

Project Information

Name: Campus
 Description: Small campus including dormitories, offices and assembly spaces.
 Analysis done by: @ AEC
 Gross Area: 48,852 ft²
 Project File: c:\temp\small_campus.gph
 Case Name: As Designed
 Case Description: As Designed
 Number of Blocks: 9

Block 1, Level 1: Dorm1 Womens

Block Information		Ceiling and Plenum Heights	
Shape	CUSTOMBLK	Floor to Floor Height	17 ft
Zoning	Custom	Plenum Height	5 ft
Number of Zones	5	Number of Floors	1
Number of Facades	0		

Block Dimensions

Coordinates (ft)	Point	X (ft)	Y (ft)
X	Pt. 1	-130.9	405.7
Y	Pt. 2	-130.9	412.0
Z	Pt. 3	-130.9	429.3
	Pt. 4	-95.1	429.3
	Pt. 5	-61.8	429.3
	Pt. 6	-34.1	429.3
	Pt. 7	-34.1	412.0
	Pt. 8	-34.1	405.7
	Pt. 9	-22.1	405.7
	Pt. 10	-22.1	388.4
	Pt. 11	-130.9	388.4

Block Constructions

Construction	Description	U-Factor (Btu/h-ft ² -°F)	Heat Cap. (Btu/ft ² -°F)
Roof	Mtl Bldg. 3" insul	0.119	0.2
Ceiling	Gyp. bd. ceiling	0.745	0.5
Floor	R-0 Mass	0.182	9.3
Int. Floor	R-0 Mass	0.182	9.3
Interior Wall	Partition	0.387	1.0

Facade Dimensions

Name	Bay Width (ft)	Window Height (ft)	Window Width (ft)
Surface_115	12	3.25	5.5
Surface_118	6	8	5.5
Surface_120	6	8	5.5
Surface_121	11	3.25	5.5
Surface_128	11	3.25	5.5

Facade Shading

Name	Window Recess (ft)	Interior Shading	Exterior Shading	Overhang Distance (ft)	Overhang Projection (ft)	Side Fin Distance (ft)	Side Fin Projection (ft)
Surface_115	0	No	No	n.a.	n.a.	n.a.	n.a.
Surface_118	0	No	Yes	-3	10	0	0
Surface_120	0	No	Yes	-3	10	0	0
Surface_121	0	No	No	n.a.	n.a.	n.a.	n.a.
Surface_128	0	No	No	n.a.	n.a.	n.a.	n.a.

Facade Constructions

Name	Window Construction	U-Factor (Btu/h-ft ² -°F)	SC	VLT	Wall Construction	U-Factor (Btu/h-ft ² -°F)	HC (Btu/ft ² -°F)

Surface_11 4	n.a.	n.a.	n.a.	n.a.	Mtl. Frm. 24" o.c. R-19 + 1" EPS	0.061	2.5
Surface_11 5	Double Low Iron 3/12/3 mm	.491	0.96	0.839	Mtl. Frm. 24" o.c. R-19 + 1" EPS	0.061	2.5
Surface_11 6	n.a.	n.a.	n.a.	n.a.	Mtl. Frm. 24" o.c. R-19 + 1" EPS	0.061	2.5
Surface_11 9	n.a.	n.a.	n.a.	n.a.	Mtl. Frm. 24" o.c. R-19 + 1" EPS	0.061	2.5
Surface_11 8	Double Low Iron 3/12/3 mm	.491	0.96	0.839	Mtl. Frm. 24" o.c. R-19 + 1" EPS	0.061	2.5
Surface_12 0	Double Low Iron 3/12/3 mm	.491	0.96	0.839	Mtl. Frm. 24" o.c. R-19 + 1" EPS	0.061	2.5
Surface_12 1	Double Low Iron 3/12/3 mm	.491	0.96	0.839	Mtl. Frm. 24" o.c. R-19 + 1" EPS	0.061	2.5
Surface_12 4	n.a.	n.a.	n.a.	n.a.	Mtl. Frm. 24" o.c. R-19 + 1" EPS	0.061	2.5
Surface_12 5	n.a.	n.a.	n.a.	n.a.	Mtl. Frm. 24" o.c. R-19 + 1" EPS	0.061	2.5
Surface_12 8	Double Low Iron 3/12/3 mm	.491	0.96	0.839	Mtl. Frm. 24" o.c. R-19 + 1" EPS	0.061	2.5
Surface_12 9	n.a.	n.a.	n.a.	n.a.	Mtl. Frm. 24" o.c. R-19 + 1" EPS	0.061	2.5

Skylight Information

Name	Width (ft)	Height (ft)	Window Construction	U-Factor (Btu/h-ft ² -°F)	SC	VLT
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 Gross Area: 48,852 ft²
 Conditioned Area: 33,647 ft²
 Window-Wall-Ratio: 0.061
 Skylight-Roof-Ratio: 0.01
 Number of Blocks: 9
 Note: This report includes floor multipliers

Occupancies Summary

Name	Area (ft ²)	Avg. LPD (W/ft ²)	Avg. EPD (W/ft ²)
CCC Admin	2,974	1.8	0.75
CCC Doms	12,490	1.8	0.75
CCC Comet Doms	3,479	1.8	0.75
CCC Edu	5,328	1.8	0.75
CCC Rec	4,896	1.8	0.75
CCC Dining	9,000	1.8	0.75
CCC Maint	10,685	1.8	0.75
Building Totals & Averages	48,852	1.8	0.75

Constructions Summary

Name	Net Area (ft ²)	U-Factor (Btu/h-ft ² -°F)	Heat Cap. (Btu/ft ² -°F)	Absorptance	Type	Category	Layers
Asm59	31	0.48	0.82	0.7		All	1
Simulated Slab	43,524	0.03	45.6	0.0	Slabs	Light	3
Partition	22,624	0.39	1.04	0.3	Partitions	Light	3
R-0 Mass	5,328	0.18	9.33	0.7	Floors	Light	3
Mtl. Frm. 24" o.c. R-19 + 1" EPS	20,621	0.06	2.5	0.7	Walls	Light	5
6" Conc., Mtl frm R-0, 70%	16,850	0.16	8.0	0.7	Walls	Light	2
Mtl Bldg. 3" insul	19,685	0.12	0.24	0.7	Roofs	Light	n.a.

Fenestrations Summary

Name	Ucog (Btu/h-ft ² -°F)	SHGC	Tvis	North (ft ²)	East (ft ²)	South (ft ²)	West (ft ²)	Total (ft ²)	No.
3.25X5.5 Double Low E	0.491	0.828	0.839	465	0	483	0	947	53
2X4 Double Clear - Skylight	0.491	0.828	0.839	200	0	0	0	200	25
Shaded 5.5X8 Double Low E Door	0.491	0.828	0.839	264	220	264	264	1,012	23
4X8 Double Low E	0.491	0.828	0.839	0	0	64	0	64	2
3X18.5 Double Low E	0.491	0.828	0.839	166	0	0	0	166	3
5X5 Double Low E	0.491	0.828	0.839	0	100	50	0	150	6
3X12.5 Double Low E	0.491	0.828	0.839	0	0	75	0	75	2
Building Totals & Averages	0.491	0.828	0.839	1,095	320	936	264	2,615	114

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Zone Loads

Name	Area (ft ²)	LPD (W/ft ²)	EPD (W/ft ²)	Occupancy	Occupant Density (ft ² /person)	Daylight Control	Illuminance (fc)	Control Fraction	Infiltration (ach)	Peak Load Cl/Ht (kBtu/h)
Dorm 1	1882	.77	.75	CCC Dorms	250.0	None	n.a.	n.a.	0.2	0/145.36
Corridor1	610	.51	.75	CCC Dorms	250.0	None	n.a.	n.a.	0.2	n.a.
Dorm 2	619	.88	.75	CCC Dorms	250.0	None	n.a.	n.a.	0.2	0/19.24
Toilet 1	576	1.01	.75	CCC Dorms	250.0	None	n.a.	n.a.	0.2	n.a.
Dorm 3	479	.67	.75	CCC Dorms	250.0	None	n.a.	n.a.	0.2	0/12.56
Dorm 4	1882	.77	.75	CCC Dorms	250.0	None	n.a.	n.a.	0.2	0/69.07
Corridor 3	610	.51	.75	CCC Dorms	250.0	None	n.a.	n.a.	0.2	n.a.
Dorm 5	439	.73	.75	CCC Dorms	250.0	None	n.a.	n.a.	0.2	0/43.69
Toilet 4	602	.98	.75	CCC Dorms	250.0	None	n.a.	n.a.	0.2	n.a.
Dorm 6	624	.77	.75	CCC Dorms	250.0	None	n.a.	n.a.	0.2	0/64.4
Dorm 7	1882	.77	.75	CCC Dorms	250.0	None	n.a.	n.a.	0.2	0/146.59
Corridor 4	610	.51	.75	CCC Dorms	250.0	None	n.a.	n.a.	0.2	n.a.
Dorm 8	441	.73	.75	CCC Dorms	250.0	None	n.a.	n.a.	0.2	0/13.4
Toilet 5	605	.97	.75	CCC Dorms	250.0	None	n.a.	n.a.	0.2	n.a.
Dorm 9	628	.77	.75	CCC Dorms	250.0	None	n.a.	n.a.	0.2	0/17.17
Toilet 2	218	.76	.75	CCC Comet Dorms	250.0	None	n.a.	n.a.	0.2	n.a.
Toilet 3	294	.63	.75	CCC Comet Dorms	250.0	None	n.a.	n.a.	0.2	n.a.
Corridor 2	532	.58	.75	CCC Comet Dorms	250.0	None	n.a.	n.a.	0.2	n.a.
Comet Dorm 2	722	.71	.75	CCC Comet Dorms	250.0	None	n.a.	n.a.	0.2	0/93.3
Comet Dorm 3	1066	.76	.75	CCC Comet Dorms	250.0	None	n.a.	n.a.	0.2	0/51.12
Coemt Dorm 4	648	.84	.75	CCC Comet Dorms	250.0	None	n.a.	n.a.	0.2	0/32.67
Admin Office 1	1627	.99	.75	CCC Admin	250.0	Dimming	50	0.18	0.2	0/57
Toilet 6	117	.29	.75	CCC Admin	250.0	None	n.a.	n.a.	0.2	n.a.
Corridor 5	818	.53	.75	CCC Admin	250.0	None	n.a.	n.a.	0.2	0/22.6
Admin Office 2	412	.90	.75	CCC Admin	250.0	Dimming	50	1	0.2	0/33.1
Rec Mech	971	.78	.75	CCC Rec	250.0	None	n.a.	n.a.	0.2	0/68.68
Recreation	3925	.90	.75	CCC Rec	250.0	None	n.a.	n.a.	0.2	0/272.54
Training	2612	1.04	.75	CCC Edu	250.0	Dimming	50	0.15	0.2	0/152.41
Corridor 7	581	2.24	.75	CCC Edu	250.0	None	n.a.	n.a.	0.2	0/54.5
Toilet 8	493	.88	.75	CCC Edu	250.0	None	n.a.	n.a.	0.2	n.a.
Computer lab	850	.80	.75	CCC Edu	250.0	None	n.a.	n.a.	0.2	0/43.27
Library	791	.78	.75	CCC Edu	250.0	None	n.a.	n.a.	0.2	0/43.31
Kitchen	2593	.77	.75	CCC Dining	250.0	None	n.a.	n.a.	0.2	0/264.6
Toilet 7	1081	1.15	.75	CCC Dining	250.0	None	n.a.	n.a.	0.2	n.a.
Dining	5326	1.67	.75	CCC Dining	100.0	None	n.a.	n.a.	0.2	0/136.39
Crew	1580	.94	.75	CCC Maint	250.0	Dimming	50	0.36	0.2	0/44.75
Corridor 6	247	1.51	.75	CCC Maint	250.0	None	n.a.	n.a.	0.2	0/12.03
Warehouse Office	3367	2.46	.75	CCC Maint	250.0	Dimming	50	0.1	0.2	n.a.
Shop Area	5490	1.45	.75	CCC Maint	250.0	None	n.a.	n.a.	0.2	n.a.

Supply Air

VisualDOE 4.0 - Zones Summary

April 9, 2004

Name	Total Flow (cfm)	Flow/Area (cfm/ft ²)	Air change/hour	Min. Flow Ratio	Cap. (kBtu/hr) Cool/Heat
Dorm 1	AutoSized - 3848	0	0	1	n.a.
Corridor1	unconditioned	0	0	1	n.a.
Dorm 2	AutoSized - 509	0	0	1	n.a.
Toilet 1	unconditioned	0	0	1	n.a.
Dorm 3	AutoSized - 332	0	0	1	n.a.
Dorm 4	AutoSized - 1828	0	0	1	n.a.
Corridor 3	unconditioned	0	0	1	n.a.
Dorm 5	AutoSized - 1157	0	0	1	n.a.
Toilet 4	unconditioned	0	0	1	n.a.
Dorm 6	AutoSized - 1705	0	0	1	n.a.
Dorm 7	AutoSized - 3881	0	0	1	n.a.
Corridor 4	unconditioned	0	0	1	n.a.
Dorm 8	AutoSized - 355	0	0	1	n.a.
Toilet 5	unconditioned	0	0	1	n.a.
Dorm 9	AutoSized - 455	0	0	1	n.a.
Toilet 2	unconditioned	0	0	1	n.a.
Toilet 3	unconditioned	0	0	1	n.a.
Corridor 2	unconditioned	0	0	1	n.a.
Comet Dorm 2	AutoSized - 2471	0	0	1	n.a.
Comet Dorm 3	AutoSized - 1354	0	0	1	n.a.
Coemt Dorm 4	AutoSized - 865	0	0	1	n.a.
Admin Office 1	AutoSized - 1507	0	0	1	n.a.
Toilet 6	unconditioned	0	0	1	n.a.
Corridor 5	AutoSized - 598	0	0	1	n.a.
Admin Office 2	AutoSized - 875	0	0	1	n.a.
Rec Mech	AutoSized - 2033	0	0	1	n.a.
Recreation	AutoSized - 8067	0	0	1	n.a.
Training	AutoSized - 4035	0	0	1	n.a.
Corridor 7	AutoSized - 1443	0	0	1	n.a.
Toilet 8	unconditioned	0	0	1	n.a.
Computer lab	AutoSized - 1146	0	0	1	n.a.
Library	AutoSized - 1147	0	0	1	n.a.
Kitchen	AutoSized - 7000	0	0	1	n.a.
Toilet 7	unconditioned	0	0	1	n.a.
Dining	AutoSized - 3608	0	0	1	n.a.
Crew	AutoSized - 1182	0	0	0.3	n.a.
Corridor 6	AutoSized - 318	0	0	0.3	n.a.
Warehouse	unconditioned	0	0	1	n.a.
Office					
Shop Area	unconditioned	0	0	0.3	n.a.

Outside Air

Name	Total Flow (cfm)	Flow(cfm)/Person	Air change/hour	Fraction Supply Air
Dorm 1	n.a.	15	n.a.	n.a.
Corridor1	unconditioned	15	n.a.	n.a.
Dorm 2	n.a.	15	n.a.	n.a.
Toilet 1	unconditioned	15	n.a.	n.a.
Dorm 3	n.a.	15	n.a.	n.a.
Dorm 4	n.a.	15	n.a.	n.a.
Corridor 3	unconditioned	15	n.a.	n.a.
Dorm 5	n.a.	15	n.a.	n.a.
Toilet 4	unconditioned	15	n.a.	n.a.
Dorm 6	n.a.	15	n.a.	n.a.
Dorm 7	n.a.	15	n.a.	n.a.
Corridor 4	unconditioned	15	n.a.	n.a.
Dorm 8	n.a.	15	n.a.	n.a.
Toilet 5	unconditioned	15	n.a.	n.a.
Dorm 9	n.a.	15	n.a.	n.a.
Toilet 2	unconditioned	15	n.a.	n.a.

Toilet 3	unconditioned	15	n.a.	n.a.
Corridor 2	unconditioned	15	n.a.	n.a.
Comet Dorm 2	n.a.	15	n.a.	n.a.
Comet Dorm 3	n.a.	15	n.a.	n.a.
Coemt Dorm 4	n.a.	15	n.a.	n.a.
Admin Office 1	n.a.	15	n.a.	n.a.
Toilet 6	unconditioned	15	n.a.	n.a.
Corridor 5	n.a.	15	n.a.	n.a.
Admin Office 2	n.a.	15	n.a.	n.a.
Rec Mech	n.a.	15	n.a.	n.a.
Recreation	n.a.	15	n.a.	n.a.
Training	n.a.	15	n.a.	n.a.
Corridor 7	n.a.	15	n.a.	n.a.
Toilet 8	unconditioned	15	n.a.	n.a.
Computer lab	n.a.	15	n.a.	n.a.
Library	n.a.	15	n.a.	n.a.
Kitchen	n.a.	15	n.a.	n.a.
Toilet 7	unconditioned	15	n.a.	n.a.
Dining	n.a.	15	n.a.	n.a.
Crew	n.a.	15	n.a.	n.a.
Corridor 6	n.a.	15	n.a.	n.a.
Warehouse Office	unconditioned	15	n.a.	n.a.
Shop Area	unconditioned	15	n.a.	n.a.

Name	<u>Thermostat</u> Type	Throttling Range (°F)	<u>PIU</u> Type	Zone Fan Volume (cfm)	Fan Power (W)
Dorm 1	Reverse Action	3	No PIU	n.a.	n.a.
Dorm 2	Reverse Action	3	No PIU	n.a.	n.a.
Dorm 3	Reverse Action	3	No PIU	n.a.	n.a.
Dorm 4	Reverse Action	3	No PIU	n.a.	n.a.
Dorm 5	Reverse Action	3	No PIU	n.a.	n.a.
Dorm 6	Reverse Action	3	No PIU	n.a.	n.a.
Dorm 7	Reverse Action	3	No PIU	n.a.	n.a.
Dorm 8	Reverse Action	3	No PIU	n.a.	n.a.
Dorm 9	Reverse Action	3	No PIU	n.a.	n.a.
Comet Dorm 2	Reverse Action	3	No PIU	n.a.	n.a.
Comet Dorm 3	Reverse Action	3	No PIU	n.a.	n.a.
Coemt Dorm 4	Reverse Action	3	No PIU	n.a.	n.a.
Admin Office 1	Reverse Action	3	No PIU	n.a.	n.a.
Corridor 5	Reverse Action	3	No PIU	n.a.	n.a.
Admin Office 2	Reverse Action	3	No PIU	n.a.	n.a.
Rec Mech	Reverse Action	3	No PIU	n.a.	n.a.
Recreation	Reverse Action	3	No PIU	n.a.	n.a.
Training	Reverse Action	3	No PIU	n.a.	n.a.
Corridor 7	Reverse Action	3	No PIU	n.a.	n.a.
Computer lab	Reverse Action	3	No PIU	n.a.	n.a.
Library	Reverse Action	3	No PIU	n.a.	n.a.
Kitchen	Reverse Action	3	No PIU	n.a.	n.a.
Dining	Reverse Action	3	No PIU	n.a.	n.a.
Crew	Reverse Action	3	No PIU	n.a.	n.a.
Corridor 6	Reverse Action	3	No PIU	n.a.	n.a.

Exhaust Fans

Name	Method	Air Volume (cfm)	Power (bhp/cfm)	Static Pressure (in. wg)	Mechanical Efficiency	Drive Efficiency	Motor Efficiency
Kitchen	Power/Unit Volume	7000.00	0.00018	n.a.	n.a.	n.a.	n.a.

<u>Zone Reheat</u>		<u>Baseboards</u>		
Name	Reheat Delta-T (°F)	Heat Source	Rating (kBtu/hr)	Control

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Alternative Name: As Designed

Hot Water Pumps

Type	Fixed-Speed
Head (ft)	30
Motor Efficiency	0.85
Impeller Efficiency	0.7

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 Number of Systems: 9

Systems Summary

Name	Type	Cond. Area (ft ²)	Supply (CFM)	Min. OA	Cooling Cap (kBtu/h)	Heating Cap (kBtu/h)	Cooling Peak (kBtu/h)	Heating Peak (kBtu/h)	Cooling Energy (MBtu)	Heating Energy (MBtu)
Womens Res Pck HP	PSZ	2981	4690	0.5	145.6	93.8	0	0	0	0
Mens Res 1 Pck HP	PSZ	2945	4690	0.5	145.6	93.8	0	0	0	0
Mens Res 2 Pck HP	PSZ	2951	4690	0.5	145.6	93.8	0	0	0	0
COMET Res Pck HP	PSZ	2435	4690	0.5	110	93.8	0	0	0	0
Admin	PSZ	2857	2980	0.5	76.2	46.8	0	0	0	0
Rec	PSZ	4896	10100	0.5	241.6	332	0	0	0	0
Edu	PSZ	4835	7770	0.5	246	295	0	0	0	0
Dining	PSZ	7919	10608	0.5	364.6	813.5	0	0	0	0
Warehouse	PSZ	1828	1500	0.5	37.9	64	0	0	0	0

Systems Summary per Conditioned Area

Name	Type	Cond. Area (ft ²)	Supply (CFM/ft ²)	Min. OA	Cooling Cap (Btu/h/ft ²)	Heating Cap (Btu/h/ft ²)	Cooling Peak (Btu/h/ft ²)	Heating Peak (Btu/h/ft ²)	Cooling Energy (kBtu/ft ²)	Heating Energy (kBtu/ft ²)
Womens Res Pck HP	PSZ	2981	1.573	0.5	49	31	0	0	0	0
Mens Res 1 Pck HP	PSZ	2945	1.592	0.5	49	32	0	0	0	0
Mens Res 2 Pck HP	PSZ	2951	1.589	0.5	49	32	0	0	0	0
COMET Res Pck HP	PSZ	2435	1.926	0.5	45	39	0	0	0	0
Admin	PSZ	2857	1.043	0.5	27	16	0	0	0	0
Rec	PSZ	4896	2.063	0.5	49	68	0	0	0	0
Edu	PSZ	4835	1.607	0.5	51	61	0	0	0	0
Dining	PSZ	7919	1.34	0.5	46	103	0	0	0	0
Warehouse	PSZ	1828	0.821	0.5	21	35	0	0	0	0

Individual System

Name: Womens Res Pck HP
 Type: Packaged Single Zone
 Occupancy: CCC Dorms
 Control Zone: Dorm 1
 Number of Conditioned Zones Served: 3
 Total Conditioned Area Served (ft²): 2980.8
 Average Air Flow per Conditioned Area (cfm/ft²): 1.57

Heating

Supply Temperature 105 °F
 Control Constant
 Capacity (kBtu/hr) 93.8
 Source Electric Heat Pump

Air to Air Heat Pump

Coefficient of Performance 3
 Energy Input Ratio 0.38
 Supplemental Heat Electric Resistance
 Supplemental Capacity (kBtu/hr) 0
 Heat On Temperature 45 °F
 HP Shut Off Temperature 45 °F
 Crankcase Heater (kW) 0
 Crankcase On Temperature 0 °F
 Defrost Type Electric Resistance
 Defrost Control Timed
 Defrost Temperature 40 °F
 Compressor Type Single Speed

Supply Fan

(Included in EER/COP)
 Fan Flow (cfm) 4690

Cooling

Supply Temperature 55 °F
 Control Constant
 Total Capacity (kBtu/h) 145.6
 Sensible Capacity (kBtu/h) 133.0
 Dehumidification none
 Coil Bypass Factor 0.19
 Energy Efficiency Ratio 9.4
 Desuperheater none
 Evaporative Condenser No
 Water Cooled Condensor No

Individual System

Name: Mens Res 1 Pck HP
 Type: Packaged Single Zone
 Occupancy: CCC Dorms
 Control Zone: Dorm 4
 Number of Conditioned Zones Served: 3
 Total Conditioned Area Served (ft²): 2945.2
 Average Air Flow per Conditioned Area (cfm/ft²): 1.59

Heating

Supply Temperature 105 °F
 Control Constant
 Capacity (kBtu/hr) 93.8
 Source Electric Heat Pump

Air to Air Heat Pump

Coefficient of Performance 3
 Energy Input Ratio 0.38
 Supplemental Heat Electric Resistance
 Supplemental Capacity (kBtu/hr) 0
 Heat On Temperature 45 °F
 HP Shut Off Temperature 45 °F
 Crankcase Heater (kW) 0
 Crankcase On Temperature 0 °F
 Defrost Type Electric Resistance
 Defrost Control Timed
 Defrost Temperature 40 °F
 Compressor Type Single Speed

Supply Fan

(Included in EER/COP)
 Fan Flow (cfm) 4690

Cooling

Supply Temperature 55 °F
 Control Constant
 Total Capacity (kBtu/h) 145.6
 Sensible Capacity (kBtu/h) 133.0
 Dehumidification none
 Coil Bypass Factor 0.19
 Energy Efficiency Ratio 9.4
 Desuperheater none
 Evaporative Condenser No
 Water Cooled Condensor No

Individual System

Name: Mens Res 2 Pck HP
 Type: Packaged Single Zone
 Occupancy: CCC Dorms
 Control Zone: Dorm 7
 Number of Conditioned Zones Served: 3
 Total Conditioned Area Served (ft²): 2951.4
 Average Air Flow per Conditioned Area (cfm/ft²): 1.59

Heating

Supply Temperature 105 °F
 Control Constant
 Capacity (kBtu/hr) 93.8
 Source Electric Heat Pump

Air to Air Heat Pump

Coefficient of Performance 3
 Energy Input Ratio 0.38
 Supplemental Heat Electric Resistance
 Supplemental Capacity (kBtu/hr) 0
 Heat On Temperature 45 °F
 HP Shut Off Temperature 45 °F
 Crankcase Heater (kW) 0
 Crankcase On Temperature 0 °F
 Defrost Type Electric Resistance
 Defrost Control Timed
 Defrost Temperature 40 °F
 Compressor Type Single Speed

Supply Fan

(Included in EER/COP)
 Fan Flow (cfm) 4690

Cooling

Supply Temperature 55 °F
 Control Constant
 Total Capacity (kBtu/h) 145.6
 Sensible Capacity (kBtu/h) 133.0
 Dehumidification none
 Coil Bypass Factor 0.19
 Energy Efficiency Ratio 9.4
 Desuperheater none
 Evaporative Condenser No
 Water Cooled Condensor No

Individual System

Name: COMET Res Pck HP
 Type: Packaged Single Zone
 Occupancy: CCC Dorms
 Control Zone: Comet Dorm 3
 Number of Conditioned Zones Served: 3
 Total Conditioned Area Served (ft²): 2434.9
 Average Air Flow per Conditioned Area (cfm/ft²): 1.93

Heating

Supply Temperature 105 °F
 Control Constant
 Capacity (kBtu/hr) 93.8
 Source Electric Heat Pump

Air to Air Heat Pump

Coefficient of Performance 3
 Energy Input Ratio 0.38
 Supplemental Heat Electric Resistance
 Supplemental Capacity (kBtu/hr) 0
 Heat On Temperature 45 °F
 HP Shut Off Temperature 45 °F
 Crankcase Heater (kW) 0
 Crankcase On Temperature 0 °F
 Defrost Type Electric Resistance
 Defrost Control Timed
 Defrost Temperature 40 °F
 Compressor Type Single Speed

Supply Fan

(Included in EER/COP)
 Fan Flow (cfm) 4690

Cooling

Supply Temperature 55 °F
 Control Constant
 Total Capacity (kBtu/h) 110.0
 Sensible Capacity (kBtu/h) 103.0
 Dehumidification none
 Coil Bypass Factor 0.19
 Energy Efficiency Ratio 9.4
 Desuperheater none
 Evaporative Condenser No
 Water Cooled Condensor No

Individual System

Name: Admin
 Type: Packaged Single Zone
 Occupancy: CCC Admin
 Control Zone: Admin Office 1
 Number of Conditioned Zones Served: 3
 Total Conditioned Area Served (ft²): 2857.0
 Average Air Flow per Conditioned Area (cfm/ft²): 1.04

Heating

Supply Temperature 105 °F
 Control Constant
 Capacity (kBtu/hr) 46.8
 Source Electric Heat Pump

Air to Air Heat Pump

Coefficient of Performance 2.7
 Energy Input Ratio 0.38
 Supplemental Heat Electric Resistance
 Supplemental Capacity (kBtu/hr) 0
 Heat On Temperature 45 °F
 HP Shut Off Temperature 45 °F
 Crankcase Heater (kW) 0
 Crankcase On Temperature 0 °F
 Defrost Type Electric Resistance
 Defrost Control Timed
 Defrost Temperature 40 °F
 Compressor Type Single Speed

Supply Fan

(Included in EER/COP)
 Fan Flow (cfm) 2980

Return Fan

Fan Power (bhp/cfm) 0.0003
 Motor Efficiency 0.85
 Delta-T 2 °F

Cooling

Supply Temperature 55 °F
 Control Constant
 Total Capacity (kBtu/h) 76.2
 Sensible Capacity (kBtu/h) 63.7
 Dehumidification none
 Coil Bypass Factor 0.19
 Energy Efficiency Ratio 10.8
 Desuperheater none
 Evaporative Condenser No
 Water Cooled Condensor No

Individual System

Name: Rec
 Type: Packaged Single Zone
 Occupancy: CCC Rec
 Control Zone: Rec Mech
 Number of Conditioned Zones Served: 2
 Total Conditioned Area Served (ft²): 4896.0
 Average Air Flow per Conditioned Area (cfm/ft²): 2.06

Economizer

Type	Temperature
Compressor Lockout	Yes
Drybulb Temperature Limit	72 °F
Lower Temperature Limit	40 °F

Supply Fan

(Included in EER/COP)	
Fan Flow (cfm)	10100

Heating

Supply Temperature	105 °F
Control	Constant
Capacity (kBtu/hr)	332.0
Source	Furnace

Cooling

Supply Temperature	55 °F
Control	Constant
Total Capacity (kBtu/h)	241.6
Sensible Capacity (kBtu/h)	207.1
Dehumidification	none
Coil Bypass Factor	0.19
Energy Efficiency Ratio	11
Desuperheater	none
Evaporative Condenser	No
Water Cooled Condensor	No

Furnace

Thermal Efficiency	0.8
Auxillary Power (kW)	0
Pilot Light (Btu/hr)	0

Individual System

Name: Edu
 Type: Packaged Single Zone
 Occupancy: CCC Edu
 Control Zone: Training
 Number of Conditioned Zones Served: 4
 Total Conditioned Area Served (ft²): 4834.9
 Average Air Flow per Conditioned Area (cfm/ft²): 1.61

Economizer

Type	Temperature
Compressor Lockout	Yes
Drybulb Temperature Limit	72 °F
Lower Temperature Limit	40 °F

Supply Fan

(Included in EER/COP)	
Fan Flow (cfm)	7770

Heating

Supply Temperature	105 °F
Control	Constant
Capacity (kBtu/hr)	295.0
Source	Furnace

Cooling

Supply Temperature	55 °F
Control	Constant
Total Capacity (kBtu/h)	246.0
Sensible Capacity (kBtu/h)	190.4
Dehumidification	none
Coil Bypass Factor	0.19
Energy Efficiency Ratio	11
Desuperheater	none
Evaporative Condenser	No
Water Cooled Condensor	No

Furnace

Thermal Efficiency	0.82
Auxillary Power (kW)	0
Pilot Light (Btu/hr)	0

Individual System

Name: Dining
 Type: Packaged Single Zone
 Occupancy: CCC Dining
 Control Zone: Kitchen
 Number of Conditioned Zones Served: 2
 Total Conditioned Area Served (ft²): 7919.0
 Average Air Flow per Conditioned Area (cfm/ft²): 1.34

Heating

Supply Temperature	105 °F
Control	Constant
Capacity (kBtu/hr)	Autosized
Autosized Ratio	1.2
Autosized Capacity	813.47
Source	Furnace

Furnace

Thermal Efficiency	0.82
Auxillary Power (kW)	0
Pilot Light (Btu/hr)	0

Supply Fan

(Included in EER/COP)
 Fan Flow (cfm) Autosized
 Autosized Flow 10608

Cooling

Supply Temperature	55 °F
Control	Constant
Total Capacity (kBtu/h)	Autosized
Sensible Capacity (kBtu/h)	Autosized
Autosized Ratio	1
Autosized Total Capacity	364.62
Dehumidification	none
Coil Bypass Factor	0.19
Energy Efficiency Ratio	11
Desuperheater	none
Evaporative Condenser	No
Water Cooled Condensor	No

Individual System

Name: Warehouse
 Type: Packaged Single Zone
 Occupancy: CCC Maint
 Control Zone: Crew
 Number of Conditioned Zones Served: 2
 Total Conditioned Area Served (ft²): 1827.7
 Average Air Flow per Conditioned Area (cfm/ft²): 0.82

Economizer

Type	Temperature
Compressor Lockout	Yes
Drybulb Temperature Limit	72 °F
Lower Temperature Limit	32 °F

Supply Fan

(Included in EER/COP)	
Fan Flow (cfm)	1500

Heating

Supply Temperature	105 °F
Control	Constant
Capacity (kBtu/hr)	64.0
Source	Furnace

Cooling

Supply Temperature	55 °F
Control	Constant
Total Capacity (kBtu/h)	37.9
Sensible Capacity (kBtu/h)	30.0
Dehumidification	none
Coil Bypass Factor	0.19
Energy Efficiency Ratio	9
Desuperheater	none
Evaporative Condenser	No
Water Cooled Condensor	No

Furnace

Thermal Efficiency	0.8
Auxillary Power (kW)	0
Pilot Light (Btu/hr)	0

Project Information

Name: Campus
 Address: Address
 Description: Small campus including dormitories, offices and assembly spaces.
 Analysis done by: @ AEC
 Weather File: ABUQUNM2
 Project File: c:\temp\small_campus.gph
 Calculation Engine: DOE-2.1E-119

Electrical Use Summary

Alternative	Lights	Equipment	Heating	Cooling	Fans	Total
Electrical End-use Totals (kWh)						
As Designed	148,393	95,852	173	56,892	91,472	392,782
T24 Base Case [T24 Schedules]	166,822	81,268	2,263	53,618	90,461	394,432
T24 Base Case [Actual Schedules]	146,034	95,852	3,035	66,669	90,461	402,051
Base Case [Actual Schedules]	151,380	95,852	301	60,586	90,461	398,580
ECM-1 Skylights	151,380	95,852	301	63,586	90,461	401,580
ECM-2 Skylights w daylight control	144,600	95,852	301	63,218	90,461	394,432
ECM-3 Efficient Int. Lights + Occ. Sens.	116,148	95,852	316	58,163	90,461	360,940
ECM-4 Ceiling Fans	151,380	95,852	982	51,943	90,461	390,618
ECM-5 Evap Cooling in dining area	151,380	95,852	301	52,970	95,911	396,414
ECM-5 Actual Sch [measures 1-5]	113,505	95,852	1,028	46,037	97,342	353,764
ECM-6 T-24l Sch [measures 1-5]	121,247	81,268	949	47,912	81,455	332,831
Incremental Electrical Savings (kWh) (compared with previous alternative, negative savings represent increases)						
T24 Base Case [T24 Schedules]	-18,429	14,584	-2,090	3,274	1,011	-1,650
T24 Base Case [Actual Schedules]	20,788	-14,584	-772	-13,051	0	-7,619
Base Case [Actual Schedules]	-5,346	0	2,734	6,083	0	3,471
ECM-1 Skylights	0	0	0	-3,000	0	-3,000
ECM-2 Skylights w daylight control	6,780	0	0	368	0	7,148
ECM-3 Efficient Int. Lights + Occ. Sens.	28,452	0	-15	5,055	0	33,492
ECM-4 Ceiling Fans	-35,232	0	-666	6,220	0	-29,678
ECM-5 Evap Cooling in dining area	0	0	681	-1,027	-5,450	-5,796
ECM-5 Actual Sch [measures 1-5]	37,875	0	-727	6,933	-1,431	42,650
ECM-6 T-24l Sch [measures 1-5]	-7,742	14,584	79	-1,875	15,887	20,933

Fuel Use Summary

Alternative	Space Heating	Hot Water Heating	Total
Fuel End-use Totals			
As Designed - Natural Gas (Therm)	4,189	444	4,633
T24 Base Case [T24 Schedules] - Natural Gas (Therm)	2,252	444	2,696
T24 Base Case [Actual Schedules] - Natural Gas (Therm)	2,666	444	3,110
Base Case [Actual Schedules] - Natural Gas (Therm)	2,414	444	2,858
ECM-1 Skylights - Natural Gas (Therm)	2,257	444	2,701
ECM-2 Skylights w daylt control - Natural Gas (Therm)	2,289	444	2,733
ECM-3 Efficient Int. Lights + Occ. Sens. - Natural Gas (Therm)	3,011	444	3,455
ECM-4 Ceiling Fans - Natural Gas (Therm)	2,414	444	2,858
ECM-5 Evap Cooling in dining area - Natural Gas (Therm)	3,000	444	3,444
ECM-5 Actual Sch [measures 1-5] - Natural Gas (Therm)	1,367	444	1,811
ECM-6 T-24l Sch [measures 1-5] - Natural Gas (Therm)	800	444	1,244
Incremental Fuel Savings (compared with previous alternative, negative savings represent increases)			
T24 Base Case [T24 Schedules] - Natural Gas (Therm)	1,937	0	1,937
T24 Base Case [Actual Schedules] - Natural Gas (Therm)	-414	0	-414
Base Case [Actual Schedules] - Natural Gas (Therm)	252	0	252
ECM-1 Skylights - Natural Gas (Therm)	157	0	157
ECM-2 Skylights w daylt control - Natural Gas (Therm)	-32	0	-32
ECM-3 Efficient Int. Lights + Occ. Sens. - Natural Gas (Therm)	-722	0	-722
ECM-4 Ceiling Fans - Natural Gas (Therm)	597	0	597
ECM-5 Evap Cooling in dining area - Natural Gas (Therm)	-586	0	-586
ECM-5 Actual Sch [measures 1-5] - Natural Gas (Therm)	1,633	0	1,633
ECM-6 T-24l Sch [measures 1-5] - Natural Gas (Therm)	567	0	567

Energy Cost Summary (\$/y)

Alternative	Total Electric	Total Fuel	Total Utility	Incremental First Cost	PV Life Cycle Cost*
Total Energy Costs (\$/y)					
As Designed	\$43,206	\$3,067	\$46,273	\$0	\$393,948
T24 Base Case [T24 Schedules]	\$30,227	\$3,630	\$33,857	\$0	\$288,244
T24 Base Case [Actual Schedules]	\$30,305	\$4,131	\$34,436	\$0	\$293,173
Base Case [Actual Schedules]	\$30,138	\$3,814	\$33,952	\$0	\$289,052
ECM-1 Skylights	\$30,430	\$3,616	\$34,046	\$0	\$289,853
ECM-2 Skylights w daylight control	\$29,973	\$3,657	\$33,630	\$0	\$286,311
ECM-3 Efficient Int. Lights + Occ. Sens.	\$27,336	\$4,559	\$31,895	\$0	\$271,540
ECM-4 Ceiling Fans	\$29,645	\$3,814	\$33,459	\$0	\$284,855
ECM-5 Evap Cooling in dining area	\$29,116	\$4,563	\$33,679	\$0	\$286,728
ECM-5 Actual Sch [measures 1-5]	\$26,694	\$2,492	\$29,186	\$0	\$248,477
ECM-6 T-24I Sch [measures 1-5]	\$26,016	\$1,742	\$27,758	\$0	\$236,320
Incremental Energy Savings (\$/y) (compared with previous alternative, negative savings represent increases)					
T24 Base Case [T24 Schedules]	\$12,979	\$-563	\$12,416	\$0	\$105,704
T24 Base Case [Actual Schedules]	\$-78	\$-501	\$-579	\$0	\$-4,929
Base Case [Actual Schedules]	\$167	\$317	\$484	\$0	\$4,121
ECM-1 Skylights	\$-292	\$198	\$-94	\$0	\$-800
ECM-2 Skylights w daylight control	\$457	\$-41	\$416	\$0	\$3,542
ECM-3 Efficient Int. Lights + Occ. Sens.	\$2,637	\$-902	\$1,735	\$0	\$14,771
ECM-4 Ceiling Fans	\$-2,309	\$745	\$-1,564	\$0	\$-13,315
ECM-5 Evap Cooling in dining area	\$529	\$-749	\$-220	\$0	\$-1,873
ECM-5 Actual Sch [measures 1-5]	\$2,422	\$2,071	\$4,493	\$0	\$38,251
ECM-6 T-24I Sch [measures 1-5]	\$678	\$750	\$1,428	\$0	\$12,157

* 20 year life cycle w/ 10% discount rate.

Monthly Electrical Usage (kWh)

Alternative	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
As Designed	31,558	28,847	32,139	31,050	32,960	33,576	35,335	36,385	34,467	34,044	31,281	31,140
T24 Base Case [T24 Schedules]	30,899	28,530	32,343	31,172	33,389	34,621	35,618	37,375	35,031	33,986	30,728	30,741
T24 Base Case [Actual Schedules]	31,560	28,852	32,256	31,568	33,850	34,987	37,007	38,389	36,005	34,778	31,360	31,438
Base Case [Actual Schedules]	31,533	28,842	32,187	31,170	33,294	34,453	36,512	37,956	35,651	34,558	31,287	31,134
ECM-1 Skylights	31,545	28,864	32,222	31,318	33,646	34,962	37,127	38,531	36,104	34,777	31,335	31,145
ECM-2 Skylights w daylight control	31,416	28,712	31,857	30,800	32,769	33,871	35,918	37,366	35,255	34,287	31,136	31,041
ECM-3 Efficient Int. Lights + Occ. Sens.	28,524	26,106	29,038	28,216	30,071	31,151	33,213	34,381	32,393	31,326	28,338	28,182
ECM-4 Ceiling Fans	30,960	28,250	31,522	30,446	32,550	33,756	35,783	37,263	34,957	33,846	30,665	30,619
ECM-5 Evap Cooling in dining area	30,851	28,593	32,088	31,524	33,982	34,414	36,027	37,151	35,182	34,887	31,284	30,429
ECM-5 Actual Sch [measures 1-5]	26,609	24,762	27,818	27,561	30,208	31,424	33,320	34,448	32,689	31,376	27,213	26,336
ECM-6 T-24l Sch [measures 1-5]	26,163	23,984	26,861	25,921	27,760	29,095	30,241	31,909	29,835	28,936	26,112	26,021

Monthly Electrical Power (kW)

Alternative	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
As Designed	97	97	97	115	107	124	129	128	129	113	104	97
T24 Base Case [T24 Schedules]	94	96	98	120	122	138	141	135	146	135	109	97
T24 Base Case [Actual Schedules]	94	95	95	119	120	133	136	137	142	126	108	95
Base Case [Actual Schedules]	96	96	96	119	114	134	138	136	142	121	107	96
ECM-1 Skylights	96	96	96	121	117	138	141	136	143	125	108	97
ECM-2 Skylights w daylight control	96	96	96	120	114	135	136	136	142	125	107	96
ECM-3 Efficient Int. Lights + Occ. Sens.	86	86	85	107	102	122	126	121	130	108	95	86
ECM-4 Ceiling Fans	94	95	94	117	113	132	136	134	141	120	106	95
ECM-5 Evap Cooling in dining area	100	92	100	113	107	118	121	123	123	111	105	101
ECM-5 Actual Sch [measures 1-5]	91	92	91	105	100	114	115	117	121	106	97	92
ECM-6 T-24l Sch [measures 1-5]	85	85	86	109	95	119	121	120	126	119	107	86

Monthly Fuel Usage

Alternative	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
As Designed - Natural Gas (Therm)	673	535	584	447	345	215	152	115	141	268	444	713
T24 Base Case [T24 Schedules] - Natural Gas (Therm)	408	312	341	247	194	120	88	77	92	150	254	413
T24 Base Case [Actual Schedules] - Natural Gas (Therm)	515	390	424	290	197	101	65	55	60	141	308	562
Base Case [Actual Schedules] - Natural Gas (Therm)	506	354	379	256	160	86	60	51	53	117	274	560
ECM-1 Skylights - Natural Gas (Therm)	482	334	347	234	144	79	55	49	51	114	266	545
ECM-2 Skylights w daylight control - Natural Gas (Therm)	486	338	353	239	148	81	56	49	52	115	268	548
ECM-3 Efficient Int. Lights + Occ. Sens. - Natural Gas (Therm)	602	432	466	320	203	102	68	58	63	149	336	657
ECM-4 Ceiling Fans - Natural Gas (Therm)	506	354	379	256	160	86	60	51	53	117	274	560
ECM-5 Evap Cooling in dining area - Natural Gas (Therm)	305	294	354	359	367	265	222	185	208	281	277	326
ECM-5 Actual Sch [measures 1-5] - Natural Gas (Therm)	174	163	209	192	198	146	108	76	94	134	130	186
ECM-6 T-24l Sch [measures 1-5] - Natural Gas (Therm)	187	140	151	114	87	59	49	42	43	68	112	191