     0     5     15     20     17     7     0     0     0     64

SUMMER-SHLDR           USE: TIME-OF-USE
METERED ENERGY:        0     0     0     0    1069   2186   2569   2430   1001     0     0     0
BILLING ENERGY:        0     0     0     0    1069   2186   2569   2430   1001     0     0     0    9255
METERED DEMAND:        0.0    0.0    0.0    0.0    29.1   34.5   39.9   35.4   27.7     0.0    0.0    0.0
BILLING DEMAND:        0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0     0.0    0.0    0.0
ENERGY CHGS($):        0     0     0     0     59    120    141    134    55     0     0     0     509

SUMMER-ON-PK           USE: TIME-OF-USE
METERED ENERGY:        0     0     0     0    1288   2681   3273   3047   1225     0     0     0
BILLING ENERGY:        0     0     0     0    1288   2681   3273   3047   1225     0     0     0    11514
METERED DEMAND:        0.0    0.0    0.0    0.0    27.8   30.0   37.1   33.4   28.7     0.0    0.0    0.0
BILLING DEMAND:        0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0     0.0    0.0    0.0
ENERGY CHGS($):        0     0     0     0     84    174    213    198     80     0     0     0     748

WINTER-DEMAND          USE: TIME-OF-USE
METERED ENERGY:      1326   1145   1273   1417   869    0     0     0    1068   1665   1145   1266
BILLING ENERGY:        0     0     0     0     0     0     0     0     0     0     0     0    11183
METERED DEMAND:       13.6   13.6   16.6   19.2   25.5    0.0    0.0    0.0    27.2   21.7   13.6   13.6
BILLING DEMAND:       13.6   13.6   16.6   19.2   25.5    0.0    0.0    0.0    27.2   21.7   13.6   13.6
DEMAND CHGS($):        68     68     83     96    127     0     0     0    136    109     68     68     823

SUMMER-DEMAND          USE: TIME-OF-USE
METERED ENERGY:        0     0     0     0    1288   2681   3273   3047   1225     0     0     0
BILLING ENERGY:        0     0     0     0     0     0     0     0     0     0     0     0    11519
METERED DEMAND:        0.0    0.0    0.0    0.0    27.8   30.0   37.1   33.4   28.7     0.0    0.0    0.0
BILLING DEMAND:        0.0    0.0    0.0    0.0    27.8   30.0   37.1   33.4   28.7     0.0    0.0    0.0
DEMAND CHGS($):        0     0     0     0    167    180    222    201    172     0     0     0     942

=====
TOTAL ENERGY:        3427   2947   3231   3436   4441   5193   6287   5862   4733   3848   2971   3251   49629
TOTAL CHARGES ($):    227    205    233    257    535    489    597    550    560    289    206    219    4368
-----

```

## **ES-G Summary of Pollutant Production**

This report gives monthly values of atmospheric pollutant production associated with the combustion of various types of fuel, both on-site and off-site at the utility power plant that supplies electricity to the building. Six types of pollutants are listed: carbon dioxide, sulphur dioxide, nitrogen oxides, carbon monoxide, hydrocarbons and particulate matter. (The following report, ES-H, gives pollutant production by time-of-use period.) See "Pollutant Production Calculation" in the *Topics Manual*.

SIMPLE STRUCTURE RUN 3A, CHICAGO                      INCREASED ROOF INSULATION                      DOE-2.2b-027    Fri Jan 9 13:55:16 1998BDL RUN 1  
 REPORT- ES-G Summary of Pollutant Production                      WEATHER FILE- Chicago IL TMY2

MONTH	CARBON DIOXIDE (LB)	SULPHUR DIOXIDE (LB)	NITROGEN OXIDES (LB)	CARBON MONOXIDE (LB)	HYDRO- CARBONS (LB)	PARTICULATE MATTER (LB)
JAN	8378.1	78.62238	17.64021	1.97866	0.10554	1.78545
FEB	6199.2	67.59749	13.97099	1.40433	0.08568	1.50900
MAR	5618.3	74.11236	13.91426	1.19124	0.08800	1.62381
APR	3899.3	78.81496	12.32568	0.65315	0.08313	1.67291
MAY	4346.2	101.85219	15.10340	0.63920	0.10394	2.14390
JUN	5082.1	119.09686	17.66057	0.74743	0.12153	2.50688
JUL	6153.1	144.19458	21.38225	0.90494	0.14714	3.03516
AUG	5737.2	134.44791	19.93694	0.84377	0.13720	2.83001
SEP	4632.5	108.56061	16.09818	0.68131	0.11078	2.28510
OCT	3836.9	88.25845	13.17182	0.57480	0.09042	1.85960
NOV	4750.3	68.15607	12.30003	0.97235	0.07883	1.48248
DEC	7006.5	74.58499	15.61343	1.59872	0.09538	1.66931
TOTAL	65638.3	1138.26819	189.11319	12.18972	1.24755	24.40296

## **ES-H Pollutant Production by Block-Charge**

This report shows monthly atmospheric pollutant production according to time of use in the month. As in Report ES-G, “Summary of Pollutant Production,” six pollutants are listed: carbon dioxide, sulphur dioxide, nitrogen oxides, carbon monoxide, hydrocarbons and particulate matter. These pollutants are produced on-site and at the utility power plant that supplies electricity to the building.

The time of use is determined by blocks, which in this examples are named WINTER-OFF-PK, WINTER-SHLDR, WINTER-ON-PK, SUMMER-OFF-PK, etc. These blocks have been defined with BLOCK-CHARGE commands and are associated with an electric UTILITY-RATE, in this case one named ELEC-RATE. See “Pollutant Production Calculation” in the *Topics Manual*.

Note that the monthly values at the end of this report under “TOTAL” should correspond to the monthly values in Report ES-G.

SIMPLE STRUCTURE RUN 3A, CHICAGO

INCREASED ROOF INSULATION

DOE-2.2b-027 Fri Jan 9 13:55:16 1998BDL RUN 1

REPORT- ES-H Pollutant Production by Block-Charge

WEATHER FILE- Chicago IL TMY2

-----  
UTILITY-RATE: ELEC-RATE  
-----

POLLUTANT	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
-----													
BLOCK: WINTER-OFF-PK							USE: TIME-OF-USE						
CO2 (LB):	1797.8	1224.4	871.0	313.6	94.2	0.0	0.0	0.0	123.1	219.7	695.9	1151.9	6491.6
SO2 (LB):	6.829	5.688	5.535	4.581	2.207	0.000	0.000	0.000	2.885	4.695	5.359	6.036	43.815
NOx (LB):	2.806	2.012	1.577	0.820	0.327	0.000	0.000	0.000	0.428	0.719	1.351	1.960	12.001
CO (LB):	0.488	0.326	0.222	0.064	0.014	0.000	0.000	0.000	0.018	0.035	0.172	0.302	1.642
HC (LB):	0.015	0.011	0.009	0.005	0.002	0.000	0.000	0.000	0.003	0.005	0.008	0.011	0.068
PM (LB):	0.183	0.145	0.133	0.099	0.046	0.000	0.000	0.000	0.061	0.099	0.125	0.150	1.042
-----													
BLOCK: WINTER-SHLDR							USE: TIME-OF-USE						
CO2 (LB):	4068.1	2945.6	2805.0	2116.9	978.0	0.0	0.0	0.0	1140.4	1974.9	2389.9	3433.8	21852.4
SO2 (LB):	41.379	35.644	39.375	41.740	22.919	0.000	0.000	0.000	26.724	45.375	36.533	39.516	329.202
NOx (LB):	8.878	6.982	7.178	6.589	3.399	0.000	0.000	0.000	3.963	6.775	6.407	7.941	58.110
CO (LB):	0.940	0.645	0.580	0.361	0.144	0.000	0.000	0.000	0.168	0.296	0.475	0.765	4.374
HC (LB):	0.054	0.044	0.046	0.044	0.023	0.000	0.000	0.000	0.027	0.046	0.041	0.049	0.375
PM (LB):	0.931	0.787	0.858	0.887	0.482	0.000	0.000	0.000	0.563	0.956	0.791	0.877	7.132
-----													
BLOCK: WINTER-ON-PK							USE: TIME-OF-USE						
CO2 (LB):	2512.2	2029.1	1942.3	1468.8	850.7	0.0	0.0	0.0	1045.7	1642.3	1664.4	2420.9	15576.4
SO2 (LB):	30.414	26.266	29.203	32.494	19.935	0.000	0.000	0.000	24.505	38.188	26.264	29.032	256.302
NOx (LB):	5.956	4.977	5.159	4.916	2.956	0.000	0.000	0.000	3.634	5.678	4.542	5.713	43.531
CO (LB):	0.550	0.433	0.389	0.228	0.125	0.000	0.000	0.000	0.154	0.243	0.326	0.532	2.980
HC (LB):	0.037	0.031	0.033	0.034	0.020	0.000	0.000	0.000	0.025	0.039	0.030	0.036	0.285
PM (LB):	0.672	0.576	0.633	0.686	0.420	0.000	0.000	0.000	0.516	0.804	0.567	0.642	5.515
-----													
BLOCK: SUMMER-OFF-PK							USE: TIME-OF-USE						
CO2 (LB):	0.0	0.0	0.0	0.0	116.6	318.9	435.4	377.1	144.8	0.0	0.0	0.0	1392.8
SO2 (LB):	0.000	0.000	0.000	0.000	2.731	7.472	10.203	8.837	3.394	0.000	0.000	0.000	32.639
NOx (LB):	0.000	0.000	0.000	0.000	0.405	1.108	1.513	1.310	0.503	0.000	0.000	0.000	4.840
CO (LB):	0.000	0.000	0.000	0.000	0.017	0.047	0.064	0.055	0.021	0.000	0.000	0.000	0.205
HC (LB):	0.000	0.000	0.000	0.000	0.003	0.008	0.010	0.009	0.003	0.000	0.000	0.000	0.033
PM (LB):	0.000	0.000	0.000	0.000	0.057	0.157	0.215	0.186	0.071	0.000	0.000	0.000	0.687
-----													
BLOCK: SUMMER-SHLDR							USE: TIME-OF-USE						
CO2 (LB):	0.0	0.0	0.0	0.0	1046.1	2139.0	2514.2	2378.3	979.9	0.0	0.0	0.0	9057.5
SO2 (LB):	0.000	0.000	0.000	0.000	24.516	50.128	58.920	55.733	22.963	0.000	0.000	0.000	212.258
NOx (LB):	0.000	0.000	0.000	0.000	3.635	7.433	8.737	8.265	3.405	0.000	0.000	0.000	31.475
CO (LB):	0.000	0.000	0.000	0.000	0.154	0.315	0.370	0.350	0.144	0.000	0.000	0.000	1.332
HC (LB):	0.000	0.000	0.000	0.000	0.025	0.051	0.060	0.057	0.023	0.000	0.000	0.000	0.217
PM (LB):	0.000	0.000	0.000	0.000	0.516	1.055	1.240	1.173	0.483	0.000	0.000	0.000	4.468
-----													
BLOCK: SUMMER-ON-PK							USE: TIME-OF-USE						
CO2 (LB):	0.0	0.0	0.0	0.0	1260.7	2624.2	3203.4	2981.8	1198.6	0.0	0.0	0.0	11268.8
SO2 (LB):	0.000	0.000	0.000	0.000	29.543	61.497	75.071	69.877	28.089	0.000	0.000	0.000	264.078
NOx (LB):	0.000	0.000	0.000	0.000	4.381	9.119	11.132	10.362	4.165	0.000	0.000	0.000	39.159
CO (LB):	0.000	0.000	0.000	0.000	0.185	0.386	0.471	0.439	0.176	0.000	0.000	0.000	1.657
HC (LB):	0.000	0.000	0.000	0.000	0.030	0.063	0.077	0.071	0.029	0.000	0.000	0.000	0.269
PM (LB):	0.000	0.000	0.000	0.000	0.622	1.294	1.580	1.471	0.591	0.000	0.000	0.000	5.559
-----													
BLOCK: WINTER-DEMAND							USE: TIME-OF-USE						
CO2 (LB):	2512.2	2029.1	1942.3	1468.8	850.7	0.0	0.0	0.0	1045.7	1642.3	1664.4	2420.9	15576.4
SO2 (LB):	30.414	26.266	29.203	32.494	19.935	0.000	0.000	0.000	24.505	38.188	26.264	29.032	256.302
NOx (LB):	5.956	4.977	5.159	4.916	2.956	0.000	0.000	0.000	3.634	5.678	4.542	5.713	43.531
CO (LB):	0.550	0.433	0.389	0.228	0.125	0.000	0.000	0.000	0.154	0.243	0.326	0.532	2.980
HC (LB):	0.037	0.031	0.033	0.034	0.020	0.000	0.000	0.000	0.025	0.039	0.030	0.036	0.285
PM (LB):	0.672	0.576	0.633	0.686	0.420	0.000	0.000	0.000	0.516	0.804	0.567	0.642	5.515
-----													
BLOCK: SUMMER-DEMAND							USE: TIME-OF-USE						
CO2 (LB):	0.0	0.0	0.0	0.0	1260.7	2624.2	3203.4	2981.8	1198.6	0.0	0.0	0.0	11268.8
SO2 (LB):	0.000	0.000	0.000	0.000	29.543	61.497	75.071	69.877	28.089	0.000	0.000	0.000	264.078
NOx (LB):	0.000	0.000	0.000	0.000	4.381	9.119	11.132	10.362	4.165	0.000	0.000	0.000	39.159
CO (LB):	0.000	0.000	0.000	0.000	0.185	0.386	0.471	0.439	0.176	0.000	0.000	0.000	1.657
HC (LB):	0.000	0.000	0.000	0.000	0.030	0.063	0.077	0.071	0.029	0.000	0.000	0.000	0.269
PM (LB):	0.000	0.000	0.000	0.000	0.622	1.294	1.580	1.471	0.591	0.000	0.000	0.000	5.559
-----													
TOTAL													
CO2 (LB):	8378.1	6199.2	5618.3	3899.3	4346.2	5082.1	6153.1	5737.2	4632.5	3836.9	4750.3	7006.5	65638.3
SO2 (LB):	78.622	67.597	74.112	78.815	101.852	119.097	144.195	134.448	108.561	88.258	68.156	74.585	1138.268
NOx (LB):	17.640	13.971	13.914	12.326	15.103	17.661	21.382	19.937	16.098	13.172	12.300	15.613	189.113
CO (LB):	1.979	1.404	1.191	0.653	0.639	0.747	0.905	0.844	0.681	0.575	0.972	1.599	12.190
HC (LB):	0.106	0.086	0.088	0.083	0.104	0.122	0.147	0.137	0.111	0.090	0.079	0.095	1.248
PM (LB):	1.785	1.509	1.624	1.673	2.144	2.507	3.035	2.830	2.285	1.860	1.482	1.669	24.403



## HOURLY-REPORT AND REPORT-BLOCK

### **Introduction**

Hourly reports are user designed. You choose the variables to be displayed from lists in the following tables. For instructions on setting up hourly reports see the HOURLY-REPORT and REPORT-BLOCK commands in the *Command/Keyword Dictionary*.

Hourly reports can be printed from the LOADS and HVAC sub-programs. You may mix REPORT-BLOCKS from the two subprograms in the same HOURLY-REPORT. However, because these two sub-programs execute sequentially (rather than in the same time step), only the variables in the report-blocks applicable to a given subprogram will print in the report following that subprogram's execution. In other words, if you mix variables from the two subprograms in the same report, the program will output the report twice; once for the LOADS variables, and again for the HVAC variables. The example shown here is from LOADS. The U-name of the HOURLY-REPORT command associated with the report is shown at the beginning of the third line. The first column of the report, headed by MMDDHH, gives the month, day and hour (in local standard time; this means that daylight savings is not taken into account in this report even if DAYLIGHT-SAVINGS = YES). Succeeding columns give the following:

variable type (GLOBAL, BUILDING-LOADS, U-name of space, etc. as found listed in the sections below);  
 variable name (DRY BULB TEMP, etc.);  
 units (F, BTU/HR, etc.);  
 variable-list number, in parentheses, chosen from the sections below; and  
 the values of the variable for hours 1 to 24.

Statistical summaries are printed at the bottom of the page. DAILY SUMMARY displays the minimum (MN), maximum (MX), sum (SM), and average (AV) values over the day for each variable. A MONTHLY SUMMARY and YEARLY SUMMARY are printed if this is the last scheduled day of the month and run period, respectively. It is important to note that the MONTHLY SUMMARY includes only those days that satisfy three conditions:

1. in the month indicated,
2. in the RUN-PERIOD, and
3. in the REPORT-SCHEDULE.

Similarly, YEARLY SUMMARY includes only the days that are

1. in the RUN-PERIOD, and
2. in the REPORT-SCHEDULE.

You may suppress printing of hourly data and print only the DAILY, MONTHLY or YEARLY Summary by using REPORT-FREQUENCY, which is a keyword in the LOADS-REPORT, SYSTEMS-REPORT, PLANT-REPORT and ECONOMICS-REPORT commands.

Hourly values may be written to files in different formats for display by spreadsheet programs and other post-processor software. See "Saving Files of Hourly Output for Postprocessing" in this manual.

Simple Structure Run 3, Chicago Design-day sizing of VAV system HOURLY REPORT- LDS-REP-1		Divide into zones; add plenum Show All Reports		DOE-2.2b-027 Fri Jan 9 WEATHER FILE- TRY CHICAGO	
MDDHH	GLOBAL	GLOBAL	GLOBAL	GLOBAL	BUILDING
	DRY BULB TEMP F	WET BULB TEMP F	WIND SPEED KNOTS	GLOBAL SOLAR BTU/HR- SQFT	-LOADS SENSIBLE CLG LOAD BTU/HR
	----( 4)	----( 3)	----(17)	----(15)	----(19)
8 5 1	80.2	70.0	6.5	0.0	58102.
8 5 2	78.4	69.5	6.5	0.0	56903.
8 5 3	76.9	69.1	6.5	0.0	55801.
8 5 4	75.7	68.7	6.5	0.0	54807.
8 5 5	74.8	68.5	6.5	0.0	53939.
8 5 6	74.2	68.3	6.5	14.7	58179.
8 5 7	74.0	68.2	6.5	73.1	66613.
8 5 8	74.8	68.5	6.5	134.4	70543.
8 5 9	76.9	69.1	6.5	189.2	71352.
8 510	80.2	70.0	6.5	233.6	71341.
8 511	84.0	71.1	6.5	264.8	72382.
8 512	87.8	72.2	6.5	280.6	74127.
8 513	91.1	73.0	6.5	280.0	76189.
8 514	93.2	73.6	6.5	263.0	79329.
8 515	94.0	73.8	6.5	230.8	82668.
8 516	93.8	73.7	6.5	185.5	84785.
8 517	93.2	73.6	6.5	130.1	84450.
8 518	92.3	73.4	6.5	68.6	80472.
8 519	91.1	73.0	6.5	11.3	72162.
8 520	89.6	72.6	6.5	0.0	66833.
8 521	87.8	72.2	6.5	0.0	64239.
8 522	86.0	71.6	6.5	0.0	62343.
8 523	84.0	71.1	6.5	0.0	60785.
8 524	82.0	70.6	6.5	0.0	59391.
DAILY SUMMARY (AUG 5)					
MN	74.0	68.2	6.5	0.0	53939.
MX	94.0	73.8	6.5	280.6	84785.
SM	2016.0	1705.4	156.0	2359.9	1637735.
AV	84.0	71.1	6.5	98.3	68239.
MONTHLY SUMMARY (AUG)					
MN	74.0	68.2	6.5	0.0	53939.
MX	94.0	73.8	6.5	280.6	84785.
SM	2016.0	1705.4	156.0	2359.9	1637735.
AV	84.0	71.1	6.5	98.3	68239.
YEARLY SUMMARY					
MN	74.0	68.2	6.5	0.0	53939.
MX	94.0	73.8	6.5	280.6	84785.
SM	2016.0	1705.4	156.0	2359.9	1637735.
AV	84.0	71.1	6.5	98.3	68239.

## HOURLY REPORT PLOT

The following example is an HOURLY-REPORT in graphic form. The month, day, and hours appear in the left-hand column. The next entry to the right is the first possible value. A period (.) indicates that there is no value at or below this value; an asterisk (\*) indicates that two or more values occupy this position. The numerical values appearing on the plot are correlated to the symbol numbers in the table above the plot. Component name, in the table, is the VARIABLE-TYPE of which the variable is a part. If a value appears at the last possible position on the right it means either that the value is at this point or that the value is higher than this point.

The original input that created the following sample plot is as follows:

```

PLOTTER1 = REPORT-BLOCK
  VARIABLE-TYPE = GLOBAL
  VARIABLE-LIST = ( 15 ) .. $GLOBAL HORIZONTAL SOLAR$

PLOTTER2 = REPORT-BLOCK
  VARIABLE-TYPE = SOUTHZONE
  VARIABLE-LIST = ( 49 ) .. $DAYL ILLUM, REF PT 1$

```

PLOTD = HOURLY-REPORT

```

REPORT-SCHEDULE = PLTSCH
REPORT-BLOCK   = ( PLOTER1, PLOTER2 )
OPTION         = PLOT
AXIS-ASSIGN    = ( 1, 2 )
AXIS-TITLES   = ( *EXTERIOR SOLAR, *INTERIOR DAYLITE* )
AXIS-MAX      = ( 500, 100 )
AXIS-MIN      = ( 0, 0 )
DIVIDE        = ( 1, 1, ) ..
    
```

```

DAYLIGHTING EXAMPLE          FLOOR OF OFFICE BUILDING IN CHICAGO
30-FT DEEP PERIM OFFS DAYLIT TO 15 FT  AUTO SHADE MANAGEMENT FOR SUN CONTROL
PLOTD = HOURLY-REPORT
    
```

SYMBOL	COMPONENT NAME	(NO.)	DESCRIPTION	AXIS	UNIT
1	GLOBAL	(15)	GLOBAL SOLAR	1	BTU/HR- SQFT
2	SOUTHZONE	(49)	DAYL ILLREF PT 1 2	2	FOOTCANDLES
INTERIOR DAYLITE					
0.00000E+00	0.20000E+02	0.40000E+02	0.60000E+02	0.80000E+02	
I.....I.....I.....I.....I.....					
EXTERIOR SOLAR					
0.00000E+00	0.10000E+03	0.20000E+03	0.30000E+03	0.40000E+03	
I.....I.....I.....I.....I.....					
1 2 7 *					
1 2 8 12					
1 2 9 . 1 2					
1 2 10 . 1 2					
1 2 11 . 1 2					
1 2 12 . 1 2					
1 2 13 . 1 2					
1 2 14 . 1 2					
1 2 15 . 1 2					
1 2 16 . 1 2					
1 2 17 *					
1 2 18 *					
1 2 19 *					
I.....I.....I.....I.....I.....					

The following tables describe each of the hourly report variables that you can have printed from LOADS and HVAC (SYSTEMS and PLANT). Hourly reports are not available for ECONOMICS.

The units shown here are English units; for metric output runs, the corresponding metric units that will be printed can be determined from the DOE-2 Units Table (see "Metric Input and Output")

## **GLOBAL**

Global variables are applicable to both the LOADS and HVAC subprograms. However, the HVAC subprogram does not use many of these variables (particularly the solar data), and unused fields will be blank.. To force the LOADS global variables to print, either include the global block with other LOADS blocks, or create an hourly-report with only a global block. In other words, do not include the global block with HVAC blocks.

<b>Variable-List Number</b>	<b>Variable in FORTRAN Code</b>	<b>Description</b>
1	CLRNES	Atmospheric clearness number
2	TGNDR	Ground temperature (Rankine)
3	WBT	Outside wetbulb temperature (F)
4	DBT	Outside drybulb temperature (F)
5	PATM	Atmospheric pressure (in. Hg)
6	CLDAMT	Cloud amount, 0 to 10 (0 = clear, 10 = overcast)
7	ISNOW	Snow flag (1 = snowfall); not used in simulation
8	IRAIN	Rain flag (1 = rainfall); not used in simulation
9	IWNDDR	Wind direction (0-15) (0=north, 4=east, 8=south, 12=west)
10	HUMRAT	Humidity ratio (lb H <sub>2</sub> O/lb air)
11	DENSTY	Outside air density (lb/ft <sup>3</sup> )
12	ENTHAL	Specific enthalpy of outside air (Btu/lb)
13		Unused
14	DIRSOL	Direct normal solar radiation from the weather file; zero when no solar on weather file (Btu/hr-ft <sup>2</sup> )
15	SOLRAD	Total horizontal solar radiation from the weather file; if non-solar weather file, = calculated total horizontal solar radiation (direct plus diffuse) (Btu/hr-ft <sup>2</sup> )
16	ICLDTY	Cloud type (0=cirrus, 1=stratus, 2=halfway between cirrus and stratus)
17	WNDSPD	Wind speed at weather station (knots). See also variable No.58, Variable-Type = U-name of SPACE, for windspeed at the building.
18	DPT	Dew-point temp (F)
19	WNDDRR	Wind direction in radians (clockwise from North)
20	CLDCOV	Cloud cover multiplier
21	RDNCC	Direct normal solar radiation. If non-solar weather tape, = clear day direct normal solar radiation times CLDCOV. If solar tape, = measured direct normal solar radiation (DIRSOL) (Btu/hr-ft <sup>2</sup> )
22	BSCC	Diffuse horizontal solar radiation from the sky. If non-solar weather tape, = clear day diffuse horizontal solar radiation times CLDCOV. If solar tape, = measured diffuse horizontal solar (total horizontal minus direct horizontal) (Btu/hr-ft <sup>2</sup> )
23	-	Unused

Variable-List Number	Variable in FORTRAN Code	Description
24	DBTR	Outside drybulb temperature (Rankine)
25	ISUNUP	Sun up flag (= 1 if sun is up; = 0 if down)
26	GUNDOG	Hour angle of sunrise for the day (radians)
27	HORANG	Current hour angle (radians)
28	TDECLN	Tangent of solar declination angle
29	EQTIME	Value of the solar equation of time (hr)
30	SOLCON	Fitted "solar constant" (Btu/hrft <sup>2</sup> ). See <i>Engineers Manual (2.1A), p.III.24.</i>
31	ATMEXT	Atmospheric extinction coefficient
32	SKYDF	Sky diffusivity factor
33	RAYCOS(1)	Solar direction cosine (x) in building coordinate system
34	RAYCOS(2)	Solar direction cosine (y) in building coordinate system
35	RAYCOS(3)	Solar direction cosine (z) in building coordinate system
36	RDN	Direct normal solar radiation intensity on a clear day [calculated] Btu/hr-ft <sup>2</sup> )
37	BSUN	Diffuse solar intensity on a horizontal surface on a clear day [calculated] Btu/hr-ft <sup>2</sup> )
38	IYR	Year
39	IMO	Month
40	IDAY	Day
41	IHR	Hour (local time; with Daylight Saving Time if appropriate)
42	IDOY	Day of year (1-365)
43	IDOW	Day of week (1-7) (1 = Sunday, 2 = Monday, ...)
44	ISCHR	Schedule hour (DST corrected IHR + IDSTF)
45	ISCDAY	Schedule day (Day of week, 1 = Sunday, 2 = Monday ... 8 = holiday)
46	IDSTF	Daylight saving time flag (1 if daylight saving in effect, 0 if not)
47	PTWV	Pressure caused by wind velocity (inches of water)
48	ATMTUR(IMO)	Atmospheric turbidity factor according to Angstrom
49	ATMMOI(IMO)	Atmospheric moisture (inches of precipitable water)
50	PHSUND	Solar altitude (degrees above horizon)
51	THSNHR	Solar azimuth (degrees) measured clockwise from North
52	ETACLD	Cloudiness factor; ranges from 0 for overcast sky to 1.0 for clear sky
53	CHISKF	Exterior horizontal illuminance from clear part of sky (footcandles)
54	OHISKF	Exterior horizontal illuminance from overcast part of sky (footcandles)
55	HISUNF	Exterior horizontal illuminance from direct sun (footcandles).

<b>Variable-List Number</b>	<b>Variable in FORTRAN Code</b>	<b>Description</b>
56	ALFAD	Ratio of exterior horizontal illuminance calculated from insolation and luminous efficacy to exterior horizontal illuminance calculated from theoretical CIE sky luminance distributions.
57	CDIRLW	Luminance efficacy of direct solar radiation (lumens/watt)
58	CDIFLW	Luminance efficacy of diffuse solar radiation from clear part of sky (lumens/watt)
59	ODIFLW	Luminance efficacy of diffuse solar radiation from overcast part of the sky (lumens/watt)

## **BUILDING-LOADS**

For each hour, entries are summed for all spaces with a heating load that hour and appear in BLDDTH (1-18), VARIABLE-LIST numbers 1-18; similarly, entries are summed for all zones with a cooling load and appear in BLDDTC (1-18), VARIABLE-LIST numbers 19-36. For example, if a building has three spaces, S1, S2, and S3, and for a given hour, S1 and S2 each have a net heating load, and S3 has a net cooling load, then: (1) the sensible heating load for S1 and S2 appears in VARIABLE-LIST number 1, the latent heating load appears in VARIABLE-LIST number 2, etc.; (2) the sensible cooling load for S3 appears in VARIABLE-LIST number 19, the latent cooling load for S3 appears in VARIABLE-LIST number 20, etc. All loads are in Btu/hr, including electric. "Sensible load" is heat extraction from space air required to maintain constant air temperature; "sensible loads" are obtained from corresponding instantaneous heat gains by application of weighting factors that account for heat storage and release by building mass. "Walls" below are exterior surfaces with tilt  $\geq 45^\circ$ ; "roofs" are exterior surfaces with tilt  $< 45^\circ$ . (All gains and loads reported here are calculated at *constant space air temperatures*. Corrections for variable space temperature are made in the SYSTEMS calculation.)

<b>Variable-List Number</b>	<b>Variable in FORTRAN Code</b>	<b>Description</b>
1	BLDDTH(1)	Building heating load (sensible)
2	BLDDTH(2)	Building heating load (latent)
3	BLDDTH(3)	Building heating load from wall conduction
4	BLDDTH(4)	Building heating load from roof conduction
5	BLDDTH(5)	Building heating load from window conduction
6	BLDDTH(6)	Building heating load from solar radiation through exterior windows
7	BLDDTH(7)	Building sensible heating load from infiltration
8	BLDDTH(8)	Building heating load from interior wall conduction
9	BLDDTH(9)	Building heating load from conduction through underground walls and floors
10	BLDDTH(10)	Building lighting heating load
11	BLDDTH(11)	Building heating load from doors
12	BLDDTH(12)	Building equipment (electrical) heating load (sensible)
13	BLDDTH(13)	Building source heating load (sensible)
14	BLDDTH(14)	Building people heating load (sensible)
15	BLDDTH(15)	Building people heating load (latent)
16	BLDDTH(16)	Building equipment (electrical) heating load (latent)
17	BLDDTH(17)	Building source heating load (latent)
18	BLDDTH(18)	Building infiltration heating load (latent)
19	BLDDTC(1)	Building cooling load (sensible)
20	BLDDTC(2)	Building cooling load (latent)
21	BLDDTC(3)	Building cooling load from wall conduction
22	BLDDTC(4)	Building cooling load from roof conduction
23	BLDDTC(5)	Building cooling load from window conduction
24	BLDDTC(6)	Building cooling load from solar radiation through exterior windows

Variable-List Number	Variable in FORTRAN Code	Description
25	BLDDTC(7)	Building cooling sensible infiltration load
26	BLDDTC(8)	Building cooling load from conduction through interior walls
27	BLDDTC(9)	Building cooling load from conduction through underground walls and floors
28	BLDDTC(10)	Building lighting cooling load
29	BLDDTC(11)	Building cooling load from door conduction
30	BLDDTC(12)	Building equipment (electrical) cooling load (sensible)
31	BLDDTC(13)	Building source cooling load (sensible)
32	BLDDTC(14)	Building people cooling load (sensible)
33	BLDDTC(15)	Building people cooling load (latent)
34	BLDDTC(16)	Building equipment (electrical) cooling load (latent)
35	BLDDTC(17)	Building source cooling load (latent)
36	BLDDTC(18)	Building infiltration cooling load (latent)
37	QBELEC	Building electric total
38	QBGAS	Building gas total
39	QBHW	Building hot water total
40	QBEQEL	Building equipment electric total
41	QBLTEL	Building lighting electric total



## **SPACE**

All space gains and loads are in Btu/hr, including electric. "Sensible gain" means the instantaneous heat gain before application of weighting factors. "Sensible load" is the heat extraction from space air required to maintain constant air temperature; "loads" are obtained from corresponding gains by application of weighting factors that account for heat storage and release by building mass. "Walls" below are exterior surfaces with tilt greater than or equal to 45°; "roofs" are exterior surfaces with tilt less than 45°. (All sensible gains and loads reported here are calculated at constant space air temperatures. Corrections for variable space temperature are made in the SYSTEMS calculation.) All quantities are before multiplication by space multiplier or floor multiplier.

<b>Variable-List Number</b>	<b>Variable in FORTRAN Code</b>	<b>Description</b>
1	QWALQ	Quick wall conduction gain
2	QCELQ	Quick roof conduction gain
3	QWINC	Window conduction gain (UAΔT conduction plus absorbed solar radiation that is conducted into the space)
4	QWALD	Delayed wall conduction gain
5	QCELD	Delayed roof conduction gain
6	QINTW	Interior wall conduction gain
7	QUGF	Underground floor conduction gain
8	QUGW	Underground wall conduction gain
9	QDOOR	Door conduction gain
10	QEQPS	Electrical equipment sensible gain
11	QEQPS2	Source sensible gain
12	QPPS	People sensible gain
13	QTSKL	Task light gain
14	QSOL	Glass transmitted solar gain (from exterior windows only)
15	QPLENUM	Light heat gain to return air
16	QWALD	Quick wall conduction load
17	QCELQ	Quick roof conduction load
18	QWINC	Window conduction load (UAΔT conduction plus absorbed solar radiation that is conducted into the space)
19	QWALD	Delayed wall conduction load
20	QCELD	Delayed roof conduction load
21	QINTW	Interior wall conduction load
22	QUGF	Underground floor conduction load
23	QUGW	Underground wall conduction load
24	QDOOR	Door conduction load
25	QEQPS	Equipment sensible load
26	QEQPS2	Source sensible load

Variable-List Number	Variable in FORTRAN Code	Description
27	QPPS	People sensible load
28	QPPL	People latent gain
29	QEQL	Equipment latent gain
30	QEQL2	Source latent gain
31	QINFL	Infiltration latent gain
32	QTSKL	Task lighting load
33	QSOL	Glass transmitted solar load (from exterior windows only)
34	ZLTOTH	Light heat gain to other space
35	QLITE	Light gain
36	QLITEW	Light load
37	QINFS	Infiltration sensible gain
38	QELECT	Electric load for space
39	CFMINF	Infiltration flow rate (cfm)
40	QSUMW	Sum of all weighted loads except infiltration and latent
41	ZCOND	Space conductance (Btu/hr-F)
42	QZS	Space sensible load
43	QZL	Space latent load
44	QZTOT	Space total load
45	QZLTEL	Space electric from lights
46	QZEQEL	Space electric from equipment
47	QZGAS	Space gas
48	QZHW	Space hot water
49	RDAYIL(1)	Daylight illuminance at LIGHT-REF-POINT1 (footcandles)
50	RDAYIL(2)	Daylight illuminance at LIGHT-REF-POINT2 (footcandles)
51	BACLUM(1)	Background luminance (footlamberts) for glare calculation at LIGHT-REF-POINT1.
52	BACLUM(2)	same as BACLUM(1) but for REF-POINT2.
53	GLRNDX(1)	Daylight glare index at LIGHT-REF-POINT1 calculated after window management (if any) has been employed as a response to MAX-GLARE, MAX-SOLAR-SCH, and/or CONDUCT-TMIN-SCH.
54	GLRNDX(2)	Daylight glare index at LIGHT-REF-POINT2 calculated after window management (if any) has been employed as a response to MAX-GLARE, MAX-SOLAR-SCH, and/or CONDUCT-TMIN-SCH.
55	FPHRP(1)	Multiplier, due to daylighting, on electric lighting power for the lighting zone at LIGHT-REF-POINT1 (varies from 1.0 if no lighting energy reduction to 0.0 if lighting energy reduced to zero).
56	FPHRP(2)	Multiplier, due to daylighting, on electric lighting power for the lighting zone at LIGHT-REF-POINT2 (varies from 1.0 if no lighting energy reduction to 0.0 if

Variable-List Number	Variable in FORTRAN Code	Description
		lighting energy reduced to zero).
57	<POWER-RED-FAC>	Net multiplier, due to daylighting, on electric lighting power for the entire space (= FPHRP(1) * ZONE-FRACTION1 + FPHRP(2) * ZONE-FRACTION2 + [1- (ZONE-FRACTION1) - (ZONE-FRACTION2)]).
58	WNDSPZ	Free-stream windspeed at the location of the space (knots). This is the weather station windspeed (Variable #17, VARIABLE-TYPE = GLOBAL) corrected for terrain, shielding, and space height effects.

**EXTERIOR-WALL**

Variable-List Number	Variable in FORTRAN Code	Description
1	SOLI	Total solar radiation on wall (direct and diffuse) after shading Btu/hr-ft <sup>2</sup>
2	XGOLGE	Fraction of the wall that is shaded from direct solar radiation
3	FILMU	Outside air film U-value, radiative plus convective (Btu/hr-ft <sup>2</sup> -F)
4	PCO	Pressure difference across wall caused by wind velocity and stack effect (inches of water)
5	Q	Heat transfer from the wall to the zone, unweighted (Btu/hr)
6	T	Outside surface temperature (Rankine)
7	CFM	Crack method air flow for wall (cfm)
8	C2	Used in response factor determination of Q and T for delayed walls
9	C3	Used in response factor determination of Q and T for delayed walls
10	SUMXDT	Used in response factor determination of Q and T for delayed walls
11	SUMYDT	Used in response factor determination of Q and T for delayed walls
12	DT	Used in response factor determination of Q and T for delayed walls
13	XSCMP	Used in response factor determination of Q and T for delayed walls
14	XSQCMP	Used in response factor determination of Q and T for delayed walls
15	ETA	Cosine of the angle between the direction of the sun and the surface outward normal
16	BG	Solar radiation reflected from ground (Btu/hr-ft <sup>2</sup> ) [total horizontal solar radiation x ground reflectance]. This is <i>not</i> equal to the ground diffuse solar radiation incident on the wall.
17	<DIREWSH>	Intensity of direct solar radiation on the surface <i>before</i> shading (Btu/hr-ft <sup>2</sup> )
18	<DIFEWSH>	Intensity of diffuse solar radiation on the surface from the sky and ground, <i>after</i> shading (Btu/hr-ft <sup>2</sup> ) incident on the wall.
19		Total solar intensity

**WINDOW**

Except as noted, the following variables are applicable to both exterior windows (WINDOW in EXTERIOR-WALL) and interior windows (WINDOW in INTERIOR-WALL between a sunspace and a non-sunspace). The effect of a window MULTIPLIER, if specified, is not taken into account.

Variable -List Number	Variable in FORTRAN Code	Description
1	UAVE	Area-weighted average of glass plus frame and curb U-value (glass U-value is multiplied by CONDUCT-SCHEDULE if defined). Includes inside and outside film coefficients (Btu/hr-ft <sup>2</sup> -F).
2	TDIR	Direct radiation transmission coefficient of all panes of glass in the window. If SHADING-COEF is specified, equals direct transmission coefficient of 1/8" clear reference glass.
3	ADIRO	Direct radiation absorption coefficient (outer pane). If SHADING-COEF is specified, equals direct absorption coefficient of 1/8" clear reference glass.
4	TDIF	Net diffuse radiation transmission coefficient of all panes of glass in the window. If SHADING-COEF is specified, equals diffuse transmission coefficient of 1/8" clear reference glass.
5	ADIFO	Diffuse radiation absorption coefficient (outer pane). If SHADING-COEF is specified, equals diffuse absorption coefficient of 1/8" clear reference glass.
6	ADIRI	Direct radiation absorption coefficient (inner pane). Zero if SHADING-COEF is specified or single pane.
7	ADIFI	Diffuse radiation absorption coefficient (inner pane). Zero if SHADING-COEF is specified or single pane.
8	FI	Inward-flowing fraction of heat from solar radiation absorbed by the inner pane. Zero if SHADING-COEF is specified or single pane.
9	FO	Inward-flowing fraction of heat from solar radiation absorbed by the inner pane.
10	AGOLGE	Fraction of window area that is shaded from direct solar radiation. [Exterior WINDOW only]
11	QDIR	Direct solar radiation incident on window (after shading by setback, overhang, etc.) divided by the total window area (Btu/hr-ft <sup>2</sup> ).
12	QDIF	Diffuse solar radiation incident on window (after shading by setback, overhang, etc.) divided by the total window area (Btu/hr-ft <sup>2</sup> ).
13	QTRANS	Direct and diffuse solar energy transmitted through glass (after shading by setback, overhang, etc.) divided by glass area (Btu/hr-ft <sup>2</sup> ), before multiplication by glass shading coefficient, if applicable, and by SHADING-SCHEDULE value. [Exterior WINDOW only]
14	QABS	Direct and diffuse solar energy absorbed by glass (after shading by setback, overhang, etc.) and conducted into the space, divided by glass area (Btu/hr-ft <sup>2</sup> ), before multiplication by glass shading coefficient, if applicable, and by SHADING-SCHEDULE value. [Exterior WINDOW only]
15	QSOLG+QABS G	Transmitted plus reconducted solar heat gain through window (glass plus frame) (after shading by setback, overhang, etc.)(Btu/hr). For exterior WINDOW: [(QTRANS+QABS)* (glass area) * (shading coefficient of glass)* (SHADING-

Variable -List Number	Variable in FORTRAN Code	Description
		SCHEDULE value if defined and shade is in place]] + [direct and diffuse solar energy absorbed by frame and conducted into the space]. shading coefficient is 1.0 if GLASS-TYPE-CODE is used.
16	GSHACO	Shading coefficient of glass. Used only if SHADING-COEEF is specified. 1.0 if GLASS-TYPE-CODE is <= 11.
17	QCON+QC/ET EMONFR	Conduction heat gain through window (glass plus frame) (Btu/hr): = UAVE * (glass area + frame area) (outside DBT - zone temp) - (exterior IR radiation correction) [exterior WINDOW only; for interior WINDOWs see Variable No. 58, VARIABLE-TYPE = ZONE, in SYSTEMS.
18	SWFAC	Switching factor. 0.0 = unswitched; 1.0 = fully switched. [Exterior WINDOW only]
19	SHMULT	Value by which solar heat gain of glazing is multiplied when glass is covered by a shading device. Determined by SHADING-SCHEDULE
20	SOLGMX	Transmitted direct solar gain threshold for activation of glass shading device (Btu/ft <sup>2</sup> ). Determined by MAX-SOLAR-SCH.
21	none	Visible transmittance of glazing (excluding shading device) for direct solar radiation. [Exterior WINDOW only]
22	TAU1	Value by which visible transmittance of glazing is multiplied when glass is covered by a shading device. Determined by VIS-TRANS-SCH. [Exterior WINDOW only]
23	<SHADING- FLAG>	Disposition of window shading device: 0 = no shade assigned to window; 1 = shade assigned but open this hour; 2 = shade assigned and closed this hour due to solar gain, outside dry bulb temperature, or glare test, or for daylit spaces because WIN-SHADE-TYPE = FIXED-INTERIOR or FIXED-EXTERIOR; 3 = shade assigned and closed this hour but no solar gain, outside dry bulb temperature, or glare test requested (preset schedule control)
24	<ILLUMW> <sub>1</sub>	Contribution of window to daylight illuminance at LIGHT-REF-POINT1 with no shading device on glass (footcandles). [Exterior WINDOW only]
25	<ILLUMW> <sub>2</sub>	Contribution of window to daylight illuminance at LIGHT-REF-POINT2 with no shading device on window (footcandles). [Exterior WINDOW only]
26	<ILLUMW> <sub>3</sub>	Contribution of window to daylight illuminance at LIGHT-REF-POINT1 with glass covered by shading device on window (footcandles). [Exterior WINDOW only]
27	<ILLUMW> <sub>4</sub>	Contribution of window to daylight illuminance at LIGHT-REF-POINT2 with glass covered by shading device (footcandles). [Exterior WINDOW only]

<b>Variable -List Number</b>	<b>Variable in FORTRAN Code</b>	<b>Description</b>
28	BLDCOV	Fraction of window covered by blind (-999 if no blind).
29	ANGLATADJ	Slat angle for window with blind (-999 if no blind).
30	qconfr + qabsgf	Frame gains from convection and solar absorption.
31	qconcurb + qabsgc	Curb gains from convection and solar absorption.

**DOOR**

<b>Variable- List Number</b>	<b>Variable in FORTRAN Code</b>	<b>Description</b>
1	FILMU	Outside air film U-value, radiative plus convective (Btu/hr-ft <sup>2</sup> -F)
2	DRGOLG	Fraction of door shaded from direct solar radiation
3	SOLID	Solar radiation incident on door (Btu/hr-ft <sup>2</sup> )
4	TSOLD	Outside surface temperature (R)
5	QD	Heat flow through door (Btu/hr-ft <sup>2</sup> -F)
6	CFMD	Crack method infiltration air flow (cfm)



**ZONE**

Variable-List Number	Variable in FORTRAN Code	Description
1	<QS>	Sensible load at constant zone temperature (from LOADS) (Btu/hr)
2	<QL>	Latent load at constant zone temperature, excluding infiltration (from LOADS) (Btu/hr)
3	<ZKW>	Zone electrical load (from LOADS) (kW)
4	<QP>	Light heat to return air (from LOADS) (Btu/hr)
5	<CFMINF>	Outdoor air infiltration rate (from LOADS) (cfm)
6	<TNOW>	Current hour zone temperature (F).
7	<TSET>	Current hour zone thermostat setting; a diagnostic variable not meaningful when <TNOW> is outside the throttling range of either HEAT-TEMP-SCH or COOL-TEMP-SCH (F)
8	<QNOW>	Current hour heat extraction rate; a diagnostic variable not meaningful when <TNOW> is outside the throttling range of either HEAT-TEMP-SCH or COOL-TEMP-SCH (F). Excludes heat extraction due to interzone convection across interior wall between sunspace and non-sunspace. For sunspaces, excludes heat extraction due to venting.
9	<CONDUCHR>	Sum of exterior wall + interior wall thermal conductances from LOADS (Btu/hr-F)
10	-	Unused
11	EXCFM	Exhaust air flow rate (cfm)
12	FH	Hot air flow rate (cfm)
13	FC	Cold air flow rate (cfm)
14	CFMZ	Zone supply air flow rate (cfm)
15	QHBZ	Baseboard heat output to zone (Btu/hr)
16	QOVER	Amount of extra heat extraction needed to hold setpoint if load not met (Btu/hr)
17	THZ	Thermostat setpoint for heating (F)
18	TCZ	Thermostat setpoint for cooling (F)
19	ERMAX	Maximum heat extraction rate (meaningful only within the current thermostat band) (Btu/hr)
20	ERMIN	Minimum heat extraction rate (meaningful only within the current thermostat band) (Btu/hr)
21	TRY	Trial zone temperature (if no zone coil activity) (F)
22	FTD	F in temperature variation calculation (TEMDEV subroutine) (Btu/hr)
23	CORINT	A part of the correction in SYSTEMS for the contribution to the zone load due to conduction from adjacent zones (partially calculated in LOADS)

Variable-List Number	Variable in FORTRAN Code	Description
		(Btu/hr)
24	G0	Air temperature weighting factors (Btu/hr-F)
25	G1	Air temperature weighting factors (Btu/hr-F)
26	G2	Air temperature weighting factors (Btu/hr-F)
27	G3	Air temperature weighting factors (Btu/hr-F)
28	SIGMAG	G0 + G1 + G2 + G3 (Btu/hr-F)
29	TL	Induced air temperature for IU, SZCI (F)
30	ZQHR	Portion of reheat load that would bring the supply temperature to the zone temperature (Btu/hr)
31	TAVE	The average zone air temperature during this hour (F). This is the value used for the energy calculation.
32	ZQH	Zone coil heating (Btu/hr)
33	ZQC	Zone coil cooling (Btu/hr)

**Note: Variables 34 through 48 apply only to the systems indicated**

		FC	HP	UHT	UVT	PTAC	
34	FCHPS (1)	TC	TS	-	TS	TS	Cold deck temp (F)
35	FCHPS (2)	QH	ZQH	ZQH	ZQH	ZQH	Zone heating (Btu/hr)
36	FCHPS (3)	QC	ZQC	-	-	ZQC	Zone cooling (Btu/hr)
37	FCHPS (4)	SFKW+ RFKW	ZFANKW	ZFANKW	ZFANKW	ZFANKW W	Zone fan energy (Btu/hr)
38	FCHPS (5)	TM	TM	-	TM	TM	Mixed air temp (F)
39	FCHPS (6)	WR	TC	-	-	TC	WR = return humidity ratio TC = coil leaving temp
40	FCHPS (7)	WM	WM	-	-	WM	Mixed air humidity ratio (lb H <sub>2</sub> O/lb dry air)
41	FCHPS (8)	WCOIL	WCOIL	-	-	WCOIL	Humidity ratio of air leaving cooling coil (lb H <sub>2</sub> O/lb dry air)
42	FCHPS (9)	PO	PO	-	PO	PO	Ratio of outside air to total supply air
43	FCHPS(10)	QCLAT	QCLATZ	-	-	QCLAT Z	Latent load (Btu/hr)
44	FCHPS(11)	PLRC	PLRC	-	-	PLRC	Cap. part load ratio (clg)
45	FCHPS(12)	-	PLRH	-	-	PLRH	Cap. part load ratio (ht)
46	FCHPS(13)	-	EIR	-	-	EIR	Electric input ratio

47	FCHPS(14)	WBTZ	WBTZ	-	-	WBTZ	Zone wetbulb temp (F)
48	FCHPS(15)	-	-	-	-	EIRM3	Supp heat load for zone heat pumps this hour (Btu/hr)
49	ACFM						Weighted plenum flow rate (cuft/min)
50	ZKW						Total zone elec (kW)
51	TCMINZ						Minimum zone supply air temperature (F)
52	THMAXZ						Maximum zone supply air temperature (F)
53	ERMAXM		All air systems				Extraction rate, top of deadband (Btu/hr)
54	ERMINM		All air systems				Extraction rate, bottom of deadband (Btu/hr)
55	THR						( <u>THROTTLING-RANGE</u> ) <sup>2</sup> (F)

In the following descriptions, "sunspace" is a SPACE with SUNSPACE = YES; and "room" is a SPACE with SUNSPACE = NO (the default) that is adjacent to a sunspace.

Variable-List Number	Variable in FORTRAN Code	Description
56	<SGIW0>	For room only: total heat gain (unweighted) due to solar radiation coming from adjacent sunspaces through interior windows (Btu/hr).
57	<SLIW0>	For room only: total solar load (weighted) through interior windows from all adjacent sunspaces (Btu/hr).
58	QGWIN	For room or sunspace: heat gain by conduction (unweighted) through interior windows (Btu/hr), calculated with the air temperature of the zone in question fixed at the LOADS calculation temperature and actual previous-hour temperatures for adjacent zones.
59	QSNABT	For room or sunspace: solar radiation absorbed on the sunspace side (opaque part) of interior walls (Btu/hr).
60	QGOPWL	For room or sunspace: heat gain by conduction (unweighted) through opaque part of interior walls (Btu/hr), calculated with the air temperature of the zone in question fixed at the LOADS calculation temperature and actual previous-hour temperatures for adjacent zones.
61	QGVEC	For room or sunspace: heat extraction from convection across interior wall. For room, includes contribution from fan heat if AIR-FLOW-TYPE = FORCED-RECIRC (Btu/hr).
62	CFMCVT	For room or sunspace: average airflow due to convection across interior wall (cfm)
63	<CFMVNT>	For sunspace only: average airflow due to venting (cfm).
64	<QGVNT>	For sunspace only: heat extraction due to venting (Btu/hr)
65	GPMZ	Flow through unit condenser (GPM)

Variable-List Number	Variable in FORTRAN Code	Description
66	GPMHZ	Flow during unit heating (GPM)
67	GPMCZ	Flow during unit cooling (GPM)
68	QHLUPZ	Heat taken from loop (Btu/hr)
69	QCLUPZ	Heat added to loop (Btu/hr)
70	QCVZ	Cooling due to natural ventilation (Btu/Hr)
71	VNTCFM	Natural ventilation flow (cuft/min)
72	See description	VNTCFM*60/<VOLUME> - the natural ventilation air changes
73	TVZ	Natural ventilation setpoint temperature (Deg F)
74		unused
75	CAPAIR	Heat transport capacity on air side of water-side economizer
76	CAPWIR	Heat transport capacity on water side of water-side economizer
77	QCWSEM	Max possible water-side economizer exchange
78	QCWSE	Actual water-side economizer exchange
79	WSEDTA	Air temperature drop through water-side economizer
80	WSEDTW	Water temperature rise through water-side economizer
81	WSEXEF	Heat-exchanger efficiency of water-side economizer
82	WSENTU	unused
83	WSEUA	unused
84	WSEQMX	unused
85	WSEPLR	Ratio of actual load to maximum capacity for water-side economizer
86	WSEDT	Difference between entering air and water temperatures for WS econo
87	<ir;Qconv>	Ice rink - Ice load due to convection (Btu/hr)
88	<ir;Qlat>	Ice rink - Ice load due to latent heat gain (Btu/hr)
89	<ir;QceilRad>	Ice rink - Ice load from ceiling radiation (Btu/hr)
90	<ir;Qlights>	Ice rink - Ice load due to lights, weighted (Btu/hr)
91	<ir;Qsolar>	Ice rink - Ice load due to solar transmittance, weighted (Btu/hr)
92	ir;Qsubfloor>	Ice rink - Ice load due to subfloor heating (Btu/hr)
93	<ir;Qresurf>	Ice rink - Ice load due to resurfacing (Btu/hr)
94	<ir;Qskaters>	Ice rink - Ice load due to skaters, weighted (Btu/hr)
95	<ir;Qrink>	Ice rink - Gross ice load, unweighted (Btu/hr)
96	<ir;Qbrine>	Ice rink - Net brine load, weighted (Btu/hr)
97	<ir;Tceil>	Ice rink - Ceiling surface temperature (Deg F by subtracting 460.)
98	<ir;Trink>	Ice rink - Rink temperature (Deg F)
99	<ir;Wrink>	Ice rink - Humidity ratio at ice temperature (lb/lb)
100	<DCVOAcfmZ>	Hourly zone OA CFM requirement for DCV calculation (cuft/min)
101	<DCVOAcfmFrac>	Hourly zone OA/total flow for DCV calculation (cfm/cfm)

**VARIABLES BY SYSTEM-TYPE FOR ZONE**

V-L No.	1	2	3	4	5	6	7	8
SYSTEM-TYPE	SENS LOAD-IN	LATENT LOAD-IN	ELEC LOAD-IN	PLENUM LOAD-IN	INFL.CFM	ZONE TEMP	THERMOSTAT SETPT	EXTRAC-TION RATE
SUM	A	A	A	A	A	A	A	A
SZRH	A	A	A	A	A	A	A	A
MZS	A	A	A	A	A	A	A	A
DDS	A	A	A	A	A	A	A	A
SZCI	A	A	A	A	A	A	A	A
UHT	A	A	A	A	A	A	A	A
UVT	A	A	A	A	A	A	A	A
FPH	A	A	A	A	A	A	A	A
TPFC	A	A	A	A	A	A	A	A
FPFC	A	A	A	A	A	A	A	A
TPIU	A	A	A	A	A	A	A	A
FPIU	A	A	A	A	A	A	A	A
VAVS	A	A	A	A	A	A	A	A
PIU	A	A	A	A	A	A	A	A
RHFS	A	A	A	A	A	A	A	A
HP	A	A	A	A	A	A	A	A
HVSY	A	A	A	A	A	A	A	A
CBVAV	A	A	A	A	A	A	A	A
RESYS	A	A	A	A	A	A	A	A
PSZ	A	A	A	A	A	A	A	A
PMZS	A	A	A	A	A	A	A	A
PVAVS	A	A	A	A	A	A	A	A
PTAC	A	A	A	A	A	A	A	A
PVVT	A	A	A	A	A	A	A	A
RESVVT								

V-L No.	9	10	11	12	13	14	15	16
SYSTEM-TYPE	TOTAL UA FOR HOUR	UNUSED	EXH CFM	HOT DECK CFM	COLD DECK CFM	SUPPLY CFM	BBRD HEAT RATE	LOAD NOT MET
SUM	A	N	N	N	N	N	A	A
SZRH	A	N	A	N	N	A	A	A
MZS	A	N	A	A	A	A	A	A
DDS	A	N	A	A	A	A	A	A
SZCI	A	N	A	N	N	A	A	A
UHT	A	N	N	A	N	A	A	A
UVT	A	N	N	A	N	A	A	A
FPH	A	N	N	N	N	N	A	A
TPFC	A	N	A	N	N	A	A	A
FPFC	A	N	A	N	N	A	A	A
TPIU	A	N	A	N	N	A	A	A
FPIU	A	N	A	N	N	A	A	A
VAVS	A	N	A	N	N	A	A	A
PIU	A	N	A	N	N	A	A	A
RHFS	A	N	A	N	N	A	A	A
HP	A	N	A	A	A	A	A	A
HVSY	A	N	A	N	N	A	A	A
CBVAV	A	N	A	N	N	A	A	A
RESYS	A	N	N	N	N	N	A	A
PSZ	A	N	A	N	N	A	A	A
PMZS	A	N	A	A	A	A	A	A
PVAVS	A	N	A	N	N	A	A	A
PTAC	A	N	N	A	A	A	A	A
PVVT	A	N	A	N	N	A	A	A
RESVVT								

Legend:  
 A = Appropriate  
 N = Not appropriate  
 X = Unused  
 D = Used for program code debugging only  
 S = System (or configuration) dependent

V-L.No.	17	18	19	20	21	22	23	24
SYSTEM-TYPE	HEAT SET POINT	COOL SET POINT	MAX COOLING	MAX HEATING	FLOAT TEMP	F IN TEMDEV	INT'TRAN TO ZONE	TEMDEV VAR G0
SUM	A	A	A	A	A	D	A	D
SZRH	A	A	A	A	A	D	A	D
MZS	A	A	A	A	A	D	D	D
DDS	A	A	A	A	A	D	A	D
SZCI	A	A	A	A	A	D	A	D
UHT	A	A	A	A	A	D	A	D
UVT	A	A	A	A	A	D	A	D
FPH	A	A	A	A	A	D	A	D
TPFC	A	A	A	A	A	D	A	D
FPFC	A	A	A	A	A	D	A	D
TPIU	A	A	A	A	A	D	A	D
FPIU	A	A	A	A	A	D	A	D
VAVS	A	A	A	A	A	D	A	D
PIU	A	A	A	A	A	D	A	D
RHFS	A	A	A	A	A	D	A	D
HP	A	A	A	A	A	D	A	D
HVSYS	A	A	A	A	A	D	A	D
CBVAV	A	A	A	A	A	D	A	D
RESYS	A	A	A	A	A	D	A	D
PSZ	A	A	A	A	A	D	A	D
PMZS	A	A	A	A	A	D	A	D
PVAVS	A	A	A	A	A	D	A	D
PTAC	A	A	A	A	A	D	A	D
PVVT	A	A	A	A	A	D	A	D
RESVVT						D		D

V-L.No.	25	26	27	28	29	30	31	32
SYSTEM-TYPE	TEMDEV VAR G1	TEMDEV VAR G2	TEMDEV VAR G3	TEMDEV SIG-MAG	IND UNIT AIR TEMP	HEAT TO ZONE T	COOL TO ZONE T	HEATING BY COILS
SUM	D	D	D	D	N	N	N	N
SZRH	D	D	D	D	N	A	N	A
MZS	D	D	D	D	N	N	N	N
DDS	D	D	D	D	N	N	N	N
SZCI	D	D	D	D	N	A	N	A
UHT	D	D	D	D	N	N	N	A
UVT	D	D	D	D	N	N	N	A
FPH	D	D	D	D	N	N	N	A
TPFC	D	D	D	D	N	N	N	A
FPFC	D	D	D	D	N	N	N	A
TPIU	D	D	D	D	A	N	N	A
VAVS	D	D	D	D	N	A	N	A
PIU	D	D	D	D	N	A	N	A
RHFS	D	D	D	D	N	A	N	A
HP	D	D	D	D	N	N	N	A
HVSYS	D	D	D	D	N	A	N	A
CBVAV	D	D	D	D	N	A	N	A
RESYS	D	D	D	D	N	N	N	N
PSZ	D	D	D	D	N	A	N	A
PMZS	D	D	D	D	N	N	N	N
PVAVS	D	D	D	D	N	A	N	A
PTAC	D	D	D	D	N	N	N	A
PVVT	D	D	D	D	N	A	N	A
RESVVT	D	D	D	D				

## Legend:

A = Appropriate  
N = Not appropriate  
X = Unused

D = Used for program code debugging only  
S = System (or configuration) dependent

V-L.No.	33	34	35	36	37	38	39	40
SYSTEM-TYPE	COOLING BY COILS	UNIT SUP TEMP	UNIT HEATING	UNIT COOLING	UNIT FAN KW	UNIT MIX TEMP	UNIT WR OR TC	UNIT MIX HUM
SUM	N	N	N	N	N	N	N	N
SZRH	N	N	N	N	N	N	N	N
MZS	N	N	N	N	N	N	N	N
DDS	N	N	N	N	N	N	N	N
SZCI	N	N	N	N	N	N	N	N
UHT	A	A	A	A	A	A	S	A
UVT	A	A	A	A	A	A	S	A
FPH	N	N	N	N	N	N	N	N
TPFC	A	A	A	A	A	A	A	A
FPFC	A	A	A	A	A	A	A	A
TPIU	N	N	N	N	N	N	N	N
FPIU	N	N	N	N	N	N	N	N
VAVS	N	N	N	N	N	N	N	N
PIU	N	N	N	N	N	N	N	N
RHFS	N	N	N	N	N	N	N	N
HP	A	A	A	A	A	A	A	A
HVSYS	A	N	N	N	N	N	N	N
CBVAV	N	N	N	N	N	N	N	N
RESYS	N	N	N	N	N	N	N	N
PSZ	N	N	N	N	N	N	N	N
PMZS	N	N	N	N	N	N	N	N
PVAVS	N	N	N	N	N	N	N	N
PTAC	A	A	A	A	A	A	S	A
PVVT	A	N	N	N	N	N	N	N
RESVVT								

V-L.No.	41	42	43	44	45	46	47	48
SYSTEM-TYPE	UNIT COIL HUM	UNIT OA-RATIO	UNIT LAT COOL	UNIT COOL. PLR	UNIT HEAT PLR	UNIT EIR	UNIT WETBULB	UNIT DEFROST
SUM	N	N	N	N	N	N	N	N
SZRH	N	N	N	N	N	N	N	N
MZS	N	N	N	N	N	N	N	N
DDS	N	N	N	N	N	N	N	N
SZCI	N	N	N	N	N	N	N	N
UHT	A	A	A	A	A	A	A	N
UVT	A	A	A	A	A	A	A	N
FPH	N	N	N	N	N	N	N	N
TPFC	A	A	A	A	A	A	A	N
FPFC	A	A	A	A	A	A	A	N
TPIU	N	N	N	N	N	N	N	N
FPIU	N	N	N	N	N	N	N	N
VAVS	N	N	N	N	N	N	N	N
PIU	N	N	N	N	N	N	N	N
RHFS	N	N	N	N	N	N	N	N
HP	A	A	A	A	A	A	A	N
HVSYS	N	N	N	N	N	N	N	A
CBVAV	N	N	N	N	N	N	N	N
RESYS	N	N	N	N	N	N	N	N
PSZ	N	N	N	N	N	N	N	N
PMZS	N	N	N	N	N	N	N	N
PVAVS	N	N	N	N	N	N	N	N
PTAC	A	A	A	A	A	A	A	A
PVVT	N	N	N	N	N	N	N	N
RESVVT								

Legend:

A = Appropriate  
 N = Not appropriate  
 X = Unused

D = Used for program code debugging only  
 S = System (or configuration) dependent

V-L.No.	49	50	51	52	53	54	55	56
SYSTEM-TYPE	WEIGHTED CFM	TOTAL ELECTRIC	MIN COOL T	MAX HEAT T	DEADBAND MAX EXTR	DEADBAND MIN EXTR	THROTTLE OVER TWO	COM WIN SOL GAIN (Btu/hr)
SUM	N	A	N	N	N	N	N	A
SZRH	A	A	A	A	A	A	A	A
MZS	A	A	A	A	A	A	A	A
DDS	A	A	A	A	A	A	A	A
SZCI	A	A	A	A	A	A	A	A
UHT	N	A	A	A	A	A	A	A
UVT	N	A	A	A	A	A	A	A
FPH	N	A	N	N	N	N	N	A
TPFC	N	A	A	A	A	A	A	A
FPFC	N	A	A	A	A	A	A	A
TPIU	A	A	A	A	A	A	A	A
FPIU	A	A	A	A	A	A	A	A
VAVS	A	A	A	A	A	A	A	A
PIU	A	A	A	A	A	A	A	A
RHFS	A	A	A	A	A	A	A	A
HP	N	A	A	A	A	A	A	A
HVSYS	A	A	A	A	A	A	A	A
CBVAV	A	A	A	A	A	A	A	A
RESYS	N	A	A	A	A	A	A	A
PSZ	A	A	A	A	A	A	A	A
PMZS	A	A	A	A	A	A	A	A
PVAVS	A	A	A	A	A	A	A	A
PTAC	N	A	A	A	A	A	A	A
PVVT	A	A	A	A	A	A	A	A
RESVVT								

V-L.No.	57	58	59	60	61	62	63	64
SYSTEM-TYPE	COM WIN SOL LOAD BTU/HR	COM WIN CONDUCT BTU/HR	COM WIN ABSD SOL BTU/HR	COM WALL CONDUCT BTU/HR	CONVEC HT GAIN BTU/HR	CONVEC AIR FLOW CFM	SUNSPACE FAN POWR KW	SUNSPACE VENT FLOW CFM
SUM	A	A	A	A	A	A	A	A
SZRH	A	A	A	A	A	A	A	A
MZS	A	A	A	A	A	A	A	A
DDS	A	A	A	A	A	A	A	A
SZCI	A	A	A	A	A	A	A	A
UHT	A	A	A	A	A	A	A	A
UVT	A	A	A	A	A	A	A	A
FPH	A	A	A	A	A	A	A	A
TPFC	A	A	A	A	A	A	A	A
FPFC	A	A	A	A	A	A	A	A
TPIU	A	A	A	A	A	A	A	A
FPIU	A	A	A	A	A	A	A	A
VAVS	A	A	A	A	A	A	A	A
PIU	A	A	A	A	A	A	A	A
RHFS	A	A	A	A	A	A	A	A
HP	A	A	A	A	A	A	A	A
HVSYS	A	A	A	A	A	A	A	A
CBVAV	A	A	A	A	A	A	A	A
RESYS	A	A	A	A	A	A	A	A
PSZ	A	A	A	A	A	A	A	A
PMZS	A	A	A	A	A	A	A	A
PVAVS	A	A	A	A	A	A	A	A
PTAC	A	A	A	A	A	A	A	A
PVVT	A	A	A	A	A	A	A	A
RESVVT								

Legend:  
 A = Appropriate  
 N = Not appropriate  
 X = Unused  
 D = Used for program code debugging only  
 S = System (or configuration) dependent



**SYSTEM**

Variable-List Number	Variable in FORTRAN Code	Description
1	TH	Temperature of air leaving the heating coil - hot deck temperature (F)
2	TC	Temperature of air leaving cooling coil - cold deck temp (F)
3	TM	Temperature of air entering coil (F)
4	TR	Return air temp downstream of the return fan and plenums (F)
5	QH	Total central heating coil energy input (Btu/hr)
6	QC	Total central cooling coil energy input (Btu/hr)
7	QHZ	Total zone heating energy input (Btu/hr)
8	QCZ	For SYSTEM:TYPE = RESYS this is the cooling by natural ventilation
9	QHB	Total baseboard heating energy input (Btu/hr)
10	QHP	Total preheat coil energy input (Btu/hr)
11	QHUM	Humidification energy input (for RESYS and RESVVT: electrical resistance heat load) (Btu/hr)
12	QDHUM	Sensible dehumidification reheat input (for RESYS and RESVVT: defrost load) (Btu/hr)
13	TCMIN	minimum temperature air handler could supply (F)
14	THMAX	maximum temperature air handler could supply (F)
15	QLSUM	Total system latent heat load from LOADS (Btu/hr)
16	QPSUM	Total system light heat to return (Btu/hr)
17	CFM	Total system supply air flow rate (cfm)
18	CFMH	Total system hot supply air flow rate (DDS, MZS, PMZS) (cfm)
19	CFMC	Total system cold supply air flow rate (DDS, MZS, PMZS) (cfm)
20	RCFM	Total system return air flow rate (cfm)
21	ECFM	Total system exhaust air flow rate (cfm)
22	CINF	Outside air infiltration rate (cfm)
23	FON	Fan on/off flag(1 = on, 0 = off, -1 cannot cycle on for NIGHT-CYCLE-CTRL)
24	HON	Heating on/off flag (1 = on, 0 = off)
25	CON	Cooling on/off flag (1 = on, 0 = off)
26	BON	Baseboard heater on-off flag (ratio from RESET-SCHEDULE)
27	CONS(1)	In the equation $Q = \text{CONS}(1) * \text{CFM} * \Delta T$ , $\text{CONS}(1) = 0.24 + 0.44 * \text{HUMRAT} * 60.0 / V(*\text{DBT}, \text{HUMRAT}, \text{PATM}) = 1.08$ at standard conditions
28	CONS(2)	In the equation $Q = \text{CONS}(2) * \text{CFM} * DW$ , $\text{CONS}(2) = 1061.0 * 60.0 / V(*\text{DBT}, \text{HUMRAT}, \text{PATM}) = 4790$ at standard conditions
29	CONS(3)	Convert fan pressure to kW: $\text{CONS}(3) = 0.3996 / \text{CONS}(1)$ , 0.363 at STP

Variable-List Number	Variable in FORTRAN Code	Description
30	PH	For dual duct systems: ratio of hot duct flow to total flow
31	PC	For dual duct systems: ratio of cold duct cfm to total cfm
32	SKW	Hourly total electrical consumption (kW)
33	FANKW	Total of supply fan, return fan, and exhaust fan electrical consumption
34	unused	unused
35	WR	Return air humidity ratio (lb H <sub>2</sub> O/lb dry air)
36	WM	Mixed air humidity ratio (lb H <sub>2</sub> O/lb dry air)
37	WCOIL	Humidity ratio of air leaving cooling coil (lb h <sub>2</sub> O/lb dry air)
38	WW	Water (moisture) added/removed from air for (de)humidification (lb/lb)
39	PO	Ratio of outside air flow to total supply air flow
40	D	Density of air x 60 min/hr (lb/ft <sup>3</sup> x min/hr)
41	FTEMP	Temperature of circulating fluid for HP system (F)
42	TCR	Effect of controller on cooling coil setpoint (F)
43	QHR	Adjusted capacity of heat pump this hour for (Btu/hr)
44	RFanPumpKW	Refrigeration system fan plus pump energy (kWh)
45	SGAS	Total gas heating (Btu/hr)
46	SKWQH	Electrical input to heating (kW)
47	SKWQC	Electrical input to cooling (kW)
48	QCLAT	Latent part of total cooling (Btu/hr)
49	SFKW	Supply fan electrical (kW)
50	RFKW	Return fan electrical (kW)
51	FONNGT	System can be night cycled: -1 for heating, 0 for no cycle, 1 for cooling
52	WSURF	Humidity ratio at saturation at coil surface temperature
53	RWalkinQ	Refrigeration system walkin load (Btu/hr)
54	TSURF	Coil surface temperature at supply setpoint (F)
55	TRh	Return temperature - dual duct hot side (return fan may be for cold only)
56	CBF	Coil bypass factor: (COIL-BF) * CBF1 * CBF2
57	CBF1	Temperature correction to COIL-BF
58	CBF2	Flow correction to COIL-BF
59	EON	Exhaust fan schedule: 0=off, 1=on
60	PLRCFM	(Current hour cfm)/(design cfm)
61	PLRC	Capacity part load ratio for cooling (also see PLRCC below)
62	PLRH	Capacity part load ratio for heating
63	QCM1	Temperature correction to COOLING-CAPACITY
64	QCM2	Temperature correction to COOL-SH-CAP
65	QHM1	Temperature correction to HEATING-CAPACITY

Variable-List Number	Variable in FORTRAN Code	Description
66	EIRM1	Temperature correction to COOLING-EIR
67	EIRM2	Part load correction to COOLING-EIR
68	EIR	(COOLING-EIR) * EIRM1 * EIRM2 (Btu/Btu)
69	OFKW	Outside fan power (kW)
70	QCT	Total cooling capacity (Btu/hr)
71	QCS	Sensible cooling capacity (Btu/hr)
72	WRMAX	Maximum humidity setpoint (lb H2O/lb)
73	WRMIN	Minimum humidity setpoint (dry air)
74	CFMRAT	Maximum ratio of zone flow (for supply fans smaller than sum of zones)
75	QdistG	Heat gains to DUCT&PIPE-ZONE from pipes and ducting
76	QdistL	Heat losses from DUCT&PIPE-ZONE from pipes and ducting
77	RON	Heat recovery on/off (0/1) flag
78	QHT	The total heating capacity (Btu/hr) for central AHU
79	TPOMIN	Mixed air temperature at minimum OA damper position for central AHU
80	POMIN	The minimum OA damper position ( fraction) for central AHU
81	QHSUP	The total supplemental heat load for RESYS, RESVVT, PSZ and PTAC (Btu/hr)
82	QRSENS	Sensible heat gain to zone from refrigerated casework (PSZ only) (Btu/hr)
83	QRLAT	Latent heat gain to zone from refrigerated casework (PSZ only) (Btu/hr)
84	QRREC	Energy recovered from condenser and used for space heating in heat recovery mode (PSZ only) (Btu/hr)
85	QRREJ	Energy rejected from condenser (PSZ only) (Btu/hr)
86	RCOMKW	Electrical energy consumed by compressors (PSZ only) (kW)
87	RDEFKW	Electrical energy consumed by defrosters (PSZ only) (kW)
88	RAUXKW	Electrical energy consumed by lights, fans, and anti-sweat heaters in refrigerated casework (PSZ only) (kW)
89	ECFMP	Plenum exhaust flow rate (cfm)
90	SCGAS	Gas used for cooling (Btu/hr)
91	QREG	Regeneration energy (Btu/hr)
92	WBR	Return air wetbulb temperature (F)
93	WB8	Debug variable for PTGSD
94	T8	Debug variable for PTGSD
95	W8	Debug variable for PTGSD
96	WB9	Debug variable for PTGSD
97	T9	Debug variable for PTGSD
98	W9	Debug variable for PTGSD

Variable-List Number	Variable in FORTRAN Code	Description
99	EFF	Direct evaporative cooler effectiveness
100	D'TON	Fraction of hour evaporative cooler or desiccant system is on
101-111	DMODE(1-7)	Debug variables for PTGSD
108	ERMAX4	Debug variable for PTGSD
109	ERMAX5	Debug variable for PTGSD
110	ERMAX6	Debug variable for PTGSD
1111	OPMODE	Debug variable for PTGSD
112	DBOA	drybulb temperature of air leaving desiccant or evaporative supplemental cooling unit (F)
113	WOA	humidity ratio of air leaving desiccant or evaporative supplemental unit (lb H <sub>2</sub> O/lb air)
114	DGAS	gas used to desiccate the air for integrated (supplemental) units (Btu/hr)
115	DKW	auxiliary electricity the integrated/supplemental desiccant unit used (kWh)
116	TCOND	temperature of water sent to condenser (DUBLSORB) (F)
117	QCOTOT	total cooling done by desiccant unit (Btu/hr)
118	QCDS	sensible cooling done by desiccant unit (Btu/hr)
119	QCCL	latent cooling done by desiccant unit (Btu/hr)
120	POA	ratio of air flowing through supplemental desiccant or evaporative unit to total supply air
121	EVKW	auxiliary electricity used by the supplemental evaporative cooler (kW)
122	QCEVT	total cooling done by the evaporative cooling unit (Btu/hr)
123	QCEVS	sensible cooling by the evaporative cooling unit (Btu/hr)
124	QCEVL	latent cooling by the evaporative cooling unit (Btu/hr)
125	HPDeFE	heat pump defrost energy (Btu)
126	D'TS	Supply air stream temperature rise across the supply fan (Deg F)
127	D'TR	Supply air stream temperature rise across the return fan (Deg F)
128	TDuctEnv	Temperature of environment (zone after loss adjustment) of duct location
129-133 and 139-150		for SYSTEM-TYPE=HP and CONDENSER-TYPE=WATER-COOLED only
129	GPMS	Condenser water flow (GPM)
130	GPMHS	Condenser flow for heating (GPM)
131	GPMCS	Condenser flow for cooling (GPM)
132	QHLUPS	Heat taken from loop (Btu/hr)
133	QCLUPS	Heat added to loop (Btu/hr)
134	IVENTF	Natural Ventilation – venting is being used 0=no
135	INT(VENTF)	Natural Ventilation – venting scheduled available 0=no 1=yes
136	IVENTG	Natural Ventilation – venting allowed (scheduled or OA enthalpy < zone)

Variable-List Number	Variable in FORTRAN Code	Description
137	QCV	Natural Ventilation – total cooling for ventilation (Btu/hr)
138	XRAN	Natural Ventilation – random number used for venting probability (0 to 1)
139	CAPAIR	Heat transport capacity of air side of water-side economizer (Btu/hr-F)
140	CAPWTR	Heat transport capacity of water side of water-side of economizer (Btu/hr-F)
141	QCWSEM	Max possible water-side economizer exchange (Btu/hr)
142	QCWSE	Actual water-side economizer exchange (Btu/hr)
143	WSEDTA	Temperature change of air (F)
144	WSEDTW	Temperature change of water (F)
145	WSEXEF	Water-side economizer heat-exchanger effectiveness
146	WSENTU	Unused
147	WSEUA	Unused
148	WSEQMX	Unused
149	WSEPLR	Fraction of water-side economizer max flow used
150	WSEDT	Air/water temperature difference
151-153	WSE13/14/15	Unused WSE variables
154	PLRCC	Compressor PLR (accounting for MIN-UNLOAD/HGB-RATIOS)
Variables 155-213 are for HEAT-SOURCE = GAS-HEAT-PUMP or COMPRESSOR-TYPE = VARIABLE SPEED		
Cooling Mode:		
155	QCRUN	Run time of compressor (hours)
156	QCLOAD	Output of unit (Btu/hr)
157	QCGAS	Gas or electricity consumed by unit for cooling (Btu/hr)
158	QCAUX	Fans/Pumps/Aux energy (Btu/hr)
159	QCGSLD	Unmet cooling load (Btu/hr)
160	QCGSUP	Unused
161	QCWAS	Waste heat generated (Btu/hr)
162	QCWASU	Waste heat used (Btu/hr)
163	QCGSAV1	Unused
164	QCFAN	Indoor fan energy (Btu/hr)
Heating Mode:		
165	QHRUN	Run time of compressor (hours)
166	QHLOAD	Output of Unit (Btu/hr)
167	QHGAS	Gas or electricity consumed by unit for heating (Btu/hr)
168	QHAUX	Fans/Pumps/Aux energy (Btu/hr)
169	QHGS LD	All non-compressor heating loads (supplemental, reheat, etc.) (Btu/hr)

Variable-List Number	Variable in FORTRAN Code	Description
170	QHGSUP	Energy input to supp (Btu/hr)
171	QHWAS	Waste heat generated (Btu/hr)
172	QHWASU	Waste heat used (Btu/hr)
173	QHGDFR	Defrost imposed heat (Btu/hr)
174	QHFAN	Indoor fan energy (Btu/hr)
175	COIL-BF-FPLR	Value of COIL-BF-FPLR used this hour
176-177	-	Unused
178	COOL-EIR-FRPMT	Value of COOL-EIR-FRPMT used this hour
179	COOL-RPM-FPLR	Value of COOL-RPM-FPLR used this hour
180	COOL-WH-FT	Value of COOL-WH-FT used this hour
181	COOL-WH-FRPMT	Value of COOL-WH-FRPMT used this hour
182	COOL-CFM-FPLR	Value of COOL-CFM-FPLR used this hour
183	OUTSIDE-FAN-CFLT	Value of OUTSIDE-FAN-CFLT used this hour
184	HEAT-EIR-FRPMT	Value of HEAT-EIR-FRPMT used this hour
185	HEAT-RPM-FPLR	Value of HEAT-RPM-FPLR used this hour
186	HEAT-WH-FT	Value of HEAT-WH-FT used this hour
187	HEAT-WH-FRPMT	Value of HEAT-WH-FRPMT used this hour
188	HEAT-CFM-FPLR	Value of HEAT-CFM-FPLR used this hour
189	OUTSIDE-FAN-HFLT	Value of OUTSIDE-FAN-HFLT used this hour
190	HEAT-LOS-FPLR	Value of HEAT-LOS-FPLR used this hour
191	COOL-LOS-FPLR	Value of COOL-LOS-FPLR used this hour
192	DEFROST-FRAC-FT	Ratio of defrost/heating time
193	DEFROST-CAP-FT	Heating fraction for defrost
194	DEFROST-PWR-FT	EIR in defrost mode
195	COOL-CAP-FRPMT	Value of COOL-CAP-FRPMT curve used this hour
196	HEAT-CAP-FRPMT	Value of HEAT-CAP-FRPMT curve used this hour
197-201	-	Unused
202	PCH	Fraction of dual duct cold air that "wipes" the heating coil first
203	ISZCZ	Single zone system control zone flag 0=not control zone 1=is C-Z
204	GCAP(1)	Capacity at maximum RPM (Btu/hr)
205	GCAP(2)	Capacity at minimum RPM (Btu/hr)
206	GEDB	Entering mixed air temperature (F)
207	QHDFRG	Gas or electricity used in defrost mode (Btu/hr)
208	GRPM	Speed of compressor (RPM)
209	PLRSUP	PLR of supplemental heating unit
210	CFMCCYC	Fraction fan are on for INDOOR-FAN-MODE=INTERMITTANT

Variable-List Number	Variable in FORTRAN Code	Description
211	CLPLR	Cycling loss PLR (fraction)
212	CFMVVT	Flow fraction for PVVT (fraction)
213	QHZHP	Total zone heating load for gas heat pump (Btu/hr)
214	PCCEDB	Condenser entering temperature (evaporative precooler exit temperature) (F)
215	FONh	Hot deck fan on/off
216	SFKWh	Hot deck fan power consumption. Note that item #33 is <i>total</i> /kw for all fans
217	DTSh	Hot deck air temperature rise
218	CFMRATH	Ratio of hot fan max flow/hourly zonal demand
219	FONNGTh	Hot deck fan on for night cycle
220	RCFMmix	Return flow to mixed air plenum
221	RfanCFM	Air moved by return/relief fan
222	EXFIL	Exfiltration from building pressurization, excluding zonal exhaust
223	D'TDUCT	Duct temperature rise/fall due to losses (F)
224	D'TDUCTh	Hot duct temperature rise/fall due to losses (for two-duct systems) (F)
225	TCDFSR	Duct air temperature (F)
226	THDFSR	Hot duct air temp (for two duct systems) (F)
227	QRNOW	Display case load at LOADS temperature
228	CRNOW	Display case conductance
229	QR(1)	Lowest temperature display case load
230	QR(2)	Intermediate temperature display case load
231	QR(3)	Highest temperature display case load
232	RQSSCH(1)	Lowest temperature conductance schedule value
233	RQSSCH(3)	Intermediate temperature conductance schedule value
234	RQSSCH(3)	Highest temperature conductance schedule value
235	AUXSCH(1)	Lowest temperature auxiliary schedule value
236	AUXSCH(2)	Intermediate temperature auxiliary schedule value
237	AUXSCH(3)	Highest temperature auxiliary schedule value
238	QSENS(1)	Lowest temperature sensible load
239	QSENS(2)	Intermediate temperature sensible load
240	QSENS(3)	Highest temperature sensible load
241	QLAT(1)	Lowest temperature latent load
242	QLAT(2)	Intermediate temperature latent load
243	QLAT(3)	Highest temperature latent load
244	QDEF(1)	Lowest temperature defrost energy

Variable-List Number	Variable in FORTRAN Code	Description
245	QDEF(2)	Intermediate temperature defrost energy
246	QDEF(3)	Highest temperature defrost energy
247	SWEATKW(1)	Lowest temperature anti-sweat energy
248	SWEATKW(2)	Intermediate temperature anti-sweat energy
249	SWEATKW(3)	Highest temperature anti-sweat energy
250	COMPKW1(1)	Lowest temperature compressor energy, no htrec
251	COMPKW1(2)	Intermediate temperature compressor energy, no htrec
252	COMPKW1(3)	Highest temperature compressor energy, no htrec
253	COMPKW2(1)	Lowest temperature compressor energy, htrec
254	COMPKW2(2)	Intermediate temperature compressor energy, htrec
255	COMPKW2(3)	Highest temperature compressor energy, htrec
256	QREC1(1)	Lowest temperature recoverable heat, no htrec
257	QREC1(2)	Intermediate temperature recoverable heat, no htrec
258	QREC1(3)	Lowest temperature recoverable heat, no htrec
259	QREC2(1)	Lowest temperature recoverable heat, htrec
260	QREC2(2)	Intermediate temperature recoverable heat, htrec
261	QREC2(3)	Highest temperature recoverable heat, htrec
262	QREJ1(1)	Lowest temperature condenser heat, no htrec
263	QREJ1(2)	Intermediate temperature condenser heat, no htrec
264	QREJ1(3)	Highest temperature condenser heat, no htrec
265	QREJ2(1)	Lowest temperature condenser heat, htrec
266	QREJ2(2)	Intermediate temperature condenser heat, htrec
267	QREJ2(3)	Highest temperature condenser heat, htrec
268	TcondR or <'TSIGc>	Condenser temperature OR WARMEST/COLDEST cooling signal T
269	PLR(1)	Lowest temperature part load ratio
270	PLR(2)	Intermediate temperature part load ratio
271	PLR(3)	Highest temperature part load ratio
272	TREJ1	Total condenser heat, no htrec
273	TREJ2	Total condenser heat, htrec
274	TREC1	Total recoverable heat, no htrec
275	TREC2	Total recoverable heat, htrec
276	EIR1(1)	Lowest temperature electric input ratio, part load correction
277	EIR1(2)	Intermediate temperature electric input ratio, part load correction
278	EIR1(3)	Highest temperature electric input ratio, part load correction
279	EIR1r(1)	Lowest temp electric input ratio, part load correction, htrec mode



Variable-List Number	Variable in FORTRAN Code	Description
280	EIR1r(2)	Intermediate temp electric input ratio, part load corr, htrec mode
281	EIR1r(3)	Highest temp electric input ratio, part load correction, htrec mode
282	EIR2(1)	Lowest temperature electric input ratio, temperature correction
283	EIR2(2)	Intermediate temp electric input ratio, temperature correction
284	EIR2(3)	Highest temperature electric input ratio, temperature correction
285	GPMcw	Condenser water flow, water-cooled
286	FRAC1	Fraction of hour in non-htrec mode
287	FRAC2	Fraction of hour in htrec mode
288	CONDcap	Condenser capacity
289	CONDplr	Condenser fan part load ratio
290	TcondFloat or <TSIGh>	Condenser temperature when floating above setpoint OR WARMEST/COLDEST heating signal T
291	EIR3	Condenser fan power part load correction factor
292	<rv;CFMoa>	ERV Outdoor airflow
293	<rv;CFMekh>	ERV Exhaust airflow
294	<rv;effSensible>	ERV Sensible effectiveness
295	<rv;effLatent>	ERV Latent effectiveness
296	<rv;Qsensible>	ERV Sensible heat transfer (heating of OA is negative)
297	<rv;Qlatent>	ERV Latent heat transfer (moisture gain of OA is negative)
298	<rv;QHxexcess>	ERV Excess heat transfer (heating of OA is negative)
299	<rv;QCxexcess>	ERV Excess coolth transfer (cooling of OA is positive)
300	<rv;TervReqd>	ERV required leaving temperature to maintain mixed-air setpoint
301	<rv;TervSetpt>	ERV Temperature setpoint for air supply to mixed air plenum
302	<rv;ToaHXi>	ERV Outdoor air temperature entering HX, after preheat
303	<rv;ToaHXo>	ERV Outdoor air temperature leaving HX (to mixed air plenum)
304	<rv;TexhHXi>	ERV Exhaust air temperature entering HX, after preheat
305	<rv;TexhHXo>	ERV Exhaust air temperature leaving HX (to outdoors)
306	<rv;WoaHXi>	ERV Outdoor air humidity ratio entering HX
307	<rv;WoaHXo>	ERV Outdoor air humidity ratio leaving HX (to mixed air plenum)
308	<rv;WexhHXi>	ERV Exhaust air humidity ratio entering HX
309	<rv;WexhHXo>	ERV Exhaust air humidity ratio leaving HX (to outdoors)
310	<rv;PLRhx>	ERV Capacity modulation of HX
311	<rv;OAbyypass> or <rv;ExhBypass>	ERV Fraction of air bypassed around HX; OA or exhaust
312	<rv;OAEcono>	ERV Fraction of OA thru economizer to maintain setpoint

Variable-List Number	Variable in FORTRAN Code	Description
313	<rv;kWoa> + <rv;kWexh>	ERV Power of integral fans
314	<rv;kWhx>	ERV Power of HX (heat wheel motor)
315	<rv;kWpreheat>	ERV Power of preheat coil
316	<rv;Qpreheat>	ERV HW load of preheat coil
317	<rv;ExhWetFlag>	ERV flag indicating that exhaust air is at dewpoint within hx
318	<rv;OAWetFlag>	ERV flag indicating that outside air is at dewpoint within hx
319	<DCVOAcfmS>	Hourly summed ZONE OA CFM for DCV calculation (cuft/min)
320	<DCVOAcfmFracCrit>	Hourly max ZONE OA/total flow for DCV calculation (cfm/cfm)

**VARIABLES BY SYSTEM-TYPE FOR SYSTEM**

V-L.No.	1	2	3	4	5	6	7	8
SYSTEM-TYPE	HEATING COIL AIR TEMP	COOLING COIL AIR TEMP	MIXED AIR TEMP	RETURN AIR TEMP	TOTAL HEATING COIL BTU	TOTAL COOLING COIL BTU	TOTAL ZONE HEATING BTU	TOTAL ZONE COOLING BTU
SUM	N	N	N	N	A	A	N	N
SZRH	N	A	A	A	A	A	A	A
MZS	A	A	A	A	A	A	N	N
DDS	A	A	A	A	A	A	N	N
SZCI	N	A	A	A	A	A	A	A
UHT	N	N	N	N	A	A	A	N
UVT	N	N	N	N	A	A	A	N
FPH	N	N	N	N	A	N	A	N
TPFC	N	N	N	N	A	A	A	A
FPFC	N	N	N	N	A	A	A	A
TPIU	N	A	A	A	A	A	A	A
FPIU	N	A	A	A	A	A	A	A
VAVS	N	A	A	A	A	A	A	A
PIU	N	A	A	A	A	A	A	A
RHFS	N	A	A	A	A	A	A	A
HP	N	N	N	N	A	A	A	A
HVSYS	A	N	A	A	A	N	A	N
CBVAV	N	A	A	A	A	A	A	A
RESYS	A	A	A	A	A	A	A	A
PSZ	N	A	A	A	A	A	A	A
PMZS	A	A	A	A	A	A	N	N
PVAVS	N	A	A	A	A	A	A	A
PTAC	A	N	N	N	A	A	A	A
PTGSD	N	D	A	A	A	A	N	N
PVVT	N	A	A	A	A	A	A	A
RESVVT								

V-L.No.	9	10	11	12	13	14	15	16
SYSTEM-TYPE	TOTAL BBRD ENERGY	TOTAL PREHEAT ENERGY	HUMID-CN HEATING	DEHUMID REHEAT	MIN SUP T	MAX SUP T	SUM ZONE LAT HEAT	SUM ZONE PLN HEAT
SUM	N	N	N	N	N	N	A	A
SZRH	A	A	A	A	A	A	A	A
MZS	A	A	A	A	A	A	A	A
DDS	A	A	A	A	A	A	A	A
SZCI	A	A	A	A	A	A	A	A
UHT	A	N	N	N	N	N	N	N
UVT	A	N	N	N	N	N	N	N
FPH	A	N	N	N	N	N	N	N
TPFC	A	N	A	A	N	N	N	N
FPFC	A	N	A	A	N	N	N	N
TPIU	A	A	A	A	A	A	A	A
FPIU	A	A	A	A	A	A	A	A
VAVS	A	A	A	A	A	A	A	A
PIU	A	A	A	A	A	A	A	A
RHFS	A	A	A	A	A	A	A	A
HP	A	N	N	N	N	N	N	N
HVSYS	A	A	A	N	A	A	A	A
CBVAV	A	A	A	A	A	A	A	A
RESYS	A	A	S	S	A	A	A	A
PSZ	A	A	A	A	A	A	A	A
PMZS	A	A	A	A	A	A	A	A
PVAVS	A	A	A	A	A	A	A	A
PTAC	A	N	N	N	N	N	N	N
PTGSD	A	N	N	N	A	A	A	A
PVVT	A	A	A	A	A	A	A	A
RESVVT								

Legend:  
 A = Appropriate  
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 X = Unused  
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 S = System (or configuration) dependent

V-L No.	17	18	19	20	21	22	23	24
SYSTEM-TYPE	TOTAL SYSTEM CFM	TOTAL HOT CFM	TOTAL COLD CFM	RETURN CFM	EXHAUST CFM	INF CFM	FANS ON/OFF	HEAT ON/OFF
SUM	N	N	N	N	N	A	A	A
SZRH	A	N	N	A	A	A	A	A
MZS	A	A	A	A	A	A	A	A
DDS	A	A	A	A	A	A	A	A
SZCI	A	N	N	A	A	A	A	A
UHT	N	N	N	N	N	N	A	A
UVT	N	N	N	N	N	N	A	A
FPH	N	N	N	N	N	N	N	A
TPFC	N	N	N	N	N	N	A	A
FPFC	N	N	N	N	N	N	A	A
TPIU	A	N	N	A	A	A	A	A
FPIU	A	N	N	A	A	A	A	A
VAVS	A	N	N	A	A	A	A	A
PIU	A	N	N	A	A	A	A	A
RHFS	A	N	N	A	A	A	A	A
HP	N	N	N	N	N	N	A	A
HVSYS	A	N	N	A	A	A	A	A
CBVAV	A	N	N	A	A	A	A	A
RESYS	A	N	N	N	N	A	A	A
PSZ	A	N	N	A	A	A	A	A
PMZS	A	A	A	A	A	A	A	A
PVAVS	A	N	N	A	A	A	A	A
PTAC	N	N	N	N	N	N	A	A
PTGSD	A	N	N	A	A	A	A	A
PVVT	A	N	N	A	A	A	A	A
RESVVT								

V-L No.	25	26	27	28	29	30	31	32
SYSTEM-TYPE	COOL ON/OFF	BBRDSCH RATIO	CONSTANT (1.08)	CONSTANT (0.689)	CONSTANT (0.363)	HOT AIR FRAC	COLD AIR FRAC	TOTAL ELECTRIC KW
SUM	A	N	N	N	N	N	N	A
SZRH	A	A	A	A	A	N	N	A
MZS	A	A	A	A	A	A	A	A
DDS	A	A	A	A	A	A	A	A
SZCI	A	A	A	A	A	N	N	A
UHT	A	A	A	A	A	N	N	A
UVT	A	A	A	A	A	N	N	A
FPH	N	A	N	N	N	N	N	A
TPFC	A	A	A	A	A	N	N	A
FPFC	A	A	A	A	A	N	N	A
TPIU	A	A	A	A	A	N	N	A
FPIU	A	A	A	A	A	N	N	A
VAVS	A	A	A	A	A	N	N	A
PIU	A	A	A	A	A	N	N	A
RHFS	A	A	A	A	A	N	N	A
HP	A	A	A	A	A	N	N	A
HVSYS	A	A	A	A	A	N	N	A
CBVAV	A	A	A	A	A	N	N	A
RESYS	A	A	A	A	A	N	N	A
PSZ	A	A	A	A	A	N	N	A
PMZS	A	A	A	A	A	A	A	A
PVAVS	A	A	A	A	A	N	N	A
PTAC	A	A	A	A	A	N	N	A
PTGSD	N	A	A	A	A	N	N	A
PVVT	A	A	A	A	A	N	N	A
RESVVT								

## Legend:

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V-L.No.	33	34	35	36	37	38	39	40
SYSTEM-TYPE	TOTAL FAN ELEC	DELTA-T RECOV	RET HUMID	MAX HUMID	HUMID LEAVING COIL	MOIST CHG	OUTSIDE/TOTAL CFM	DENSITY (AIR*60)
SUM	N	N	N	N	N	N	N	N
SZRH	A	A	A	A	A	A	A	A
MZS	A	A	A	A	A	A	A	A
DDS	A	A	A	A	A	A	A	A
SZCI	A	A	A	A	A	A	A	A
UHT	A	N	N	N	N	N	N	N
UVT	A	N	N	N	N	N	N	N
FPH	A	N	N	N	N	N	N	N
TPFC	A	N	N	N	N	N	N	N
FPFC	A	N	N	N	N	N	N	N
TPIU	A	A	A	A	A	A	A	A
FPIU	A	A	A	A	A	A	A	A
VAVS	A	A	A	A	A	A	A	A
PIU	A	A	A	A	A	A	A	A
RHFS	A	A	A	A	A	A	A	A
HP	A	N	N	N	N	N	N	N
HVSY	A	A	A	A	A	A	A	A
CBVAV	A	A	A	A	A	A	A	A
RESYS	A	N	N	A	A	A	N	N
PSZ	A	A	A	A	A	A	A	A
PMZS	A	A	A	A	A	A	A	A
PVAVS	A	A	A	A	A	A	A	A
PTAC	A	N	N	N	N	N	N	N
PTGSD	A	N	A	A	A	A	A	A
PVVT	A	A	A	A	A	A	A	N
RESVVT								

V-L.No.	41	42	43	44	45	46	47	48
SYSTEM-TYPE	FLUID TEMP	COOL-CTR EFFECT	QHR	QCR	HEATING GAS	HEATING ELEC	COOLING ELEC	LATENT COOLING
SUM	N	N	N	N	A	A	N	N
SZRH	N	A	A	N	A	A	A	A
MZS	N	A	N	N	A	A	A	A
DDS	N	A	N	N	A	A	A	A
SZCI	N	A	A	N	A	A	A	A
UHT	N	N	N	N	A	A	N	N
UVT	N	N	N	N	A	A	N	N
FPH	N	N	N	N	N	A	N	N
TPFC	N	N	N	N	A	A	N	A
FPFC	N	N	N	N	A	A	N	A
TPIU	N	A	N	N	A	A	N	A
FPIU	N	A	N	N	A	A	N	A
VAVS	N	A	A	N	A	A	N	A
PIU	N	A	A	N	A	A	N	A
RHFS	N	A	A	N	A	A	N	A
HP	A	N	N	N	N	A	A	A
HVSY	N	N	N	N	A	A	N	N
CBVAV	N	A	A	N	A	A	N	A
RESYS	N	N	N	N	A	A	A	A
PSZ	N	A	A	N	A	A	A	A
PMZS	N	A	A	N	A	A	A	A
PVAVS	N	A	A	N	A	A	A	A
PTAC	N	N	N	N	A	A	A	A
PTGSD	N	A	N	N	A	N	N	A
PVVT	N	A	A	A	A	A	A	A
RESVVT								

## Legend:

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D = Used for program code debugging only  
S = System (or configuration) dependent

V-L.No.	49	50	51	52	53	54	55	56
SYSTEM-TYPE	SUPPLY ELEC	RETURN ELEC	CYCLE ON/H OFF C	SURFACE HUMIDITY	Walkin Q	SURFACE TEMP	DD heating coil entering temp	BYPASS FACTOR
SUM	N	N	N	N	N	A	N	N
SZRH	A	A	A	N	A	A	N	A
MZS	A	A	N	N	N	A	A	A
DDS	A	A	N	N	N	A	A	A
SZCI	A	A	A	N	A	A	N	A
UHT	N	N	N	N	N	A	N	N
UVT	N	N	N	N	N	A	N	N
FPH	N	N	N	N	N	A	N	N
TPFC	N	N	N	N	N	A	N	A
FPFC	N	N	N	N	N	A	N	A
TPIU	A	A	N	N	N	A	N	A
FPIU	A	A	N	N	N	A	N	A
VAVS	A	A	A	N	A	A	N	A
PIU	A	A	A	N	N	A	N	A
RHFS	A	A	A	N	A	A	N	A
HP	A	N	N	N	N	A	N	A
HVSYS	A	A	N	N	N	A	N	N
CBVAV	A	A	A	N	N	A	N	A
RESYS	A	N	N	N	N	A	N	A
PSZ	A	A	A	N	A	A	N	A
PMZS	A	A	A	N	N	A	A	A
PVAVS	A	A	A	N	A	A	N	A
PTAC	N	N	N	N	N	A	N	A
PTGSD	A	A	N	N	N	N	N	A
PVVT	A	A	A	A	A	A	N	A
RESVVT					N			

V-L.No.	57	58	59	60	61	62	63	64
SYSTEM-TYPE	CBF F (WB,DB)	CBF F CFM	EXHAUST FANS ON/OFF	PLR CFM	PLR COOLING	PLR HEATING	COOL-CAP F (WB, DB)	COOL-SH F (WB,DB)
SUM	N	N	N	N	N	N	N	N
SZRH	A	A	A	A	A	N	A	A
MZS	A	A	A	A	A	N	A	A
DDS	A	A	A	A	A	N	A	A
SZCI	A	A	A	A	A	N	A	A
UHT	N	N	N	N	N	N	N	N
UVT	N	N	N	N	N	N	N	N
FPH	N	N	N	N	N	N	N	N
TPFC	N	N	N	N	N	N	N	N
FPFC	N	N	N	N	N	N	N	N
TPIU	A	A	A	A	A	N	A	A
FPIU	A	A	A	A	A	N	A	A
VAVS	A	A	A	A	A	N	A	A
PIU	A	A	A	A	A	N	A	A
RHFS	A	A	A	A	A	N	A	A
HP	N	N	N	N	N	N	N	N
HVSYS	N	N	A	N	N	N	N	N
CBVAV	A	A	A	A	A	N	A	A
RESYS	A	A	N	A	A	A	A	A
PSZ	A	A	A	A	A	A	A	A
PMZS	A	A	A	A	A	N	A	A
PVAVS	A	A	A	A	A	A	A	A
PTAC	N	N	N	N	N	N	N	N
PTGSD	N	N	N	A	N	N	N	N
PVVT	A	A	A	A	A	A	A	A
RESVVT			N					

## Legend:

A = Appropriate  
 N = Not appropriate  
 X = Unused

D = Used for program code debugging only  
 S = System (or configuration) dependent

V-L.No.	65	66	67	68	69	70	71	72
SYSTEM-TYPE	HEAT-CAP F (TEMP)	EIR F (WB,DB)	EIR F (PLR)	EIR	OUTSIDE FAN KW	COOLING CAPACITY	SENSIBLE CAPACITY	MAX HUMID SETPOINT
SUM	N	N	N	N	N	N	N	N
SZRH	N	N	N	N	N	A	A	A
MZS	N	N	N	N	N	A	A	A
DDS	N	N	N	N	N	A	A	A
SZCI	N	N	N	N	N	A	A	A
UHT	N	N	N	N	N	N	N	N
UVT	N	N	N	N	N	N	N	N
FPH	N	N	N	N	N	N	N	N
TPFC	N	N	N	N	N	N	N	N
FPFC	N	N	N	N	N	N	N	N
TPIU	N	N	N	N	N	A	A	A
FPIU	N	N	N	N	N	A	A	A
VAVS	N	N	N	N	N	A	A	A
PIU	N	N	N	N	N	A	A	A
RHFS	N	N	N	N	N	A	A	A
HP	N	N	N	N	N	N	N	N
HVSYS	N	N	N	N	N	A	A	A
CBVAV	N	N	N	N	N	A	A	A
RESYS	A	A	A	A	A	A	A	A
PSZ	A	A	A	A	A	A	A	A
PMZS	N	A	A	A	A	A	A	A
PVAVS	N	A	A	A	A	A	A	A
PTAC	N	N	N	N	N	A	A	A
PTGSD	N	N	N	N	N	A	A	A
PVVT	A	A	A	A	A	A	A	A
RESVVT								

V-L.No.	73	74	75	76	77	78	79	80
SYSTEM-TYPE	MIN HUMID SETPOINT	VAV MAX CFM RATE	PIPE DUCT LOSS	PIPE DUCT LOSS	ERV SCHED ULE	HEATING CAPACITY	TEMP AT MIN OA	MIN OA EST
SUM	N	N	N	N	X	N	N	N
SZRH	A	A	S	S	A	A	A	A
MZS	A	A	S	S	A	A	A	A
DDS	A	A	S	S	A	A	A	A
SZCI	A	N	S	S	A	A	A	A
UHT	N	N	S	S	X	N	N	N
UVT	N	N	S	S	X	N	N	N
FPH	N	N	S	S	X	N	N	N
TPFC	N	N	S	S	A	N	N	N
FPFC	N	N	S	S	A	N	N	N
TPIU	A	N	S	S	A	A	A	A
FPIU	A	N	S	S	A	A	A	A
VAVS	A	A	S	S	A	A	A	A
PIU	A	A	S	S	A	A	A	A
RHFS	A	A	S	S	A	A	A	A
HP	N	N	S	S	X	N	N	N
HVSYS	A	N	S	S	A	A	A	A
CBVAV	A	N	S	S	A	A	A	A
RESYS	A	N	S	S	X	N	N	N
PSZ	A	A	S	S	A	A	A	A
PMZS	A	A	S	S	A	A	A	A
PVAVS	A	A	S	S	A	A	A	A
PTAC	A	N	S	S	X	N	N	N
PTGSD	N	N	S	S	X	N	N	A
PVVT	A	A	S	S	A	A	A	A
RESVVT								

## Legend:

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V-L.No.	81	82	83	84	85	86	87	88
SYSTEM-TYPE	HP SUPP HEAT	REFG ZONE SENS HT	REFG ZONE LAT HT	REFG SYS REC HT	REFG SYS REJ HT	REFG SYS COMP KW	REFG SYS DEF KW	REFG SYS AUX KW
SUM	N	N	N	N	N	N	N	N
SZRH	N	A	A	A	A	A	A	A
MZS	N	N	N	N	N	N	N	N
DDS	N	N	N	N	N	N	N	N
SZCI	N	A	A	A	A	A	A	A
UHT	N	N	N	N	N	N	N	N
UVT	N	N	N	N	N	N	N	N
FPH	N	N	N	N	N	N	N	N
TPFC	N	N	N	N	N	N	N	N
FPFC	N	N	N	N	N	N	N	N
TPIU	N	N	N	N	N	N	N	N
FPIU	N	N	N	N	N	N	N	N
VAVS	N	A	A	A	A	A	A	A
PIU	N	N	N	N	N	N	N	N
RHFS	N	A	A	A	A	A	A	A
HP	N	N	N	N	N	N	N	N
HVSYS	N	N	N	N	N	N	N	N
CBVAV	N	N	N	N	N	N	N	N
RESYS	A	N	N	N	N	N	N	N
PSZ	A	A	A	A	A	A	A	A
PMZS	N	N	N	N	N	N	N	N
PVAVS	A	A	A	A	A	A	A	A
PTAC	A	N	N	N	N	N	N	N
PTGSD	N	N	N	N	N	N	N	N
PVVT	A	A	A	A	A	A	A	A
RESVVT		N	N	N	N	N	N	N

V-L.No.	89	90	91	92	93	94	95	96
SYSTEM-TYPE	PLEN EXH FLOW RATE	COOL GAS	REGEN POWER	RETURN WB TEMP	WB8	T8	W8	WB9
SUM	N	N	N	N	N	N	N	N
SZRH	A	N	N	N	N	N	N	N
MZS	A	N	N	N	N	N	N	N
DDS	A	N	N	N	N	N	N	N
SZCI	A	N	N	N	N	N	N	N
UHT	N	N	N	N	N	N	N	N
UVT	N	N	N	N	N	N	N	N
FPH	N	N	N	N	N	N	N	N
TPFC	N	N	N	N	N	N	N	N
FPFC	N	N	N	N	N	N	N	N
TPIU	A	N	N	N	N	N	N	N
FPIU	A	N	N	N	N	N	N	N
VAVS	A	N	N	N	N	N	N	N
PIU	A	N	N	N	N	N	N	N
RHFS	A	N	N	N	N	N	N	N
HP	N	N	N	N	N	N	N	N
HVSYS	A	N	N	N	N	N	N	N
CBVAV	A	N	N	N	N	N	N	N
RESYS	N	N	N	N	N	N	N	N
PSZ	A	N	N	N	N	N	N	N
PMZS	A	N	N	N	N	N	N	N
PVAVS	A	N	N	N	N	N	N	N
PTAC	N	N	N	N	N	N	N	N
PTGSD	A	N	A	A	A	A	A	A
PVVT	A	N	N	N	N	N	N	N
RESVVT								

## Legend:

A = Appropriate  
N = Not appropriate  
X = Unused

D = Used for program code debugging only  
S = System (or configuration) dependent



V-L.No.	97	98	99	100	101	102	103	104
SYSTEM-TYPE	T9	W9	EFF	DTON	MODE 1	MODE 2	MODE 3	MODE 4
SUM	N	N	N	N	N	N	N	N
SZRH	N	N	N	N	N	N	N	N
MZS	N	N	N	N	N	N	N	N
DDS	N	N	N	N	N	N	N	N
SZCI	N	N	N	N	N	N	N	N
UHT	N	N	N	N	N	N	N	N
UVT	N	N	N	N	N	N	N	N
FPH	N	N	N	N	N	N	N	N
TPFC	N	N	N	N	N	N	N	N
FPFC	N	N	N	N	N	N	N	N
TPIU	N	N	N	N	N	N	N	N
FPIU	N	N	N	N	N	N	N	N
VAVS	N	N	N	N	N	N	N	N
PIU	N	N	N	N	N	N	N	N
RHFS	N	N	N	N	N	N	N	N
HP	N	N	N	N	N	N	N	N
HVSY	N	N	N	N	N	N	N	N
CBVAV	N	N	N	N	N	N	N	N
RESYS	N	N	N	N	N	N	N	N
PSZ	N	N	N	N	N	N	N	N
PMZS	N	N	N	N	N	N	N	N
PVAVS	N	N	N	N	N	N	N	N
PTAC	N	N	N	N	N	N	N	N
PTGSD	A	A	A	A	A	A	A	A
PVVT	N	N	N	N	N	N	N	N
RESVVT								

V-L.No.	105	106	107	108	109	110	111
SYSTEM-TYPE	MODE 5	MODE 6	MODE 7	ERMAX 4	ERMAX 4	ERMAX 4	MODE 4
SUM	N	N	N	N	N	N	N
SZRH	N	N	N	N	N	N	N
MZS	N	N	N	N	N	N	N
DDS	N	N	N	N	N	N	N
SZCI	N	N	N	N	N	N	N
UHT	N	N	N	N	N	N	N
UVT	N	N	N	N	N	N	N
FPH	N	N	N	N	N	N	N
TPFC	N	N	N	N	N	N	N
FPFC	N	N	N	N	N	N	N
TPIU	N	N	N	N	N	N	N
FPIU	N	N	N	N	N	N	N
VAVS	N	N	N	N	N	N	N
PIU	N	N	N	N	N	N	N
RHFS	N	N	N	N	N	N	N
HP	N	N	N	N	N	N	N
HVSY	N	N	N	N	N	N	N
CBVAV	N	N	N	N	N	N	N
RESYS	N	N	N	N	N	N	N
PSZ	N	N	N	N	N	N	N
PMZS	N	N	N	N	N	N	N
PVAVS	N	N	N	N	N	N	N
PTAC	N	N	N	N	N	N	N
PTGSD	A	A	A	A	A	A	A
PVVT	N	N	N	N	N	N	N
RESVVT							

## Legend:

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X = Unused

D = Used for program code debugging only  
S = System (or configuration) dependent

**BUILDING-HVAC**

Variable-List Number	Variable in FORTRAN Code	Description
1	<QCPL>	Total cooling load (Btu/hr)
2	<QHPL>	Total heating load (Btu/hr)
3	<PKW>	Total electrical load (kW)
4	<PGAS>	Total gas load (Btu/hr)
5	<PKWQH>	Portion of <PKW> used for heating (kW)
6	<PKWQC>	Portion of <PKW> used for cooling (kW)
7	<PFANKW>	Portion of <PKW> used for fans (kW)
8		unused
9	<PCGAS>	Gas used for cooling (packaged equipment)
10	-	unused

**VARIABLES BY SYSTEM-TYPE FOR BUILDING-HVAC**

V-L No.	1	2	3	4	5	6	7	8
SYSTEM-TYPE	COOLING LOAD	HEATING LOAD	ELEC KW LOAD	HEATING GAS	HEATING ELEC KW	COOLING ELEC KW	FANS ELEC KW	HEATING OIL
SUM	A	A	A	A	A	N	N	X
SZRH	A	A	A	A	A	N	A	X
MZS	A	A	A	A	A	N	A	X
DDS	A	A	A	A	A	N	A	X
SZCI	A	A	A	A	A	N	A	X
UHT	A	A	A	A	A	N	A	X
UVT	A	A	A	A	A	N	A	X
FPH	A	A	A	A	A	N	A	X
TPFC	A	A	A	A	A	N	A	X
FPFC	A	A	A	A	A	N	A	X
TPIU	A	A	A	A	A	N	A	X
FPIU	A	A	A	A	A	N	A	X
VAVS	A	A	A	A	A	N	A	X
PIU	A	A	A	A	A	N	A	X
RHFS	A	A	A	A	A	N	A	X
HP	A	A	A	A	A	A	A	X
HVSYS	A	A	A	A	A	N	A	X
CBVAV	A	A	A	A	A	N	A	X
RESYS	A	A	A	A	A	A	A	X
PSZ	A	A	A	A	A	A	A	X
PMZS	A	A	A	A	A	A	A	X
PVAVS	A	A	A	A	A	A	A	X
PTAC	A	A	A	A	A	A	A	X
PVVT	A	A	A	A	A	A	A	X
PTGSD								
RESVVT								

V-L No.	9	10
SYSTEM-TYPE	COOLING GAS	UNUSED
SUM		X
SZRH		X
MZS		X
DDS		X
SZCI		X
UHT		X
UVT		X
FPH		X
TPFC		X
FPFC		X
TPIU		X
FPIU		X
VAVS		X
PIU		X
RHFS		X
HP		X
HVSYS		X
CBVAV		X
RESYS		X
PSZ		X
PMZS		X
PVAVS		X
PTAC		X
PVVT		X
PTGSD		
RESVVT		

## Legend:

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**CIRCULATION-LOOP**

Variable-List Number	Variable in FORTRAN Code	Description
1	RunLoop	0 = Loop Off, 1 = Loop Active
2	ModeCtrl	0 = Floating, 1 = Heating, 2 = Cooling
3	GPMs	Flow rate on supply side (gpm)
4	GPMr	Flow rate on return side (gpm)
5	QloopNet	Net loop load, including pump heat and thermal losses
6	QcoilH	Heating loads of loop end-uses (coils, etc.)
7	QcoilC	Cooling loads of loop end-uses (coils, etc.)
8	Q2nd	Load on primary loop from secondary loops
9	Q1st	Load on primary loop from primary equipment (absorption chillers, etc.)
10	QCp	Load on loop due to loop temperature swing
11	QlossS	Thermal loss, supply side
12	QlossR	Thermal loss, return side
13	Tenv	Temperature of loop's environment
14	Tset	Supply temperature setpoint
15	Tsupply	Supply temperature
16	TcoilEnt	Temperature entering coils (supply minus thermal dT)
17	TcoilExit	Temperature exiting coils, entering return
18	Treturn	Temperature at return outlet (entering chillers, etc.)
19	dTsc	Loop temperature rise, supply side
20	dTrc	Loop temperature rise, return side
21	TavgS	Average loop temperature, supply side
22	TavgR	Average loop temperature, return side
23	TavgPast	Last hours's average loop temperature, supply and return
24	Tfloat	Temperature loop will achieve if no active heating/cooling
25	HDpump	Head pressure across pump
26	Qpump	Heat gain from pump
27	dTpump	Fluid temperature rise from pump
28	GPM21	Flow from a secondary loop onto primary (2ndary loops only)
29	HEAD21f	Friction from a secondary loop onto primary (excludes static heads)
30	Qover	Primary equipment overload
31	QpumpEq	Heat gain due to primary equipment pumps
32	GMPpumpEq	Flow of primary equipment pumps (valid only if powering loop)
33	dTpumpEq	Temperature rise of primary equipment pumps

Variable-List Number	Variable in FORTRAN Code	Description
34	PipeHead	Head due to loop friction (excluding coils, chillers, etc.)
35	DesEqGPM	Design flow through all active primary equipment units
36	PLRpipe	Flow ratio of loop (fraction of nominal flow)
37	TotalLoopCap	Total capacity of all active primary equipment units
38	CapRatio	Capacity limit (<1 if loop overloaded previous hour)
39	GPM2	Flow from all attached secondary loops
40	Friction	Net head loss of loop and attachments, excluding static
41	Qhtrec	Total heat recovered to loop
42	Th trec	Return temperature after heat recovery
43	dT over	Temperature rise due to loop overload (WLHP loops only)
44	TcoilEst	Estimated temperature entering coils (CW and WLHP loops only)
45	Qprocess	Process load on this loop
46	Tinlet	Make-up water inlet temperature (DHW loops only)
47	QoverNew	Loop overload not carried over from previous hour
48		unused
49		unused
50		unused

**PUMP**

Variable-List Number	Variable in FORTRAN Code	Description
1	PMPgpm	Pump flow
2	PMPkw	Pump power
3	PMPnum	Number of pumps running
4	RPMr	Speed ratio (fraction of nominal)
5	PMPfrac	Fraction of hour running
6	PMPset	Head required at setpoint
7	PMPhead	Actual head developed
8	PMPfric	Head on pump due to friction of all components (coils, piping, etc.)
9	PMPstatic	Static head on pump due to static head of components
10	HEADr	Head ratio (fraction of nominal)
11	PMPGPMr	Flow ratio (fraction of nominal)
12	GPMmax	Maximum flow per pump at actual head
13	HPRPM	RPMr ** <pm:POWER-EXP>
14	XGPMR	PMPGPMr / RPMr
15	PMPHPR	Output of curve <pm:HP-fGPM> with XGPMr as input
16	PMPQ	Pump heat added to fluid
17	PMDdT	Temperature rise across pump
18	PMPVFDloss	Loss in variable-frequency drive

**CHILLER**

Variable-List Number	Variable in FORTRAN Code	Description
1	EQload	Equipment load
2	EQrun	Operating point of machine (greater than load if HGB or cycling)
3	EQhgb	Load due to hot-gas bypass
4	OperCap	Available capacity at current conditions
5	Frac	Fraction of hour this equipment ran
6	PLR	Part load ratio (fraction of Available)
7	EQsupplyT	Supply temperature
8	ECT	Entering condenser temperature
9	EIRPLR	Electric input ratio as f(PLR)
10	EIRFT	Electric input ratio as f(EQsupplyT, ECT)
11	EQeir	Net electric input ratio
12	EQelec	Electric demand
13	EQfanKW	Electric demand of air-cooled condenser
14	EQaux	Electric demand of auxiliaries
15	HIRPLR	Heat input ratio as f(PLR)
16	HIRFT	Heat input ratio as f(EQsupplyT, ECT)
17	EQHIR	Net heat input ratio
18	EQfuel	Fuel/thermal demand
19	EQcond	Rejected heat
20	EQrecvr	Recoverable heat
21	HWflow	Flow to/from hot water loop
22	HWhead	Head on hot water loop
23	CHWflow	Flow to/from chilled water loop
24	CHWhead	Head on chilled water loop
25	CWflow	Flow to/from condenser water loop
26	CWhead	Head on condenser water loop
27	HTRECFflow	Flow to/from heat-recovery loop
28	HTREChhead	Head on heat-recovery loop
29	ForcePump	Flag indicating equipment pump must run, even if no load
30	EQstart	Start-up load
31	EQloadH	Equipment load (heating side of gas-fired chiller heater only)
32	EqstartH	Start-up load (heating side of gas-fired chiller heater only)
33	PLRh	Part load ratio (heating side of gas-fired chiller heater only)

34	FracH	Fraction of hour operating (heating side of gas-fired chiller heater only)
35	EQfuelH	Fuel consumption (heating side of gas-fired chiller heater only)
36	EQelecH	Electric consumption (heating side of gas-fired chiller heater only)

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**BOILER**

Variable-List Number	Variable in FORTRAN Code	Description
1	EQload	Equipment load
2	EQrun	Operating point of machine (greater than load if HGB or cycling)
3		unused
4	OperCap	Available capacity at current conditions
5	Frac	Fraction of hour this equipment ran
6	PLR	Part load ratio (fraction of Available)
7	EQsupplyT	Supply temperature
8	ECT	Environment temperature
9	EIRPLR	Electric input ratio as f(PLR)
10		unused
11	EQeir	Net electric input ratio
12	EQelec	Electric demand
13		unused
14	EQaux	Electric demand of auxiliaries
15	HIRPLR	Heat input ratio as f(PLR)
16	HIRFT	Heat input ratio as f(ECT)
17	EQHIR	Net heat input ratio
18	EQfuel	Fuel demand
19		unused
20		unused
21		unused
22		unused
23		unused
24		unused
25		unused
26		unused
27		unused
28		unused
29	ForcePump	Flag indicating equipment pump must run, even if no load
30	EQstart	Start-up load
31		unused
32		unused
33		unused

34	unused
35	unused
36	unused

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**ELEC-GENERATOR**

Variable-List Number	Variable in FORTRAN Code	Description
1	EQload	Equipment load
2		unused
3		unused
4	OperCap	Available capacity at current conditions
5	Frac	Fraction of hour this equipment ran
6	PLR	Part load ratio (fraction of Available)
7		unused
8		unused
9	EIRPLR	EIR correction as function of PLR (PV-ARRAY only)
10		unused
11	EQEIR	Electric input ratio (EIR) (PV-ARRAY only)
12	EQelec	Direct-current input from PV-MODULE (PV-ARRAY only)
13		unused
14	EQaux	Electric demand of auxiliaries
15	HIRPLR	Heat input ratio as f(PLR)
16	HIRFT	Heat input ratio as f(drybulb)
17	EQHIR	Net heat input ratio
18	EQfuel	Fuel demand
19		unused
20	EQrecvr	Recoverable heat
21		unused
22		unused
23		unused
24		unused
25	CWflow	Flow to/from condenser water loop
26	CWhead	Head on condenser water loop
27		unused
28		unused
29		unused
30	EQstart	Start-up load
31		unused
32		unused
33		unused

34	unused
35	unused
36	unused

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**PV-MODULE**

Variable-List Number	Variable in FORTRAN Code	Description
1	n/a	DC power output
2	Vmp	Voltage at maximum power point
3	Imp	Current at maximum power point
4	SOLRAD	Total horizontal solar radiation
5	Edirect	Direct radiation on module surface
6	Ediffuse	Diffuse radiation on module surface
7	Eground	Ground reflected radiation on module surface
8	AOI	Angle of incidence, 0° = normal to surface
9	fAOI	Angle of incidence optical correction factor
10	AirMass	Relative air mass, 1 = sun directly overhead at sea level
11	fAirMass	Air mass spectral correction factor
12	Epoa	Plane-of-array irradiation
13	Eeffective	Ratio of plane-of-array irradiation to reference irradiation, suns
14	Tcell	Internal cell temperature
15		unused
16		unused
17		unused
18		unused
19		unused
20		unused
21		unused
22		unused
23		unused
24		unused
25		unused
26		unused
27		unused
28		unused
29		unused
30		unused

**DW-HEATER**

Variable-List Number	Variable in FORTRAN Code	Description
1	EQload	Equipment load
2	EQrun	Operating point of machine (greater than load if HGB or cycling)
3		unused
4	OperCap	Available capacity at current conditions
5	Frac	Fraction of hour this equipment ran
6	PLR	Part load ratio (fraction of Available)
7	EQsupplyT	Supply temperature
8	ECT	Environment temperature
9	EIRPLR	Electric input ratio as f(PLR)
10	EIRFT	Electric input ratio as f(EQsupplyT, ECT)
11	EQeir	Net electric input ratio
12	EQelec	Electric demand
13		unused
14	EQaux	Electric demand of auxiliaries
15	HIRPLR	Heat input ratio as f(PLR)
16	HIRFT	Heat input ratio as f(ECT)
17	EQHIR	Net heat input ratio
18	EQfuel	Fuel demand
19		unused
20		unused
21		unused
22		unused
23		unused
24		unused
25		unused
26		unused
27		unused
28		unused
29	Qenvir	Heat lost to environment, jacket and off-hours stack, Btu/F
30		unused
31		unused
32		unused
33		unused

34	unused
35	unused
36	unused

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**HEAT-REJECTION**

Variable-List Number	Variable in FORTRAN Code	Description
1	TWRload	Equipment load
2	TCAP	Available capacity
3	TWRrej	Net heat rejected, including tower pump
4	CWgpm	Circulation loop flow to this tower
5	TWRgpm	Flow internal to tower
6	TWRsupply	Leaving tower temperature
7	TWRset	Leaving tower temperature setpoint
8	Ttower	Leaving tower temperature (same as TWRsupply)
9	RANGE	Temperature drop through tower
10	APP	Leaving tower temperature minus wetbulb temperature
11		unused
12	GPMra	Flow capacity ratio (fraction of nominal) (design variable only)
13	GPMcap	Flow capacity at current conditions
14	GPMcell	Assigned flow per cell
15	NumCells	Number of cells operating
16	MinCells	Minimum number of cells that can handle flow
17	MaxCells	Maximum number of cells that can handle flow
18	Ttop	Temperature at top of throttling range
19	GPMtop	Flow capacity at top of throttling range
20	Tbot	Temperature at bottom of throttling range
21	GPMbot	Flow capacity at bottom of throttling range
22	CFMra	Required airflow (fraction of nominal)
23	FankWr	Fan power ratio (fraction of nominal)
24	FankW	Fan power, all cells
25	TWRaux	Auxiliary power
26	QpanLoss	Pan heat loss
27	QcoilLoss	Coil heat loss (fluid cooler only)
28	SpraykW	Spray pump power (fluid cooler only)
29	Twet1	Wetbulb temperature, limited to allowable range
30	Tstart	Condenser water temperature at beginning of hour



**THERMAL-STORAGE**

Variable-List Number	Variable in FORTRAN Code	Description
1	Qcharge	Charging demand
2	Qdischarge	Discharging load
3	Qloss	Thermal loss
4	Qfreeze	Heating load to prevent tank freeze-up
5	Qtank	Heat/Coolth in tank relative to reference temperature
6	CapMax	Available discharge capacity
7	AuxkW	Auxiliary electric demand
8	TtankEnv	Environmental temperature
9	Ttank	Temperature in tank
10	NumChrgHours	Number of hours required to charge tank
11	NumHoursToSt	Number of hours until tank will start charging
12	ChrgHours	Number of hours tank has been charging
13	DChrgHours	Number of hours tank has been discharging
14	StoredKWh	Boiler/Chiller electrical consumption stored in tank
15	StoredFuel	Boiler/Chiller fuel consumption stored in tank

**ELEC-METER**

Variable-List Number	Variable in FORTRAN Code	Description
1	<em;LIGHT>	End-use, lights
2	<em;TASK>	End-use, task lights
3	<em;EQUIP>	End-use, equipment
4	<em;HEAT>	End-use, space heating equipment
5	<em;COOL>	End-use, space cooling equipment
6	<em;HTREJ>	End-use, heat-rejection equipment, except pumps
7	<em;AUX>	End-use, auxiliary loads
8	<em;VENT>	End-use, vent fans
9	<em;REFG>	End-use, refrigeration equipment
10	<em;SUPP>	End-use, supplemental heat pump heating
11	<em;DHW>	End-use, domestic water heating
12	<em;EXTERIOR>	End-use, exterior loads
13	<em;CogenSurplus>	End-use, generator surplus
14		unused
15		unused
16		unused
17		unused
18		unused
19	<em;TES_ADJUST>	End-use, thermal storage adjustment factor
20	<em;TOTAL>	Total usage
21	<em;TRANSFORMER>	Transformer loss
22	<em.TDVsrc>	Multiplier to convert site energy to source 'TDV energy'

**FUEL-METER**

Variable-List Number	Variable in FORTRAN Code	Description
1	<fm;LIGHT>	End-use, lights
2	<fm;TASK>	End-use, task lights
3	<fm;EQUIP>	End-use, equipment
4	<fm;HEAT>	End-use, space heating equipment
5	<fm;COOL>	End-use, space cooling equipment
6	<fm;HTREJ>	End-use, heat-rejection equipment, except pumps
7	<fm;AUX>	End-use, auxiliary loads
8	<fm;VENT>	End-use, vent fans
9	<fm;REFG>	End-use, refrigeration equipment
10	<fm;SUPP>	End-use, supplemental heat pump heating
11	<fm;DHW>	End-use, domestic water heating
12	<fm;EXTERIOR>	End-use, exterior loads
13		unused
14		unused
15		unused
16		unused
17		unused
18		unused
19	<fm;TES_ADJUST>	End-use, thermal storage adjustment factor
20	<fm;TOTAL>	Total usage
21		unused
22	<fm.TDVsrc>	Multiplier to convert site energy to source 'TDV energy'

**STEAM-METER**

Variable-List Number	Variable in FORTRAN Code	Description
1	<sm;LIGHT>	End-use, lights
2	<sm;TASK>	End-use, task lights
3	<sm;EQUIP>	End-use, equipment
4	<sm;HEAT>	End-use, space heating equipment
5	<sm;COOL>	End-use, space cooling equipment
6	<sm;HTREJ>	End-use, heat-rejection equipment, except pumps
7	<sm;AUX>	End-use, auxiliary loads
8	<sm;VENT>	End-use, vent fans
9	<sm;REFG>	End-use, refrigeration equipment
10	<sm;SUPP>	End-use, supplemental heat pump heating
11	<sm;DHW>	End-use, domestic water heating
12	<sm;EXTERIOR>	End-use, exterior loads
13		unused
14		unused
15		unused
16		unused
17		unused
18		unused
19	<sm;TES_ADJUST>	End-use, thermal storage adjustment factor
20	<sm;TOTAL>	Total usage
21		unused

**CHW-METER**

Variable-List Number	Variable in FORTRAN Code	Description
1	<cm;LIGHT>	End-use, lights
2	<cm;TASK>	End-use, task lights
3	<cm;EQUIP>	End-use, equipment
4	<cm;HEAT>	End-use, space heating equipment
5	<cm;COOL>	End-use, space cooling equipment
6	<cm;HTREJ>	End-use, heat-rejection equipment, except pumps
7	<cm;AUX>	End-use, auxiliary loads
8	<cm;VENT>	End-use, vent fans
9	<cm;REFG>	End-use, refrigeration equipment
10	<cm;SUPP>	End-use, supplemental heat pump heating
11	<cm;DHW>	End-use, domestic water heating
12	<cm;EXTERIOR>	End-use, exterior loads
13		unused
14		unused
15		unused
16		unused
17		unused
18		unused
19	<cm;TES_ADJUST>	End-use, thermal storage adjustment factor
20	<cm;TOTAL>	Total usage
21		unused

**GROUND-LOOP-HX**

<b>Variable- List Number</b>	<b>Variable in FORTRAN Code</b>	<b>Description</b>
1	Qload	Thermal load
2	GPM	Fluid flow
3	OperCap	Available capacity at current conditions
4	OutletT	Outlet temperature
5	FarGroundT	Far field ground temperature
6	GroundDeltaT	Ground temperature rise at well bore
7	QdeltaT	Ground temperature rise due to current load
8	LoopDeltaT	Fluid temperature rise
9	Qrate	Rate of heat addition/removal (including cycling)
10	Runtime	Fraction of hour running