Asheville North Carolina

Blank Worksheets

General Project Information

Project Name ______________________ Floor Area ______________________
Location ______________________ Date ______________________
Designer ______________________ ______________________

Worksheet I: Conservation Performance Level

A. Envelope Heat Loss

Construction Description	Area		R-value [Table A]		Heat Loss
Ceilings/roofs		÷		=	
		÷		=	
Walls		÷		=	
		÷		=	
Insulated Floors		÷		=	
		÷		=	
Non-solar Glazing		÷		=	
		÷		=	
Doors		÷		=	
		÷		=	
				Total	Btu/°F-h

B. Foundation Perimeter Heat Loss

Description	Perimeter		Heat Loss Factor [Table B]		Heat Loss
Slabs-on-Grade		×		=	
Heated Basements		×		=	
Unheated Basements		×		=	
Perimeter Insulated Crawlspaces		×		=	
				Total	Btu/°F-h

C. Infiltration Heat Loss

______ (Building Volume) × ______ (Air Changes per Hour) × .018 = ______ Btu/°F-h

D. Total Heat Loss per Square Foot

24 × ______ (Total Heat Loss (A+B+C)) ÷ ______ (Floor Area) = ______ Btu/DD-sf

E. Conservation Performance Level

______ (Total Heat Loss per Square Foot) × ______ (Heating Degree Days [Table C]) × ______ (Heating Degree Day Multiplier [Table C]) = ______ Btu/yr-sf

F. Comparison Conservation Performance (From Previous Calculation or from Table D)

______ Btu/yr-sf

Compare Line E to Line F

Worksheet II: Auxiliary Heat Performance Level

A. Projected Area of Passive Solar Glazing

Solar System Reference Code	Rough Frame Area		Net Area Factor		Adjustment Factor [Table E]		Projected Area
		×	0.80	×		=	
		×	0.80	×		=	
		×	0.80	×		=	
		×	0.80	×		=	
		×	0.80	×		=	
		×	0.80	×		=	
		×	0.80	×		=	
	Total Area						______ sf Total Projected Area

______ ÷ ______ = ______

Total Projected Area ÷ Floor Area = Total Projected Area per Square Foot

B. Load Collector Ratio

24 × ______ ÷ ______ = ______

Total Heat Loss [Worksheet I] ÷ Total Projected Area

C. Solar Savings Fraction

Solar System Reference Code	Projected Area		System Solar Savings Fraction [Table F]		
		×		=	
		×		=	
		×		=	
		×		=	
		×		=	
		×		=	
		×		=	

______ ÷ ______ = ______

Total ÷ Total Projected Area = Solar Savings Fraction

D. Auxiliary Heat Performance Level

[1 – ______] × ______ = ______ Btu/yr-sf

Solar Savings Fraction; Conservation Performance Level [Worksheet I, Step E]

E. Comparative Auxiliary Heat Performance (From Previous Calculation or from Table G) ______ Btu/yr-sf

Compare Line D to Line E

Worksheet III: Thermal Mass/Comfort

A. Heat Capacity of Sheetrock and Interior Furnishings

	Floor Area		Unit Heat Capacity		Total Heat Capacity
Rooms with Direct Gain	________	×	4.7	=	________
Spaces Connected to Direct Gain Spaces	________	×	4.5	=	________
					________ Btu/°F Total

B. Heat Capacity of Mass Surfaces Enclosing Direct Gain Spaces

Mass Description (include thickness)	Area		Unit Heat Capacity [Table H]		Total Heat Capacity
Trombe Walls	________	×	8.8	=	________
Water Walls	________	×	10.4	=	________
Exposed Slab in Sun	________	×	13.4	=	________
Exposed Slab Not in Sun	________	×	1.8	=	________
________	________	×	________	=	________
________	________	×	________	=	________
________	________	×	________	=	________
					________ Btu/°F Total

C. Heat Capacity of Mass Surfaces Enclosing Spaces Connected to Direct Gain Spaces

Mass Description (include thickness)	Area		Unit Heat Capacity [Table H]		Total Heat Capacity
Trombe Walls	________	×	3.8	=	________
Water Walls	________	×	4.2	=	________
________	________	×	________	=	________
________	________	×	________	=	________
________	________	×	________	=	________
					________ Btu/°F Total

D. Total Heat Capacity

________ Btu/°F
(A+B+C)

E. Total Heat Capacity per Square Foot

________ ÷ ________ = ________ Btu/°F-sf
Total Heat Capacity; Conditioned Floor Area

F. Clear Winter Day Temperature Swing

	Total Projected Area [Worksheet II]		Comfort Factor [Table I]		
Direct Gain	________	×	________	=	________
Sunspaces or Vented Trombe Walls	________	×	________	=	________

________ ÷ ________ = ________ °F
Total; Total Heat Capacity

G. Recommended Maximum Temperature Swing

________ °F

Compare Line F to Line G

Worksheet IV: Summer Cooling Performance Level

A. Opaque Surfaces

Description		Heat Loss [Worksheet I]		Radiant Barrier Factor [Table J]		Absorptance [Table K]		Heat Gain Factor [Table L]		Load
Ceilings/roofs		____	×	____	×	____	×	____	=	____
____		____	×	____	×	____	×	____	=	____
____		____	×	____	×	____	×	____	=	____
Walls		____	×	na		____	×	____	=	____
____		____	×	na		____	×	____	=	____
Doors		____	×	na		____	×	____	=	____
										____ Total kBtu/yr

B. Non-solar Glazing

Description	Rough Frame Area		Net Area Factor		Shade Factor [Table M]		Heat Gain Factor [Table L]		Load
North Glass	____	×	0.80	×	____	×	____	=	____
East Glass	____	×	0.80	×	____	×	____	=	____
West Glass	____	×	0.80	×	____	×	____	=	____
Skylights	____	×	0.80	×	____	×	____	=	____
									____ Total kBtu/yr

C. Solar Glazing

Solar System Description	Rough Frame Area		Net Area Factor		Shade Factor [Table M]		Heat Gain Factor [Table L]		Load
Direct Gain	____	×	0.80	×	____	×	____	=	____
Storage Walls	____	×	0.80	×	____	×	____	=	____
Sunspace	____	×	0.80	×	____	×	____	=	____
____	____	×	0.80	×	____	×	____	=	____
									____ Total kBtu/yr

D. Internal Gain

____ + (____ × ____) = ____ kBtu/yr

Constant Component [Table N] + (Variable Component [Table N] × Number of Bedrooms) = kBtu/yr

E. Cooling Load per Square Foot

1,000 × ____ (A+B+C+D) ÷ ____ Floor Area = ____ Btu/yr-sf

F. Adjustment for Thermal Mass and Ventilation

____ [Table O] Btu/yr-sf

G. Cooling Performance Level

____ (E -F) Btu/yr-sf

H. Comparison Cooling Performance (From Previous Calculation or from Table P)

____ Btu/yr-sf

Compare Line G to Line H

Table A—Equivalent Thermal Performance of Assemblies R-values (hr-F-sf/Btu)

A1—Ceilings/Roofs

Attic Construction	Insulation R-value R-30	R-38	R-49	R-60
	27.9	35.9	46.9	57.9

Framed Construction	Insulation R-value R-19	R-22	R-30	R-38
2x6 at 16"oc	14.7	15.8	16.3	—
2x6 at 24"oc	15.3	16.5	17.1	—
2x8 at 16"oc	17.0	18.9	20.6	21.1
2x8 at 24"oc	17.6	19.6	21.6	22.2
2x10 at 16"oc	18.1	20.1	24.5	25.7
2x10 at 24"oc	18.4	20.7	25.5	26.8
2x12 at 16"oc	18.8	21.0	25.5	30.1
2x12 at 24"oc	19.0	21.4	27.3	31.4

A2—Framed Walls

Single Wall Framing	Insulation R-value R-11	R-13	R-19	R-25
2x4 at 16"oc	12.0	13.6	—	—
2x4 at 24"oc	12.7	13.9	—	—
2x6 at 16"oc	14.1	15.4	17.7	19.2
2x6 at 24"oc	14.3	15.6	18.2	19.8

Double Wall Framing	Total Thickness (inches) 8	10	12	14
	25.0	31.3	37.5	43.8

The R-value of insulating sheathing should be added to the values in this table.

A3—Insulated Floors

Framing	Insulation R-value R-11	R-19	R-30	R-38
2x6s at 16"oc	18.2	23.8	29.9	—
2x6s at 24"oc	18.4	24.5	31.5	—
2x8s at 16"oc	18.8	24.9	31.7	36.0
2x8s at 24"oc	18.9	25.4	33.1	37.9
2x10 at 16"oc	19.3	25.8	33.4	38.1
2x10 at 24"oc	19.3	26.1	34.4	39.8
2x12 at 16"oc	19.7	26.5	34.7	39.8
2x12 at 24"oc	19.6	26.7	35.5	41.2

These R-values include the buffering effect of a ventilated crawlspace or unconditioned basement.

A4—Windows

	Air Gap 1/4 in.	1/2 in.	1/2 in. argon
Standard Metal Frame			
Single	.9		
Double	1.1	1.2	1.2
Low-e (e<=0.40)	1.2	1.3	1.3
Metal frame with thermal break			
Double	1.5	1.6	1.7
Low-e (e<=0.40)	1.6	1.8	1.8
Low-e (e<=0.20)	1.7	1.9	2.0
Wood frame with vinyl cladding			
Double	2.0	2.1	2.2
Low-e (e<=0.40)	2.1	2.4	2.5
Low-e (e<=0.20)	2.2	2.6	2.7
Low-e (e<=0.10)	2.3	2.6	2.9

These R-values are based on a 3 mph wind speed and are typical for the entire rough framed opening. Manufacture's data, based on National Fenestration Rating Council procedures, should be used when available. One half the R-value of movable insulation should be added, when appropriate.

Table A—continued ..

A5—Doors

Solid wood with Weatherstripping	2.2
Metal with rigid foam core	5.9

Table B—Perimeter Heat Loss Factors for Slabs-on-Grade and Basements (Btu/h-F-ft)

Perimeter Insulation	Slabs-on-Grade	Heated Basements	Unheated Basements	Insulated Crawlspaces
None	0.8	1.3	1.1	1.1
R-5	0.4	0.8	0.7	0.6
R-7	0.3	0.7	0.6	0.5
R-11	0.3	0.6	0.5	0.4
R-19	0.2	0.4	0.5	0.3
R-30	0.1	0.3	0.4	0.2

Table C—Heating Degree Days (F-day)

C1—Heating Degree Days (Base 65°F)

Andrews	4,505
Asheville	4,294
Black Mountain	4,202
Boone	5,474
Brevard	4,223
Celo	5,415
Cullowhee	4,155
Fletcher	4,962
Franklin	4,138
Hendersonville	4,348
Marshall	4,510
Pisgah Forest	4,554
Waynesville	4,595
Blairsville, GA	4,525
Clayton, GA	3,749
Dahlohega, GA	3,735

C2—Heating Degree Day Multiplier

Heat Loss per Square Foot	Passive Solar Glazing Area per Square Foot .00	.05	.10	.15	.20
12.00	1.12	1.13	1.13	1.14	1.15
11.50	1.11	1.12	1.13	1.14	1.14
11.00	1.10	1.11	1.12	1.13	1.14
10.50	1.09	1.10	1.11	1.12	1.13
10.00	1.08	1.09	1.10	1.11	1.12
9.50	1.07	1.08	1.10	1.11	1.12
9.00	1.06	1.07	1.09	1.10	1.11
8.50	1.05	1.06	1.08	1.09	1.10
8.00	1.03	1.05	1.07	1.08	1.09
7.50	1.01	1.03	1.05	1.07	1.08
7.00	0.99	1.01	1.04	1.05	1.07
6.50	0.97	1.00	1.02	1.04	1.06
6.00	0.94	0.97	1.00	1.02	1.04
5.50	0.91	0.95	0.98	1.00	1.02
5.00	0.87	0.92	0.95	0.98	1.01
4.50	0.83	0.88	0.93	0.96	0.99
4.00	0.78	0.84	0.89	0.93	0.96
3.50	0.71	0.79	0.85	0.90	0.94
3.00	0.63	0.73	0.80	0.86	0.90
2.50	0.53	0.65	0.74	0.81	0.87
2.00	0.40	0.55	0.67	0.75	0.82

Table D—Base Case Conservation Performance (Btu/yr-sf)

Base Case	31,134

Table E—Projected Area Adjustment Factors

Degrees off True South	Solar System Type DG, TW, WW, SSC	SSA SSD	SSB, SSE
0	1.00	0.77	0.75
5	1.00	0.76	0.75
10	0.98	0.75	0.74
15	0.97	0.74	0.73
20	0.94	0.72	0.70
25	0.91	0.69	0.68
30	0.87	0.66	0.65

Table F—Solar System Saving Fractions

F1—Direct Gain

Load Collector Ratio	DGC1 Double Glazing	DGC2 Low-e Glazing	DGC3 R-9 Night Insulation
400	0.05	0.06	0.07
300	0.07	0.08	0.09
200	0.10	0.11	0.13
150	0.13	0.14	0.17
100	0.18	0.21	0.25
80	0.22	0.25	0.30
60	0.27	0.31	0.37
50	0.31	0.36	0.43
45	0.33	0.38	0.46
40	0.36	0.42	0.50
35	0.39	0.46	0.55
30	0.43	0.51	0.62
25	0.48	0.57	0.69
20	0.55	0.65	0.77
15	0.62	0.74	0.85

F2—Trombe Walls

Load Collector Ratio	TWF3 Unvented Non-selective	TWA3 Vented Non-selective	TWJ2 Unvented Selective	TWI4 Unvented Night Insulation
400	0.04	0.06	0.05	0.02
300	0.05	0.08	0.08	0.04
200	0.09	0.11	0.14	0.09
150	0.11	0.14	0.19	0.14
100	0.17	0.20	0.28	0.22
80	0.20	0.23	0.34	0.27
60	0.25	0.29	0.42	0.35
50	0.29	0.33	0.48	0.40
45	0.31	0.35	0.51	0.43
40	0.34	0.38	0.55	0.47
35	0.37	0.41	0.59	0.52
30	0.41	0.45	0.65	0.57
25	0.47	0.50	0.71	0.63
20	0.53	0.57	0.78	0.71
15	0.62	0.66	0.86	0.80

F3—Water Walls

Load Collector Ratio	WWA3 No Night Insulation	WWB4 Night Insulation	WWC2 Selective Surface
400	0.06	0.02	0.03
300	0.08	0.06	0.06
200	0.12	0.12	0.12
150	0.15	0.17	0.18
100	0.22	0.27	0.27
80	0.26	0.33	0.33
60	0.32	0.42	0.41
50	0.36	0.48	0.47
45	0.39	0.52	0.51
40	0.42	0.56	0.55
35	0.46	0.61	0.59
30	0.50	0.66	0.65
25	0.56	0.72	0.71
20	0.63	0.79	0.78
15	0.72	0.87	0.86

F4—Sunspaces

Load Collector Ratio	Sunspace Type SSA1	SSB1	SSC1	SSD1	SSE1
400	0.12	0.09	0.05	0.12	0.09
300	0.14	0.11	0.07	0.14	0.12
200	0.18	0.14	0.11	0.19	0.16
150	0.21	0.17	0.14	0.24	0.20
100	0.27	0.22	0.19	0.31	0.26
80	0.30	0.26	0.23	0.35	0.30
60	0.36	0.31	0.28	0.42	0.36
50	0.40	0.34	0.32	0.47	0.40
45	0.42	0.36	0.35	0.49	0.43
40	0.45	0.39	0.37	0.53	0.46
35	0.48	0.42	0.41	0.56	0.50
30	0.52	0.46	0.45	0.61	0.54
25	0.57	0.50	0.50	0.66	0.59
20	0.63	0.56	0.56	0.72	0.65
15	0.71	0.64	0.65	0.80	0.73

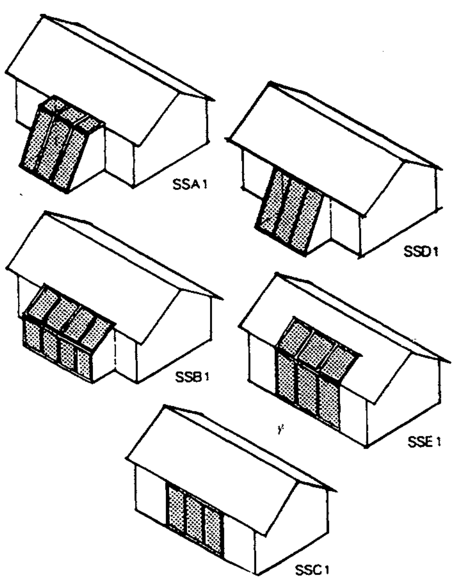


Table G—Base Case Auxiliary Heat Performance (Btu/yr-sf)

Base Case	28,451

Table H—Unit Heat Capacities (Btu/F-sf)

H1—Mass Surfaces Enclosing Direct Gain Spaces

Material	Thickness (inches) 1	2	3	4	6	8	12
Poured Conc.	1.8	4.3	6.7	8.8	11.3	11.5	10.3
Conc. Masonry	1.8	4.2	6.5	8.4	10.2	10.0	9.0
Face Brick	2.0	4.7	7.1	9.0	10.4	9.9	9.0
Flag Stone	2.1	4.8	7.1	8.5	8.6	8.0	7.6
Builder Brick	1.5	3.7	5.4	6.5	6.6	6.0	5.8
Adobe	1.3	3.2	4.8	5.5	5.4	4.9	4.8
Hardwood	0.4	1.4	1.8	1.7	1.5	1.5	1.5
Water	5.2	10.4	15.6	20.8	31.2	41.6	62.4

H2—Rooms with no Direct Solar Gain

Material	Thickness (inches) 1	2	3	4	6	8	12
Poured Conc.	1.7	3.0	3.6	3.8	3.7	3.6	3.4
Conc. Masonry	1.6	2.9	3.5	3.6	3.6	3.4	3.2
Face Brick	1.8	3.1	3.6	3.7	3.5	3.4	3.2
Flag Stone	1.9	3.1	3.4	3.4	3.2	3.1	3.0
Builder Brick	1.4	2.6	3.0	3.1	2.9	2.7	2.7
Adobe	1.2	2.4	2.8	2.8	2.6	2.4	2.4
Hardwood	0.5	1.1	1.3	1.2	1.1	1.0	1.1

Table I—Comfort Factors (Btu/sf)

Direct Gain	860
Sunspaces and Vented Trombe Walls	290

Table J—Radiant Barrier Factors

Radiant Barrier	0.75
No Radiant Barrier	1.00

Table K—Solar Absorptances

Color	Absorptance
Gloss White	0.25
Semi-gloss White	0.30
Light Green	0.47
Kelly Green	0.51
Medium Blue	0.51
Medium Yellow	0.57
Medium Orange	0.58
Medium Green	0.59
Light Buff Brick	0.60
Bare Concrete	0.65
Red Brick	0.70
Medium Red	0.80
Medium Brown	0.84
Dark Blue-Grey	0.88
Dark Brown	0.88

Table L—Heat Gain Factors

Ceiling/roofs	37.0
Walls and Doors	15.6
North Glass	27.7
East Glass	51.0
West Glass	55.5
Skylights	113.1
Direct Gain Glazing	41.5
Trombe Walls and Water Walls	5.4
Sunspaces	
SSA1	23.5
SSB1	23.5
SSC1	5.4
SSD1	23.5
SSE1	23.5

Table M—Shading Factors

Projection Factor	South	East	North	West
0.00	1.00	1.00	1.00	1.00
0.20	0.83	0.93	0.90	0.93
0.40	0.60	0.80	0.79	0.80
0.60	0.49	0.65	0.68	0.65
0.80	0.33	0.51	0.56	0.51
1.00	0.27	0.38	0.45	0.39
1.20	0.22	0.27	0.33	0.28

Multiply by 0.8 for low-e glass, 0.7 for tinted glass and 0.6 for low-e tinted glass.

Table N—Internal Gain Factors

Constant Component	1,980	kBtu/yr
Variable Component	830	kBtu/yr-BR

Table O—Thermal Mass and Ventilation Adjustment (Btu/yr-sf)

Total Heat Capacity per SF	Night Vent w/ Ceil. Fan	Night Vent w/ No Ceil. Fan	No Night Vent w/ Ceil. Fan	No Night Vent w/ No Ceil. Fan
0.0	3,390	1,410	2,270	-250
1.0	4,640	2,690	3,520	1,030
2.0	5,290	3,380	4,160	1,720
3.0	5,620	3,750	4,500	2,090
4.0	5,790	3,950	4,670	2,290
5.0	5,880	4,060	4,760	2,400
6.0	5,920	4,120	4,800	2,460
7.0	5,950	4,150	4,830	2,490
8.0	5,960	4,170	4,840	2,510
9.0	5,970	4,170	4,850	2,520
10.0	5,970	4,180	4,850	2,520

Total heat capacity per square foot is calculated on Worksheet III, Step E.

Table P—Base Case Cooling Performance (Btu/sf-yr)

Base Case	7,598

General
The Worksheets provide a calculation procedure to estimate the performance level of passive solar building designs. It is recommended that the results be compared to Worksheet calculations for the builder's typical house. Performance levels for the NAHB Base Case House used in the Guidelines are also provided for comparison.

A separate worksheet is provided for the four separate performance levels and associated base cases.

The worksheets are supported by a number of data tables. The tables are given a letter designation and are referenced next to each worksheet entry, when applicable.

The floor area used in the calculations should not include sunspaces, garages or other unconditioned spaces.

Worksheet I—Conservation Performance Level
This is an estimate of the amount of heat energy needed by the building each year from both the solar system and the auxiliary heating system.

For *Step A*, it is necessary to measure the net area of surfaces that enclose conditioned space. For walls, the net surface area is the gross wall area less the window and door area.

Rough frame dimensions are generally used to measure window area. The R-values in Table A4 are for the rough frame window area.

Heat loss from passive solar systems is *excluded*. The surface area of direct gain glazing, Trombe walls, water walls and the walls that separate sunspaces from the house are ignored.

Step A includes consideration of insulated floors over crawlspaces, unheated basements or garages. R-values are provided in Table A3 that account for the buffering effect of these unconditioned spaces. When insulation is not installed in the floor assembly, but rather around the perimeter of a crawlspace or unheated basement, *Step B* should be used.

The perimeter method of *Step B* is used for slabs-on-grade, the below-grade portion of heated basements, unheated basements (when the floor is not insulated), and perimeter insulated crawlspaces (when the floor is not insulated). Heated basement walls that are above grade should be considered in *Step A*.

Slab edge perimeter, unheated basements or perimeter insulated crawlspaces adjacent to sunspaces should not be included.

The conservation performance level is calculated as the product of the heat loss per degree day per square foot (Step D) and the heating degree days, adjusted for the heat loss and solar glazing per square foot. The adjustment is taken from Table C, based on data calculated on *Worksheet I, Step D* and *Worksheet II, Step A*.

Should the estimated conservation performance level be greater than desired, the designer should consider additional building insulation or reducing non-south glass area.

Worksheet II—Auxiliary Heat Performance Level
This is an estimate of the amount of heat that must be provided each year from the auxiliary heating system. It accounts for savings due to solar energy.

In *Step A* ,the user may enter the rough frame area of solar glazing, since it is generally easier to measure the rough frame area than it is the net glazing area. The worksheet includes a net area factor of 0.80 to account for window frames and mullions. If the designer enters the net glass area, then the net area factor is 1.00.

The projected area of the solar energy systems may be calculated using the adjustment factors in Table E or by making a scaled elevation drawing of the building facing exactly south and measuring the glazing area from the scaled drawing.

The projected area per square foot is calculated as the last part of *Step A*. This is used to determine the heating degree days adjustment used on *Worksheet I, Step E*.

The load collector ratio is calculated in *Step B*. This is used to determine the solar savings fractions in *Step C*.

The solar energy systems used in *Step C* should be identical to those used in *Step A*. The first and last columns of *Step A* are simply carried down.

The solar savings fraction is determined separately for each type of passive solar system by looking up values in Tables F1 through F4. The sunspace system types are shown beneath Table F4.

If the auxiliary heat performance level calculated in *Step D* is larger than desired, the designer should consider increasing the size of the solar energy systems or adding additional solar energy systems, i.e. thermal storage walls.

Worksheet III—Comfort Performance Level
This is the temperature swing expected on a clear winter day with the auxiliary heating system not operating.

This worksheet requires that two sub-areas be defined within the building: those areas that receive direct solar gains and those areas that are connected to rooms that receive direct solar gains. Rooms that are separated from direct gain spaces by more than one door should not be included in either category.

Thermal mass elements located in unconditioned spaces such as sunspaces are not included.

An exposed slab is one finished with vinyl tile, ceramic tile or other highly conductive materials. Carpeted slabs should not be considered exposed. The exposed slab area should be further reduced by about 50 percent to account for throw rugs and furnishings.

As a rule-of-thumb, exposed slab area should be considered to be in the sun only when it is located directly behind south glazing. The maximum slab area that is assumed to be in the sun should not exceed 1.5 times the adjacent south glass area.

In *Step F*, the projected area of solar glazing calculated on Worksheet II is used to calculate the comfort performance level. The projected area of water walls and unvented Trombe walls is excluded in this step.

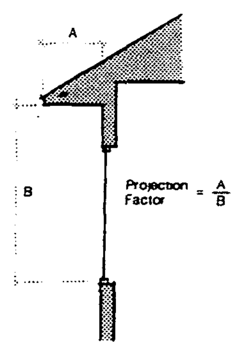
A high temperature swing indicates inadequate thermal mass or too much direct gain solar glazing. If the comfort performance level is greater than desired (13°F recommended), additional thermal mass should be added to the building or direct gain glazing should be reduced.

Worksheet IV—Summer Cooling Performance Level
This is an estimate of the annual cooling load of the building—the heat that needs to be removed from the building by an air conditioner in order to maintain comfort during the summer.

In *Step A*, only the envelope surfaces that are exposed to sunlight are to be included. For instance, floors over crawlspaces and walls or doors adjacent to garages are excluded.

Steps B and C of the worksheet account for solar gains. They use the rough frame area since this is easier to measure. The worksheets include a net area factor of 0.80 to account for window frames and mullions. If the net window area is used, the net area factor is 1.00.

Table M gives the shade factor for windows with overhangs based on a projection factor. The projection factor is the ratio between the horizontal projection of the overhang from the surface of window and the distance from the bottom of the window to the bottom of the overhang. When windows have sunscreens, tints or films, the shade factors in Table M should not be used. Instead, a shading coefficient should be determined from manufacturers' literature.



If the cooling performance level is greater than desired, the designer should consider reducing non-south glass, providing additional shading or increasing thermal mass.