

APPENDIX 2: WINDOW HAP CALCULATIONS

Base Case:

Table 1. Annual Costs

Component	WSHP (\$)
Air System Fans	25,347
Cooling	1,041
Heating	169
Pumps	27,335
Cooling Tower Fans	3,470
HVAC Sub-Total	57,363
Lights	235,016
Electric Equipment	0
Misc. Electric	0
Misc. Fuel Use	0
Non-HVAC Sub-Total	235,016
Grand Total	292,379

Table 2. Annual Cost per Unit Floor Area

Component	WSHP (\$/ft²)
Air System Fans	0.088
Cooling	0.004
Heating	0.001
Pumps	0.095
Cooling Tower Fans	0.012
HVAC Sub-Total	0.199
Lights	0.817
Electric Equipment	0.000
Misc. Electric	0.000
Misc. Fuel Use	0.000
Non-HVAC Sub-Total	0.817
Grand Total	1.017
Gross Floor Area (ft²)	287584.0
Conditioned Floor Area (ft²)	287584.0

Note: Values in this table are calculated using the Gross Floor Area.

Table 3. Component Cost as a Percentage of Total Cost

Component	WSHP (%)
Air System Fans	8.7
Cooling	0.4
Heating	0.1
Pumps	9.3
Cooling Tower Fans	1.2
HVAC Sub-Total	19.6
Lights	80.4
Electric Equipment	0.0
Misc. Electric	0.0
Misc. Fuel Use	0.0
Non-HVAC Sub-Total	80.4
Grand Total	100.0

1. Annual Coil Loads

Component	Load (kBTU)	(kBTU/ft ²)
Cooling Coil Loads	24,589,650	85.504
Heating Coil Loads	1,267,536	4.408
Grand Total	25,857,182	89.912

2. Energy Consumption by System Component

Component	Site Energy (kBTU)	Site Energy (kBTU/ft ²)	Source Energy (kBTU)	Source Energy (kBTU/ft ²)
Air System Fans	1,015,470	3.531	3,626,679	12.611
Cooling	41,719	0.145	148,997	0.518
Heating	6,777	0.024	24,203	0.084
Pumps	1,095,080	3.808	3,911,000	13.600
Cooling Towers	139,026	0.483	496,522	1.727
HVAC Sub-Total	2,298,072	7.991	8,207,401	28.539
Lights	9,415,216	32.739	33,625,772	116.925
Electric Equipment	0	0.000	0	0.000
Misc. Electric	0	0.000	0	0.000
Misc. Fuel Use	0	0.000	0	0.000
Non-HVAC Sub-Total	9,415,216	32.739	33,625,772	116.925
Grand Total	11,713,288	40.730	41,833,173	145.464

Tinted Glass:

Table 1. Annual Costs

Component	WSHP (\$)
Air System Fans	19,533
Cooling	1,052
Heating	164
Pumps	27,335
Cooling Tower Fans	3,470
HVAC Sub-Total	51,554
Lights	235,018
Electric Equipment	0
Misc. Electric	0
Misc. Fuel Use	0
Non-HVAC Sub-Total	235,018
Grand Total	286,572

Table 2. Annual Cost per Unit Floor Area

Component	WSHP (\$/ft²)
Air System Fans	0.068
Cooling	0.004
Heating	0.001
Pumps	0.095
Cooling Tower Fans	0.012
HVAC Sub-Total	0.179
Lights	0.817
Electric Equipment	0.000
Misc. Electric	0.000
Misc. Fuel Use	0.000
Non-HVAC Sub-Total	0.817
Grand Total	0.997
Gross Floor Area (ft²)	287584.0
Conditioned Floor Area (ft²)	287584.0

Note: Values in this table are calculated using the Gross Floor Area.

Table 3. Component Cost as a Percentage of Total Cost

Component	WSHP (%)
Air System Fans	6.8
Cooling	0.4
Heating	0.1
Pumps	9.5
Cooling Tower Fans	1.2
HVAC Sub-Total	18.0
Lights	82.0
Electric Equipment	0.0
Misc. Electric	0.0
Misc. Fuel Use	0.0
Non-HVAC Sub-Total	82.0
Grand Total	100.0

1. Annual Coil Loads

Component	Load (kBTU)	(kBTU/ft²)
Cooling Coil Loads	21,653,520	75.295
Heating Coil Loads	1,256,917	4.371
Grand Total	22,910,439	79.665

2. Energy Consumption by System Component

Component	Site Energy (kBTU)	Site Energy (kBTU/ft²)	Source Energy (kBTU)	Source Energy (kBTU/ft²)
Air System Fans	782,507	2.721	2,794,666	9.718
Cooling	42,165	0.147	150,588	0.524
Heating	6,568	0.023	23,456	0.082
Pumps	1,095,080	3.808	3,911,000	13.600
Cooling Towers	139,026	0.483	496,522	1.727
HVAC Sub-Total	2,065,345	7.182	7,376,233	25.649
Lights	9,415,216	32.739	33,625,772	116.925
Electric Equipment	0	0.000	0	0.000
Misc. Electric	0	0.000	0	0.000
Misc. Fuel Use	0	0.000	0	0.000
Non-HVAC Sub-Total	9,415,216	32.739	33,625,772	116.925
Grand Total	11,480,561	39.921	41,002,005	142.574

Reflective Glass:

Table 1. Annual Costs

Component	WSHP (\$)
Air System Fans	15,244
Cooling	1,046
Heating	166
Pumps	27,335
Cooling Tower Fans	3,470
HVAC Sub-Total	47,261
Lights	235,019
Electric Equipment	0
Misc. Electric	0
Misc. Fuel Use	0
Non-HVAC Sub-Total	235,019
Grand Total	282,280

Table 2. Annual Cost per Unit Floor Area

Component	WSHP (\$/ft ²)
Air System Fans	0.053
Cooling	0.004
Heating	0.001
Pumps	0.095
Cooling Tower Fans	0.012
HVAC Sub-Total	0.164
Lights	0.817
Electric Equipment	0.000
Misc. Electric	0.000
Misc. Fuel Use	0.000
Non-HVAC Sub-Total	0.817
Grand Total	0.982
Gross Floor Area (ft ²)	287584.0
Conditioned Floor Area (ft ²)	287584.0

Note: Values in this table are calculated using the Gross Floor Area.

Table 3. Component Cost as a Percentage of Total Cost

Component	WSHP (%)
Air System Fans	5.4
Cooling	0.4
Heating	0.1
Pumps	9.7
Cooling Tower Fans	1.2
HVAC Sub-Total	16.7
Lights	83.3
Electric Equipment	0.0
Misc. Electric	0.0
Misc. Fuel Use	0.0
Non-HVAC Sub-Total	83.3
Grand Total	100.0

1. Annual Coil Loads

Component	Load (kBTU)	(kBTU/ft ²)
Cooling Coil Loads	17,864,830	62.120
Heating Coil Loads	1,261,666	4.387
Grand Total	19,126,496	66.508

2. Energy Consumption by Energy Source

Component	Site Energy (kBTU)	Site Energy (kBTU/ft ²)	Source Energy (kBTU)	Source Energy (kBTU/ft ²)
HVAC Components				
Electric	1,893,335	6.584	6,761,909	23.513
Natural Gas	0	0.000	0	0.000
Fuel Oil	0	0.000	0	0.000
Propane	0	0.000	0	0.000
Remote Hot Water	0	0.000	0	0.000
Remote Steam	0	0.000	0	0.000
Remote Chilled Water	0	0.000	0	0.000
HVAC Sub-Total	1,893,335	6.584	6,761,909	23.513
Non-HVAC Components				
Electric	9,415,216	32.739	33,625,772	116.925
Natural Gas	0	0.000	0	0.000
Fuel Oil	0	0.000	0	0.000
Propane	0	0.000	0	0.000
Remote Hot Water	0	0.000	0	0.000
Remote Steam	0	0.000	0	0.000
Non-HVAC Sub-Total	9,415,216	32.739	33,625,772	116.925
Grand Total	11,308,551	39.323	40,387,681	140.438

Triple Pane:

Table 1. Annual Costs

Component	WSHP (\$)
Air System Fans	14,622
Cooling	1,054
Heating	164
Pumps	27,335
Cooling Tower Fans	3,470
HVAC Sub-Total	46,645
Lights	235,019
Electric Equipment	0
Misc. Electric	0
Misc. Fuel Use	0
Non-HVAC Sub-Total	235,019
Grand Total	281,664

Table 2. Annual Cost per Unit Floor Area

Component	WSHP (\$/ft²)
Air System Fans	0.051
Cooling	0.004
Heating	0.001
Pumps	0.095
Cooling Tower Fans	0.012
HVAC Sub-Total	0.162
Lights	0.817
Electric Equipment	0.000
Misc. Electric	0.000
Misc. Fuel Use	0.000
Non-HVAC Sub-Total	0.817
Grand Total	0.980
Gross Floor Area (ft²)	287584.0
Conditioned Floor Area (ft²)	287584.0

Note: Values in this table are calculated using the Gross Floor Area.

Table 3. Component Cost as a Percentage of Total Cost

Component	WSHP (%)
Air System Fans	5.2
Cooling	0.4
Heating	0.1
Pumps	9.7
Cooling Tower Fans	1.2
HVAC Sub-Total	16.6
Lights	83.4
Electric Equipment	0.0
Misc. Electric	0.0
Misc. Fuel Use	0.0
Non-HVAC Sub-Total	83.4
Grand Total	100.0

1. Annual Coil Loads

Component	Load (kBTU)	(kBTU/ft²)
Cooling Coil Loads	18,571,010	64.576
Heating Coil Loads	1,256,917	4.371
Grand Total	19,827,931	68.947

2. Energy Consumption by System Component

Component	Site Energy (kBTU)	Site Energy (kBTU/ft²)	Source Energy (kBTU)	Source Energy (kBTU/ft²)
Air System Fans	585,784	2.037	2,092,085	7.275
Cooling	42,218	0.147	150,777	0.524
Heating	6,569	0.023	23,462	0.082
Pumps	1,095,080	3.808	3,911,000	13.600
Cooling Towers	139,026	0.483	496,522	1.727
HVAC Sub-Total	1,868,677	6.498	6,673,846	23.207
Lights	9,415,216	32.739	33,625,772	116.925
Electric Equipment	0	0.000	0	0.000
Misc. Electric	0	0.000	0	0.000
Misc. Fuel Use	0	0.000	0	0.000
Non-HVAC Sub-Total	9,415,216	32.739	33,625,772	116.925
Grand Total	11,283,893	39.237	40,299,618	140.132