TM-1436
Appendix V

FERMILAB CENTRAL COMPUTING FACILITY

SUBCONSTRUCTION 2/4
SYSTEMS ANALYSIS

12 NOVEMBER, 1986

ANALYST: S.F.KRSTULOVICH

FERMILAB CONSTRUCTION ENGINEERING SERVICES

FERMILAB CENTRAL COMPUTING FACILITY

SUBCONSTRUCTION 2/4
BUILDING SECTOR PHYSICAL PARAMETERS AND DESCRIPTION

12 NOVEMBER, 1986

ANALYST: S.F.KRSTULOVICH

FERMILAB CONSTRUCTION ENGINEERING SERVICES

COMPLEX BUILDING INPUT SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site : AURORA,IL FERMI, User Defined 60117862.0

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1. ROOM CONDITIONS AND FLOOR AREAS
   Thermostat settings : Cooling = 68 F; Heating = 68 F; Setback = 0 F
   Warm-up factor = 0 %; Room design relative humidity = 45 %
   Floor Areas: Perimeter = 29,760 Sqft; Interior = 0 Sqft
   Cooling provided during unoccupied period.

2. WALLS, ROOF, GLASS, SKYLIGHTS:

Exposure	Area (Sqft)	U-Factor BTU/(hr-sqft-F)	Glass Area (Sqft)	Glass U-Factor BTU/(hr-sqft-F)
North Wall	0	0.060	2,060	0.550
Northeast Wall	0	0.060	0	0.550
East Wall	1,630	0.060	690	0.550
Southeast Wall	3,260	0.060	1,380	0.550
South Wall	3,260	0.060	1,380	0.550
Southwest Wall	980	0.060	420	0.550
West Wall	0	0.060	760	0.550
Northwest Wall	0	0.060	1,520	0.550
Perimeter Roof	0	0.050	0	0.001
Interior Roof	0	0.050	0	0.001

WALLS: Color = Light; Wt. = Medium; ROOF: Color = Medium; Wt. = Medium
BUILDING WT. = Medium; VERTICAL GLASS : Double Glazed
Shade Factors : Glass = 0.650 ; Skylights = 0.000
Internal shades are used. ; A ceiling plenum is used.

3. LIGHTS:
   Perimeter : 1.000 Watts/Sqft = 29,760 Watts Total
   Interior : 0.000 Watts/Sqft = 0 Watts Total
   Diversity Factors : Occupied = 100 %; Unoccupied = 90 %
   Perimeter Lights : Ballast , recessed
   Interior Lights : Ballast , recessed

4. MISCELLANEOUS ELECTRICAL LOADS:
   Perimeter : Occupied = 6.720 Watts/Sqft = 200,000 Watts Total
   Unoccupied = 6.720 Watts/Sqft = 200,000 Watts Total
   Interior : Occupied = 0.000 Watts/Sqft = 0 Watts Total
   Unoccupied = 0.000 Watts/Sqft = 0 Watts Total

5. PEOPLE LOADS
   Total Occupancy = 1,488 sqft/person = 20 people total
   Activity Level: 2. Office or retail
   Sensible = 245.0 BTU/hr/person; Latent = 205.0 BTU/hr/person
   Diversity Factors : Occupied = 80 %; Unoccupied = 50 %

6. MISCELLANEOUS INTERNAL LOADS:
   Sensible : Occupied = 0 BTU/hr; Unoccupied = 0 BTU/hr
   Latent : Occupied = 0 BTU/hr; Unoccupied = 0 BTU/hr

7. WALLS ADJACENT TO NON-CONDITIONED REGIONS:
   Wall Areas : Perimeter = 8,340 Sqft; Interior = 0 Sqft
   Wall U-Factor = 0.380 BTU/(hr-sqft-F)
   Adjacent region heating temperature = 65 F
   Adjacent region is not cooled

8. INFILTRATION DATA:
   Air Flow Rates: Occupied = 149 cfm; Unoccupied = 89 cfm

FERMILAB CENTRAL COMPUTING FACILITY

SUBCONSTRUCTION 2/4
BUILDING LOAD CALCULATIONS

12 NOVEMBER, 1986
ANALYST: S.F.KRSTULOVICH

FERMILAB CONSTRUCTION ENGINEERING SERVICES

LOAD PROFILE SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 (Complex) Date : 11-25-86

Site Name : AURORA,IL FERMI, User Defined 60117862.0

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TABLE 1. OCCUPIED PERIOD (Load does not include vent. load, fan heat)

Bin Temp (F)	Bin Hours (hr/yr)	<--------Perimeter Zone-------> Sensible (tons)	Latent (tons)	Plenum (tons)	Zone (F)	<---------Interior Zone-----> Sensible (tons)	Latent (tons)	Plenum (tons)	Zone (F)
93	0.0	102.42	0.86	3.17	68	0.00	0.00	0.00	--
90	25.8	94.28	0.62	3.17	68	0.00	0.00	0.00	--
85	59.4	90.09	0.57	3.17	68	0.00	0.00	0.00	--
80	145.3	85.90	0.52	3.17	68	0.00	0.00	0.00	--
75	237.7	81.71	0.47	3.17	68	0.00	0.00	0.00	--
70	270.6	77.53	0.43	3.17	68	0.00	0.00	0.00	--
65	264.5	73.34	0.40	3.17	68	0.00	0.00	0.00	--
60	255.0	70.47	0.38	3.17	68	0.00	0.00	0.00	--
55	244.7	67.60	0.35	3.17	68	0.00	0.00	0.00	--
50	232.1	64.73	0.34	3.17	68	0.00	0.00	0.00	--
45	229.5	61.87	0.26	3.17	68	0.00	0.00	0.00	--
40	237.6	59.00	0.19	3.17	68	0.00	0.00	0.00	--
35	238.5	56.13	0.14	3.17	68	0.00	0.00	0.00	--
30	218.2	53.26	0.09	3.17	68	0.00	0.00	0.00	--
25	174.5	50.40	0.04	3.17	68	0.00	0.00	0.00	--
20	122.4	47.53	0.01	3.17	68	0.00	0.00	0.00	--
15	78.1	44.66	-0.02	3.17	68	0.00	0.00	0.00	--
10	46.1	41.79	-0.04	3.17	68	0.00	0.00	0.00	--
5	25.1	38.93	-0.06	3.17	68	0.00	0.00	0.00	--
0	12.7	36.06	-0.07	3.17	68	0.00	0.00	0.00	--
-5	6.2	33.19	-0.08	3.17	68	0.00	0.00	0.00	--
-6	4.6	32.62	-0.09	3.17	68	0.00	0.00	0.00	--

TABLE 2. UNOCCUPIED PERIOD (Load does not include vent. load, fan heat)

90	14.6	93.30	0.38	2.86	68	0.00	0.00	0.00	--
85	36.3	89.13	0.35	2.86	68	0.00	0.00	0.00	--
80	99.3	84.97	0.32	2.86	68	0.00	0.00	0.00	--
75	215.3	80.81	0.29	2.86	68	0.00	0.00	0.00	--
70	357.6	76.65	0.27	2.86	68	0.00	0.00	0.00	--
65	463.3	72.49	0.25	2.86	68	0.00	0.00	0.00	--
60	500.4	69.65	0.23	2.86	68	0.00	0.00	0.00	--
55	482.0	66.81	0.22	2.86	68	0.00	0.00	0.00	--
50	447.6	63.97	0.21	2.86	68	0.00	0.00	0.00	--
45	422.7	61.13	0.16	2.86	68	0.00	0.00	0.00	--
40	413.7	58.29	0.12	2.86	68	0.00	0.00	0.00	--
35	417.0	55.45	0.09	2.86	68	0.00	0.00	0.00	--
30	417.4	52.61	0.06	2.86	68	0.00	0.00	0.00	--
25	395.2	49.77	0.03	2.86	68	0.00	0.00	0.00	--
20	336.9	46.93	0.01	2.86	68	0.00	0.00	0.00	--
15	252.8	44.09	-0.00	2.86	68	0.00	0.00	0.00	--
10	165.7	41.25	-0.02	2.86	68	0.00	0.00	0.00	--
5	96.3	38.41	-0.03	2.86	68	0.00	0.00	0.00	--
0	50.9	35.57	-0.04	2.86	68	0.00	0.00	0.00	--
-5	25.3	32.73	-0.04	2.86	68	0.00	0.00	0.00	--
-6	21.1	32.16	-0.05	2.86	68	0.00	0.00	0.00	--
-6	0.0	-32.62	-0.22	0.00	68	0.00	0.00	0.00	--

SOLAR GAIN SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 (Complex) Date : 11-25-86

Site Name : AURORA,IL FERMI, User Defined 60117862.0

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TABLE 1. SOLAR GAINS BY EXPOSURE

Bin Temp (F)	North	NE	East	SE	South	SW	West	NW	Perim Horiz	Inter Horiz
	Solar Gains by Exposure (BTU/(hr-sqft))									
93	9.7	15.0	22.2	23.2	33.9	67.7	66.5	32.0	0.0	0.0
90	6.9	10.7	15.7	16.5	24.1	48.0	47.1	22.6	0.0	0.0
85	6.5	10.1	14.9	15.7	23.0	45.7	44.8	21.5	0.0	0.0
80	6.2	9.6	14.2	14.9	21.8	43.3	42.4	20.3	0.0	0.0
75	5.8	9.0	13.4	14.2	20.7	40.9	40.0	19.1	0.0	0.0
70	5.5	8.5	12.6	13.4	19.6	38.6	37.7	18.0	0.0	0.0
65	5.1	7.9	11.8	12.6	18.5	36.2	35.3	16.8	0.0	0.0
60	4.8	7.4	11.0	11.8	17.4	33.9	32.9	15.6	0.0	0.0
55	4.4	6.8	10.3	11.0	16.2	31.5	30.6	14.4	0.0	0.0
50	4.1	6.3	9.5	10.3	15.1	29.2	28.2	13.3	0.0	0.0
45	3.7	5.7	8.7	9.5	14.0	26.8	25.8	12.1	0.0	0.0
40	3.4	5.2	7.9	8.7	12.9	24.4	23.5	10.9	0.0	0.0
35	3.0	4.6	7.1	7.9	11.8	22.1	21.1	9.8	0.0	0.0
30	2.7	4.1	6.4	7.2	10.6	19.7	18.8	8.6	0.0	0.0
25	2.3	3.5	5.6	6.4	9.5	17.4	16.4	7.4	0.0	0.0
20	2.0	3.0	4.8	5.6	8.4	15.0	14.0	6.3	0.0	0.0
15	1.6	2.4	4.0	4.8	7.3	12.7	11.7	5.1	0.0	0.0
10	1.2	1.9	3.2	4.1	6.2	10.3	9.3	3.9	0.0	0.0
5	0.9	1.3	2.5	3.3	5.0	8.0	6.9	2.8	0.0	0.0
0	0.5	0.8	1.7	2.5	3.9	5.6	4.6	1.6	0.0	0.0
-5	0.2	0.2	0.9	1.7	2.8	3.2	2.2	0.4	0.0	0.0
-6	0.1	0.1	0.7	1.6	2.6	2.8	1.7	0.2	0.0	0.0
-6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ETD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 (Complex) Date : 11-25-86

Site Name : AURORA,IL FERMI, User Defined 60117862.0

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TABLE 1. OCCUPIED PERIOD

Bin Temp (F)	Equivalent Temperature Differences (F) By Exposure North	NE	East	SE	South	SW	West	NW	Perim Roof	Inter Roof
93	18.0	19.9	21.2	26.5	30.0	28.5	25.0	19.3	40.4	-----
90	15.4	16.7	17.6	21.4	23.9	22.8	20.3	16.3	31.7	-----
85	11.0	12.2	13.1	16.7	19.1	18.1	15.7	11.8	26.4	-----
80	6.6	7.8	8.6	12.1	14.2	13.4	11.1	7.4	21.1	-----
75	2.2	3.3	4.1	7.4	9.4	8.6	6.4	2.9	15.8	-----
70	-2.2	-1.2	-0.4	2.7	4.6	3.9	1.8	-1.5	10.5	-----
65	-6.6	-5.6	-4.9	-1.9	-0.2	-0.8	-2.8	-5.9	5.1	-----
60	-11.0	-10.1	-9.4	-6.6	-5.0	-5.5	-7.5	-10.4	-0.2	-----
55	-15.4	-14.5	-13.9	-11.3	-9.8	-10.3	-12.1	-14.8	-5.5	-----
50	-19.8	-19.0	-18.4	-15.9	-14.6	-15.0	-16.7	-19.3	-10.8	-----
45	-24.2	-23.5	-22.9	-20.6	-19.4	-19.7	-21.4	-23.7	-16.1	-----
40	-28.6	-27.9	-27.4	-25.3	-24.2	-24.4	-26.0	-28.1	-21.4	-----
35	-33.0	-32.4	-31.9	-29.9	-29.0	-29.2	-30.6	-32.6	-26.7	-----
30	-37.4	-36.9	-36.4	-34.6	-33.8	-33.9	-35.3	-37.0	-32.0	-----
25	-41.8	-41.3	-40.9	-39.3	-38.7	-38.6	-39.9	-41.5	-37.3	-----
20	-46.2	-45.8	-45.4	-43.9	-43.5	-43.4	-44.5	-45.9	-42.6	-----
15	-50.5	-50.2	-50.0	-48.6	-48.3	-48.1	-49.2	-50.3	-47.9	-----
10	-54.9	-54.7	-54.5	-53.3	-53.1	-52.8	-53.8	-54.8	-53.2	-----
5	-59.3	-59.2	-59.0	-57.9	-57.9	-57.5	-58.4	-59.2	-58.6	-----
0	-63.7	-63.6	-63.5	-62.6	-62.7	-62.3	-63.1	-63.7	-63.9	-----
-5	-68.1	-68.1	-68.0	-67.3	-67.5	-67.0	-67.7	-68.1	-69.2	-----
-6	-69.0	-69.0	-68.9	-68.2	-68.5	-67.9	-68.6	-69.0	-70.2	-----

TABLE 2. UNOCCUPIED PERIOD

90	15.4	16.7	17.6	21.4	23.9	22.8	20.3	16.3	31.7	-----
85	11.0	12.2	13.1	16.7	19.1	18.1	15.7	11.8	26.4	-----
80	6.6	7.8	8.6	12.1	14.2	13.4	11.1	7.4	21.1	-----
75	2.2	3.3	4.1	7.4	9.4	8.6	6.4	2.9	15.8	-----
70	-2.2	-1.2	-0.4	2.7	4.6	3.9	1.8	-1.5	10.5	-----
65	-6.6	-5.6	-4.9	-1.9	-0.2	-0.8	-2.8	-5.9	5.1	-----
60	-11.0	-10.1	-9.4	-6.6	-5.0	-5.5	-7.5	-10.4	-0.2	-----
55	-15.4	-14.5	-13.9	-11.3	-9.8	-10.3	-12.1	-14.8	-5.5	-----
50	-19.8	-19.0	-18.4	-15.9	-14.6	-15.0	-16.7	-19.3	-10.8	-----
45	-24.2	-23.5	-22.9	-20.6	-19.4	-19.7	-21.4	-23.7	-16.1	-----
40	-28.6	-27.9	-27.4	-25.3	-24.2	-24.4	-26.0	-28.1	-21.4	-----
35	-33.0	-32.4	-31.9	-29.9	-29.0	-29.2	-30.6	-32.6	-26.7	-----
30	-37.4	-36.9	-36.4	-34.6	-33.8	-33.9	-35.3	-37.0	-32.0	-----
25	-41.8	-41.3	-40.9	-39.3	-38.7	-38.6	-39.9	-41.5	-37.3	-----
20	-46.2	-45.8	-45.4	-43.9	-43.5	-43.4	-44.5	-45.9	-42.6	-----
15	-50.5	-50.2	-50.0	-48.6	-48.3	-48.1	-49.2	-50.3	-47.9	-----
10	-54.9	-54.7	-54.5	-53.3	-53.1	-52.8	-53.8	-54.8	-53.2	-----
5	-59.3	-59.2	-59.0	-57.9	-57.9	-57.5	-58.4	-59.2	-58.6	-----
0	-63.7	-63.6	-63.5	-62.6	-62.7	-62.3	-63.1	-63.7	-63.9	-----
-5	-68.1	-68.1	-68.0	-67.3	-67.5	-67.0	-67.7	-68.1	-69.2	-----
-6	-69.0	-69.0	-68.9	-68.2	-68.5	-67.9	-68.6	-69.0	-70.2	-----
-6	-74.0	-74.0	-74.0	-74.0	-74.0	-74.0	-74.0	-74.0	-74.0	-----

SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

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BIN DATA

Period : Occupied O.A. Humidity Ratio = 0.0153
Bin Number : 0 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = 93 F Interior Zone Indoor DB = n/a

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BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	241,681	0
Glass Transmission	112,888	0
Wall Transmission	14,796	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	79,230	0
Lighting (29,760 W Total)	88,875	0
Misc. Elec. (200,000 W Total)	682,600	0
People (20 People Total)	4,900	4,100
Miscellaneous Internal Loads	0	0
Infiltration	4,092	6,274
Total Room Loads	1,229,061	10,374
Total Room Tons	102.42	0.86
Total Room sqft/ton	290.56	34,424.13
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	38,089 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

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TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	28,325	19,952
Northeast Glass	0	0	0
East Glass	690	9,488	15,303
Southeast Glass	1,380	18,975	32,038
South Glass	1,380	18,975	46,791
Southwest Glass	420	5,775	28,440
West Glass	760	10,450	50,566
Northwest Glass	1,520	20,900	48,592
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	2,071	-
Southeast Wall	3,260	5,186	-
South Wall	3,260	5,864	-
Southwest Wall	980	1,674	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

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SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

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BIN DATA

Period : Occupied O.A. Humidity Ratio = 0.0124
Bin Number : 1 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = 90 F Interior Zone Indoor DB = n/a

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BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	171,361	0
Glass Transmission	99,341	0
Wall Transmission	11,920	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	69,722	0
Lighting (29,760 W Total)	88,875	0
Misc. Elec. (200,000 W Total)	682,600	0
People (16 People Total)	3,920	3,280
Miscellaneous Internal Loads	0	0
Infiltration	3,601	4,204
Total Room Loads	1,131,340	7,484
Total Room Tons	94.28	0.62
Total Room sqft/ton	315.66	47,719.48
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	38,089 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

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TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	24,926	14,131
Northeast Glass	0	0	0
East Glass	690	8,349	10,848
Southeast Glass	1,380	16,698	22,745
South Glass	1,380	16,698	33,230
Southwest Glass	420	5,082	20,167
West Glass	760	9,196	35,834
Northwest Glass	1,520	18,392	34,406
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	1,723	-
Southeast Wall	3,260	4,189	-
South Wall	3,260	4,667	-
Southwest Wall	980	1,341	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

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SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

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BIN DATA

Period : Occupied O.A. Humidity Ratio = 0.0114
Bin Number : 2 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = 85 F Interior Zone Indoor DB = n/a

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BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	162,918	0
Glass Transmission	76,764	0
Wall Transmission	9,348	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	53,876	0
Lighting (29,760 W Total)	88,875	0
Misc. Elec. (200,000 W Total)	682,600	0
People (16 People Total)	3,920	3,280
Miscellaneous Internal Loads	0	0
Infiltration	2,783	3,511
Total Room Loads	1,081,083	6,791
Total Room Tons	90.09	0.57
Total Room sqft/ton	330.34	52,591.08
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	38,089 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

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TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	19,261	13,409
Northeast Glass	0	0	0
East Glass	690	6,452	10,309
Southeast Glass	1,380	12,903	21,674
South Glass	1,380	12,903	31,685
Southwest Glass	420	3,927	19,177
West Glass	760	7,106	34,035
Northwest Glass	1,520	14,212	32,628
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	1,282	-
Southeast Wall	3,260	3,276	-
South Wall	3,260	3,726	-
Southwest Wall	980	1,063	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

****

SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86

Site: AURORA,IL FERMI, User Defined 60117862.0

****

BIN DATA

Period : Occupied O.A. Humidity Ratio = 0.0106

Bin Number : 3 Perimeter Zone Indoor DB = 68 F

Outdoor Dry Bulb = 80 F Interior Zone Indoor DB = n/a

****

BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	154,474	0
Glass Transmission	54,186	0
Wall Transmission	6,776	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	38,030	0
Lighting (29,760 W Total)	88,875	0
Misc. Elec. (200,000 W Total)	682,600	0
People (16 People Total)	3,920	3,280
Miscellaneous Internal Loads	0	0
Infiltration	1,964	2,905
Total Room Loads	1,030,825	6,185
Total Room Tons	85.90	0.52
Total Room sqft/ton	346.44	57,742.04
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	38,089 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

****

TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	13,596	12,686
Northeast Glass	0	0	0
East Glass	690	4,554	9,771
Southeast Glass	1,380	9,108	20,603
South Glass	1,380	9,108	30,140
Southwest Glass	420	2,772	18,187
West Glass	760	5,016	32,236
Northwest Glass	1,520	10,032	30,850
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	842	-
Southeast Wall	3,260	2,363	-
South Wall	3,260	2,786	-
Southwest Wall	980	786	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

****

SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

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BIN DATA

Period : Occupied O.A. Humidity Ratio = 0.0099
Bin Number : 4 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = 75 F Interior Zone Indoor DB = n/a

****

BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	146,031	0
Glass Transmission	31,609	0
Wall Transmission	4,204	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	22,184	0
Lighting (29,760 W Total)	88,875	0
Misc. Elec. (200,000 W Total)	682,600	0
People (16 People Total)	3,920	3,280
Miscellaneous Internal Loads	0	0
Infiltration	1,146	2,380
Total Room Loads	980,568	5,660
Total Room Tons	81.71	0.47
Total Room sqft/ton	364.20	63,098.52
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	38,089 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

****

TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	7,931	11,964
Northeast Glass	0	0	0
East Glass	690	2,657	9,232
Southeast Glass	1,380	5,313	19,532
South Glass	1,380	5,313	28,594
Southwest Glass	420	1,617	17,198
West Glass	760	2,926	30,438
Northwest Glass	1,520	5,852	29,073
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	401	-
Southeast Wall	3,260	1,450	-
South Wall	3,260	1,845	-
Southwest Wall	980	508	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

****

SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

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BIN DATA

Period : Occupied O.A. Humidity Ratio = 0.0093
Bin Number : 5 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = 70 F Interior Zone Indoor DB = n/a

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BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	137,587	0
Glass Transmission	9,031	0
Wall Transmission	1,632	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	6,338	0
Lighting (29,760 W Total)	88,875	0
Misc. Elec. (200,000 W Total)	682,600	0
People (16 People Total)	3,920	3,280
Miscellaneous Internal Loads	0	0
Infiltration	327	1,929
Total Room Loads	930,311	5,209
Total Room Tons	77.53	0.43
Total Room sqft/ton	383.87	68,556.54
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	38,089 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

****

TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	2,266	11,242
Northeast Glass	0	0	0
East Glass	690	759	8,693
Southeast Glass	1,380	1,518	18,461
South Glass	1,380	1,518	27,049
Southwest Glass	420	462	16,208
West Glass	760	836	28,639
Northwest Glass	1,520	1,672	27,295
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	-39	-
Southeast Wall	3,260	537	-
South Wall	3,260	905	-
Southwest Wall	980	230	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

****

SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

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BIN DATA

Period : Occupied O.A. Humidity Ratio = 0.0087
Bin Number : 6 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = 65 F Interior Zone Indoor DB = n/a

****

BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	129,144	0
Glass Transmission	-13,547	0
Wall Transmission	-940	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	-9,508	0
Lighting (29,760 W Total)	88,875	0
Misc. Elec. (200,000 W Total)	682,600	0
People (16 People Total)	3,920	3,280
Miscellaneous Internal Loads	0	0
Infiltration	-491	1,547
Total Room Loads	880,053	4,827
Total Room Tons	73.34	0.40
Total Room sqft/ton	405.79	73,980.08
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	38,089 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

****

TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	-3,399	10,519
Northeast Glass	0	0	0
East Glass	690	-1,139	8,155
Southeast Glass	1,380	-2,277	17,390
South Glass	1,380	-2,277	25,504
Southwest Glass	420	-693	15,218
West Glass	760	-1,254	26,841
Northwest Glass	1,520	-2,508	25,517
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	-480	-
Southeast Wall	3,260	-376	-
South Wall	3,260	-36	-
Southwest Wall	980	-48	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

****

SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86

Site: AURORA,IL FERMI, User Defined 60117862.0

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BIN DATA

Period : Occupied O.A. Humidity Ratio = 0.0083

Bin Number : 7 Perimeter Zone Indoor DB = 68 F

Outdoor Dry Bulb = 60 F Interior Zone Indoor DB = n/a

****

BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	120,700	0
Glass Transmission	-36,124	0
Wall Transmission	-3,512	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	-9,508	0
Lighting (29,760 W Total)	88,875	0
Misc. Elec. (200,000 W Total)	682,600	0
People (16 People Total)	3,920	3,280
Miscellaneous Internal Loads	0	0
Infiltration	-1,309	1,229
Total Room Loads	845,642	4,509
Total Room Tons	70.47	0.38
Total Room sqft/ton	422.31	79,206.89
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	38,089 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

****

TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	-9,064	9,797
Northeast Glass	0	0	0
East Glass	690	-3,036	7,616
Southeast Glass	1,380	-6,072	16,319
South Glass	1,380	-6,072	23,959
Southwest Glass	420	-1,848	14,228
West Glass	760	-3,344	25,042
Northwest Glass	1,520	-6,688	23,739
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	-920	-
Southeast Wall	3,260	-1,289	-
South Wall	3,260	-977	-
Southwest Wall	980	-326	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

****

SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

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BIN DATA

Period : Occupied O.A. Humidity Ratio = 0.0079
Bin Number : 8 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = 55 F Interior Zone Indoor DB = n/a

****

BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	112,257	0
Glass Transmission	-58,702	0
Wall Transmission	-6,084	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	-9,508	0
Lighting (29,760 W Total)	88,875	0
Misc. Elec. (200,000 W Total)	682,600	0
People (16 People Total)	3,920	3,280
Miscellaneous Internal Loads	0	0
Infiltration	-2,128	969
Total Room Loads	811,230	4,249
Total Room Tons	67.60	0.35
Total Room sqft/ton	440.22	84,056.15
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	38,089 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

****

TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	-14,729	9,074
Northeast Glass	0	0	0
East Glass	690	-4,934	7,077
Southeast Glass	1,380	-9,867	15,248
South Glass	1,380	-9,867	22,414
Southwest Glass	420	-3,003	13,238
West Glass	760	-5,434	23,243
Northwest Glass	1,520	-10,868	21,962
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	-1,361	-
Southeast Wall	3,260	-2,202	-
South Wall	3,260	-1,917	-
Southwest Wall	980	-604	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

****

SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

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BIN DATA

Period : Occupied O.A. Humidity Ratio = 0.0076
Bin Number : 9 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = 50 F Interior Zone Indoor DB = n/a

****

BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	103,813	0
Glass Transmission	-81,279	0
Wall Transmission	-8,656	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	-9,508	0
Lighting (29,760 W Total)	88,875	0
Misc. Elec. (200,000 W Total)	682,600	0
People (16 People Total)	3,920	3,280
Miscellaneous Internal Loads	0	0
Infiltration	-2,946	762
Total Room Loads	776,819	4,042
Total Room Tons	64.73	0.34
Total Room sqft/ton	459.72	88,346.48
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	38,089 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

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TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	-20,394	8,352
Northeast Glass	0	0	0
East Glass	690	-6,831	6,539
Southeast Glass	1,380	-13,662	14,178
South Glass	1,380	-13,662	20,868
Southwest Glass	420	-4,158	12,248
West Glass	760	-7,524	21,445
Northwest Glass	1,520	-15,048	20,184
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	-1,802	-
Southeast Wall	3,260	-3,115	-
South Wall	3,260	-2,858	-
Southwest Wall	980	-882	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

****

SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

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BIN DATA

Period : Occupied O.A. Humidity Ratio = 0.0063
Bin Number : 10 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = 45 F Interior Zone Indoor DB = n/a

****

BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	95,370	0
Glass Transmission	-103,857	0
Wall Transmission	-11,228	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	-9,508	0
Lighting (29,760 W Total)	88,875	0
Misc. Elec. (200,000 W Total)	682,600	0
People (16 People Total)	3,920	3,280
Miscellaneous Internal Loads	0	0
Infiltration	-3,765	-177
Total Room Loads	742,408	3,103
Total Room Tons	61.87	0.26
Total Room sqft/ton	481.03	115,104.57
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	38,089 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

****

TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	-26,059	7,629
Northeast Glass	0	0	0
East Glass	690	-8,729	6,000
Southeast Glass	1,380	-17,457	13,107
South Glass	1,380	-17,457	19,323
Southwest Glass	420	-5,313	11,259
West Glass	760	-9,614	19,646
Northwest Glass	1,520	-19,228	18,406
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	-2,242	-
Southeast Wall	3,260	-4,028	-
South Wall	3,260	-3,799	-
Southwest Wall	980	-1,160	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

****

SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

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BIN DATA

Period : Occupied O.A. Humidity Ratio = 0.0052
Bin Number : 11 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = 40 F Interior Zone Indoor DB = n/a

****

BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	86,927	0
Glass Transmission	-126,434	0
Wall Transmission	-13,800	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	-9,508	0
Lighting (29,760 W Total)	88,875	0
Misc. Elec. (200,000 W Total)	682,600	0
People (16 People Total)	3,920	3,280
Miscellaneous Internal Loads	0	0
Infiltration	-4,583	-969
Total Room Loads	707,996	2,311
Total Room Tons	59.00	0.19
Total Room sqft/ton	504.41	154,549.36
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	38,089 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

****

TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	-31,724	6,907
Northeast Glass	0	0	0
East Glass	690	-10,626	5,461
Southeast Glass	1,380	-21,252	12,036
South Glass	1,380	-21,252	17,778
Southwest Glass	420	-6,468	10,269
West Glass	760	-11,704	17,847
Northwest Glass	1,520	-23,408	16,629
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	-2,683	-
Southeast Wall	3,260	-4,941	-
South Wall	3,260	-4,739	-
Southwest Wall	980	-1,438	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

****

SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

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BIN DATA

Period : Occupied O.A. Humidity Ratio = 0.0043
Bin Number : 12 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = 35 F Interior Zone Indoor DB = n/a

****

BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	78,483	0
Glass Transmission	-149,012	0
Wall Transmission	-16,372	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	-9,508	0
Lighting (29,760 W Total)	88,875	0
Misc. Elec. (200,000 W Total)	682,600	0
People (16 People Total)	3,920	3,280
Miscellaneous Internal Loads	0	0
Infiltration	-5,401	-1,635
Total Room Loads	673,585	1,645
Total Room Tons	56.13	0.14
Total Room sqft/ton	530.18	217,037.84
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	38,089 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

****

TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	-37,389	6,184
Northeast Glass	0	0	0
East Glass	690	-12,524	4,923
Southeast Glass	1,380	-25,047	10,965
South Glass	1,380	-25,047	16,233
Southwest Glass	420	-7,623	9,279
West Glass	760	-13,794	16,049
Northwest Glass	1,520	-27,588	14,851
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	-3,123	-
Southeast Wall	3,260	-5,853	-
South Wall	3,260	-5,680	-
Southwest Wall	980	-1,715	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

****

SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

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BIN DATA

Period : Occupied O.A. Humidity Ratio = 0.0035
Bin Number : 13 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = 30 F Interior Zone Indoor DB = n/a

****

BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	70,040	0
Glass Transmission	-171,589	0
Wall Transmission	-18,944	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	-9,508	0
Lighting (29,760 W Total)	88,875	0
Misc. Elec. (200,000 W Total)	682,600	0
People (16 People Total)	3,920	3,280
Miscellaneous Internal Loads	0	0
Infiltration	-6,220	-2,224
Total Room Loads	639,174	1,056
Total Room Tons	53.26	0.09
Total Room sqft/ton	558.72	338,300.69
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	38,089 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

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TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	-43,054	5,462
Northeast Glass	0	0	0
East Glass	690	-14,421	4,384
Southeast Glass	1,380	-28,842	9,894
South Glass	1,380	-28,842	14,687
Southwest Glass	420	-8,778	8,289
West Glass	760	-15,884	14,250
Northwest Glass	1,520	-31,768	13,073
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	-3,564	-
Southeast Wall	3,260	-6,766	-
South Wall	3,260	-6,621	-
Southwest Wall	980	-1,993	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

****

SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

****

BIN DATA

Period : Occupied O.A. Humidity Ratio = 0.0028
Bin Number : 14 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = 25 F Interior Zone Indoor DB = n/a

****

BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	61,596	0
Glass Transmission	-194,167	0
Wall Transmission	-21,516	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	-9,508	0
Lighting (29,760 W Total)	88,875	0
Misc. Elec. (200,000 W Total)	682,600	0
People (16 People Total)	3,920	3,280
Miscellaneous Internal Loads	0	0
Infiltration	-7,038	-2,747
Total Room Loads	604,762	533
Total Room Tons	50.40	0.04
Total Room sqft/ton	590.51	670,261.94
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	38,089 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

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TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	-48,719	4,740
Northeast Glass	0	0	0
East Glass	690	-16,319	3,845
Southeast Glass	1,380	-32,637	8,823
South Glass	1,380	-32,637	13,142
Southwest Glass	420	-9,933	7,299
West Glass	760	-17,974	12,451
Northwest Glass	1,520	-35,948	11,296
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	-4,004	-
Southeast Wall	3,260	-7,679	-
South Wall	3,260	-7,561	-
Southwest Wall	980	-2,271	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

****

SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

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BIN DATA

Period : Occupied O.A. Humidity Ratio = 0.0022
Bin Number : 15 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = 20 F Interior Zone Indoor DB = n/a

****

BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	53,153	0
Glass Transmission	-216,744	0
Wall Transmission	-24,088	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	-9,508	0
Lighting (29,760 W Total)	88,875	0
Misc. Elec. (200,000 W Total)	682,600	0
People (16 People Total)	3,920	3,280
Miscellaneous Internal Loads	0	0
Infiltration	-7,857	-3,168
Total Room Loads	570,351	112
Total Room Tons	47.53	0.01
Total Room sqft/ton	626.14	%3,200,620.20
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	38,089 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

****

TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	-54,384	4,017
Northeast Glass	0	0	0
East Glass	690	-18,216	3,307
Southeast Glass	1,380	-36,432	7,752
South Glass	1,380	-36,432	11,597
Southwest Glass	420	-11,088	6,310
West Glass	760	-20,064	10,653
Northwest Glass	1,520	-40,128	9,518
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	-4,445	-
Southeast Wall	3,260	-8,592	-
South Wall	3,260	-8,502	-
Southwest Wall	980	-2,549	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

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SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

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BIN DATA

Period : Occupied O.A. Humidity Ratio = 0.0017
Bin Number : 16 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = 15 F Interior Zone Indoor DB = n/a

****

BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	44,709	0
Glass Transmission	-239,322	0
Wall Transmission	-26,660	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	-9,508	0
Lighting (29,760 W Total)	88,875	0
Misc. Elec. (200,000 W Total)	682,600	0
People (16 People Total)	3,920	3,280
Miscellaneous Internal Loads	0	0
Infiltration	-8,675	-3,506
Total Room Loads	535,939	-226
Total Room Tons	44.66	-0.02
Total Room sqft/ton	666.34	%1,577,787.38
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	38,089 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

****

TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	-60,049	3,295
Northeast Glass	0	0	0
East Glass	690	-20,114	2,768
Southeast Glass	1,380	-40,227	6,681
South Glass	1,380	-40,227	10,052
Southwest Glass	420	-12,243	5,320
West Glass	760	-22,154	8,854
Northwest Glass	1,520	-44,308	7,740
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	-4,885	-
Southeast Wall	3,260	-9,505	-
South Wall	3,260	-9,443	-
Southwest Wall	980	-2,827	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

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SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

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BIN DATA

Period : Occupied O.A. Humidity Ratio = 0.0013
Bin Number : 17 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = 10 F Interior Zone Indoor DB = n/a

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BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	36,266	0
Glass Transmission	-261,899	0
Wall Transmission	-29,232	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	-9,508	0
Lighting (29,760 W Total)	88,875	0
Misc. Elec. (200,000 W Total)	682,600	0
People (16 People Total)	3,920	3,280
Miscellaneous Internal Loads	0	0
Infiltration	-9,493	-3,776
Total Room Loads	501,528	-496
Total Room Tons	41.79	-0.04
Total Room sqft/ton	712.06	719,694.31
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	38,089 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

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TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	-65,714	2,572
Northeast Glass	0	0	0
East Glass	690	-22,011	2,229
Southeast Glass	1,380	-44,022	5,610
South Glass	1,380	-44,022	8,507
Southwest Glass	420	-13,398	4,330
West Glass	760	-24,244	7,055
Northwest Glass	1,520	-48,488	5,962
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	-5,326	-
Southeast Wall	3,260	-10,418	-
South Wall	3,260	-10,383	-
Southwest Wall	980	-3,105	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

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SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

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BIN DATA

Period : Occupied O.A. Humidity Ratio = 0.0010
Bin Number : 18 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = 5 F Interior Zone Indoor DB = n/a

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BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	27,822	0
Glass Transmission	-284,477	0
Wall Transmission	-31,804	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	-9,508	0
Lighting (29,760 W Total)	88,875	0
Misc. Elec. (200,000 W Total)	682,600	0
People (16 People Total)	3,920	3,280
Miscellaneous Internal Loads	0	0
Infiltration	-10,312	-3,991
Total Room Loads	467,117	-711
Total Room Tons	38.93	-0.06
Total Room sqft/ton	764.52	502,480.69
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	38,089 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

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TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	-71,379	1,850
Northeast Glass	0	0	0
East Glass	690	-23,909	1,691
Southeast Glass	1,380	-47,817	4,539
South Glass	1,380	-47,817	6,961
Southwest Glass	420	-14,553	3,340
West Glass	760	-26,334	5,257
Northwest Glass	1,520	-52,668	4,185
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	-5,767	-
Southeast Wall	3,260	-11,331	-
South Wall	3,260	-11,324	-
Southwest Wall	980	-3,383	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

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SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

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BIN DATA

Period : Occupied O.A. Humidity Ratio = 0.0008
Bin Number : 19 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = 0 F Interior Zone Indoor DB = n/a

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BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	19,379	0
Glass Transmission	-307,054	0
Wall Transmission	-34,376	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	-9,508	0
Lighting (29,760 W Total)	88,875	0
Misc. Elec. (200,000 W Total)	682,600	0
People (16 People Total)	3,920	3,280
Miscellaneous Internal Loads	0	0
Infiltration	-11,130	-4,160
Total Room Loads	432,705	-880
Total Room Tons	36.06	-0.07
Total Room sqft/ton	825.32	405,647.78
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	38,089 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

****

TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	-77,044	1,127
Northeast Glass	0	0	0
East Glass	690	-25,806	1,152
Southeast Glass	1,380	-51,612	3,468
South Glass	1,380	-51,612	5,416
Southwest Glass	420	-15,708	2,350
West Glass	760	-28,424	3,458
Northwest Glass	1,520	-56,848	2,407
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	-6,207	-
Southeast Wall	3,260	-12,244	-
South Wall	3,260	-12,264	-
Southwest Wall	980	-3,661	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

****

SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

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BIN DATA

Period : Occupied O.A. Humidity Ratio = 0.0006
Bin Number : 20 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = -5 F Interior Zone Indoor DB = n/a

****

BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	10,936	0
Glass Transmission	-329,632	0
Wall Transmission	-36,948	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	-9,508	0
Lighting (29,760 W Total)	88,875	0
Misc. Elec. (200,000 W Total)	682,600	0
People (16 People Total)	3,920	3,280
Miscellaneous Internal Loads	0	0
Infiltration	-11,949	-4,294
Total Room Loads	398,294	-1,014
Total Room Tons	33.19	-0.08
Total Room sqft/ton	896.62	352,236.34
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	38,089 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

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TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	-82,709	405
Northeast Glass	0	0	0
East Glass	690	-27,704	613
Southeast Glass	1,380	-55,407	2,397
South Glass	1,380	-55,407	3,871
Southwest Glass	420	-16,863	1,361
West Glass	760	-30,514	1,659
Northwest Glass	1,520	-61,028	629
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	-6,648	-
Southeast Wall	3,260	-13,157	-
South Wall	3,260	-13,205	-
Southwest Wall	980	-3,939	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

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SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

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BIN DATA

Period : Occupied O.A. Humidity Ratio = 0.0006
Bin Number : 21 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = -6 F Interior Zone Indoor DB = n/a

****

BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	9,247	0
Glass Transmission	-334,147	0
Wall Transmission	-37,463	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	-9,508	0
Lighting (29,760 W Total)	88,875	0
Misc. Elec. (200,000 W Total)	682,600	0
People (16 People Total)	3,920	3,280
Miscellaneous Internal Loads	0	0
Infiltration	-12,112	-4,317
Total Room Loads	391,412	-1,037
Total Room Tons	32.62	-0.09
Total Room sqft/ton	912.39	344,418.88
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	38,089 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

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TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	-83,842	260
Northeast Glass	0	0	0
East Glass	690	-28,083	506
Southeast Glass	1,380	-56,166	2,183
South Glass	1,380	-56,166	3,562
Southwest Glass	420	-17,094	1,163
West Glass	760	-30,932	1,300
Northwest Glass	1,520	-61,864	274
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	-6,736	-
Southeast Wall	3,260	-13,339	-
South Wall	3,260	-13,393	-
Southwest Wall	980	-3,994	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

****

SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86

Site: AURORA,IL FERMI, User Defined 60117862.0

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BIN DATA

Period : Unoccupied O.A. Humidity Ratio = 0.0124

Bin Number : 1 Perimeter Zone Indoor DB = 68 F

Outdoor Dry Bulb = 90 F Interior Zone Indoor DB = n/a

****

BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	171,361	0
Glass Transmission	99,341	0
Wall Transmission	11,920	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	69,722	0
Lighting (26,784 W Total)	79,987	0
Misc. Elec. (200,000 W Total)	682,600	0
People (10 People Total)	2,450	2,050
Miscellaneous Internal Loads	0	0
Infiltration	2,161	2,522
Total Room Loads	1,119,542	4,572
Total Room Tons	93.30	0.38
Total Room sqft/ton	318.99	78,106.10
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	34,280 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

****

TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	24,926	14,131
Northeast Glass	0	0	0
East Glass	690	8,349	10,848
Southeast Glass	1,380	16,698	22,745
South Glass	1,380	16,698	33,230
Southwest Glass	420	5,082	20,167
West Glass	760	9,196	35,834
Northwest Glass	1,520	18,392	34,406
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	1,723	-
Southeast Wall	3,260	4,189	-
South Wall	3,260	4,667	-
Southwest Wall	980	1,341	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

****

SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

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BIN DATA

Period : Unoccupied O.A. Humidity Ratio = 0.0114
Bin Number : 2 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = 85 F Interior Zone Indoor DB = n/a

****

BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	162,918	0
Glass Transmission	76,764	0
Wall Transmission	9,348	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	53,876	0
Lighting (26,784 W Total)	79,987	0
Misc. Elec. (200,000 W Total)	682,600	0
People (10 People Total)	2,450	2,050
Miscellaneous Internal Loads	0	0
Infiltration	1,670	2,106
Total Room Loads	1,069,612	4,156
Total Room Tons	89.13	0.35
Total Room sqft/ton	333.88	85,922.51
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	34,280 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

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TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	19,261	13,409
Northeast Glass	0	0	0
East Glass	690	6,452	10,309
Southeast Glass	1,380	12,903	21,674
South Glass	1,380	12,903	31,685
Southwest Glass	420	3,927	19,177
West Glass	760	7,106	34,035
Northwest Glass	1,520	14,212	32,628
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	1,282	-
Southeast Wall	3,260	3,276	-
South Wall	3,260	3,726	-
Southwest Wall	980	1,063	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

****

SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

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BIN DATA

Period : Unoccupied O.A. Humidity Ratio = 0.0106
Bin Number : 3 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = 80 F Interior Zone Indoor DB = n/a

****

BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	154,474	0
Glass Transmission	54,186	0
Wall Transmission	6,776	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	38,030	0
Lighting (26,784 W Total)	79,987	0
Misc. Elec. (200,000 W Total)	682,600	0
People (10 People Total)	2,450	2,050
Miscellaneous Internal Loads	0	0
Infiltration	1,178	1,743
Total Room Loads	1,019,682	3,793
Total Room Tons	84.97	0.32
Total Room sqft/ton	350.23	94,156.13
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	34,280 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

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TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	13,596	12,686
Northeast Glass	0	0	0
East Glass	690	4,554	9,771
Southeast Glass	1,380	9,108	20,603
South Glass	1,380	9,108	30,140
Southwest Glass	420	2,772	18,187
West Glass	760	5,016	32,236
Northwest Glass	1,520	10,032	30,850
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	842	-
Southeast Wall	3,260	2,363	-
South Wall	3,260	2,786	-
Southwest Wall	980	786	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

****

SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

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BIN DATA

Period : Unoccupied O.A. Humidity Ratio = 0.0099
Bin Number : 4 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = 75 F Interior Zone Indoor DB = n/a

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BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	146,031	0
Glass Transmission	31,609	0
Wall Transmission	4,204	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	22,184	0
Lighting (26,784 W Total)	79,987	0
Misc. Elec. (200,000 W Total)	682,600	0
People (10 People Total)	2,450	2,050
Miscellaneous Internal Loads	0	0
Infiltration	687	1,428
Total Room Loads	969,752	3,478
Total Room Tons	80.81	0.29
Total Room sqft/ton	368.26	102,684.65
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	34,280 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

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TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	7,931	11,964
Northeast Glass	0	0	0
East Glass	690	2,657	9,232
Southeast Glass	1,380	5,313	19,532
South Glass	1,380	5,313	28,594
Southwest Glass	420	1,617	17,198
West Glass	760	2,926	30,438
Northwest Glass	1,520	5,852	29,073
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	401	-
Southeast Wall	3,260	1,450	-
South Wall	3,260	1,845	-
Southwest Wall	980	508	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

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SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

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BIN DATA

Period : Unoccupied O.A. Humidity Ratio = 0.0093
Bin Number : 5 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = 70 F Interior Zone Indoor DB = n/a

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BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	137,587	0
Glass Transmission	9,031	0
Wall Transmission	1,632	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	6,338	0
Lighting (26,784 W Total)	79,987	0
Misc. Elec. (200,000 W Total)	682,600	0
People (10 People Total)	2,450	2,050
Miscellaneous Internal Loads	0	0
Infiltration	196	1,157
Total Room Loads	919,822	3,207
Total Room Tons	76.65	0.27
Total Room sqft/ton	388.25	111,339.79
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	34,280 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

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TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	2,266	11,242
Northeast Glass	0	0	0
East Glass	690	759	8,693
Southeast Glass	1,380	1,518	18,461
South Glass	1,380	1,518	27,049
Southwest Glass	420	462	16,208
West Glass	760	836	28,639
Northwest Glass	1,520	1,672	27,295
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	-39	-
Southeast Wall	3,260	537	-
South Wall	3,260	905	-
Southwest Wall	980	230	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

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SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

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BIN DATA

Period : Unoccupied O.A. Humidity Ratio = 0.0087
Bin Number : 6 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = 65 F Interior Zone Indoor DB = n/a

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BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	129,144	0
Glass Transmission	-13,547	0
Wall Transmission	-940	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	-9,508	0
Lighting (26,784 W Total)	79,987	0
Misc. Elec. (200,000 W Total)	682,600	0
People (10 People Total)	2,450	2,050
Miscellaneous Internal Loads	0	0
Infiltration	-295	928
Total Room Loads	869,892	2,978
Total Room Tons	72.49	0.25
Total Room sqft/ton	410.53	119,905.42
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	34,280 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

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TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	-3,399	10,519
Northeast Glass	0	0	0
East Glass	690	-1,139	8,155
Southeast Glass	1,380	-2,277	17,390
South Glass	1,380	-2,277	25,504
Southwest Glass	420	-693	15,218
West Glass	760	-1,254	26,841
Northwest Glass	1,520	-2,508	25,517
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	-480	-
Southeast Wall	3,260	-376	-
South Wall	3,260	-36	-
Southwest Wall	980	-48	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

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SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

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BIN DATA

Period : Unoccupied O.A. Humidity Ratio = 0.0083
Bin Number : 7 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = 60 F Interior Zone Indoor DB = n/a

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BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	120,700	0
Glass Transmission	-36,124	0
Wall Transmission	-3,512	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	-9,508	0
Lighting (26,784 W Total)	79,987	0
Misc. Elec. (200,000 W Total)	682,600	0
People (10 People Total)	2,450	2,050
Miscellaneous Internal Loads	0	0
Infiltration	-786	737
Total Room Loads	835,808	2,787
Total Room Tons	69.65	0.23
Total Room sqft/ton	427.28	128,127.70
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	34,280 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

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TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	-9,064	9,797
Northeast Glass	0	0	0
East Glass	690	-3,036	7,616
Southeast Glass	1,380	-6,072	16,319
South Glass	1,380	-6,072	23,959
Southwest Glass	420	-1,848	14,228
West Glass	760	-3,344	25,042
Northwest Glass	1,520	-6,688	23,739
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	-920	-
Southeast Wall	3,260	-1,289	-
South Wall	3,260	-977	-
Southwest Wall	980	-326	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

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SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

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BIN DATA

Period : Unoccupied O.A. Humidity Ratio = 0.0079
Bin Number : 8 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = 55 F Interior Zone Indoor DB = n/a

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BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	112,257	0
Glass Transmission	-58,702	0
Wall Transmission	-6,084	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	-9,508	0
Lighting (26,784 W Total)	79,987	0
Misc. Elec. (200,000 W Total)	682,600	0
People (10 People Total)	2,450	2,050
Miscellaneous Internal Loads	0	0
Infiltration	-1,277	581
Total Room Loads	801,724	2,631
Total Room Tons	66.81	0.22
Total Room sqft/ton	445.44	135,727.56
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	34,280 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

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TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	-14,729	9,074
Northeast Glass	0	0	0
East Glass	690	-4,934	7,077
Southeast Glass	1,380	-9,867	15,248
South Glass	1,380	-9,867	22,414
Southwest Glass	420	-3,003	13,238
West Glass	760	-5,434	23,243
Northwest Glass	1,520	-10,868	21,962
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	-1,361	-
Southeast Wall	3,260	-2,202	-
South Wall	3,260	-1,917	-
Southwest Wall	980	-604	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

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SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

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BIN DATA

Period : Unoccupied O.A. Humidity Ratio = 0.0076
Bin Number : 9 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = 50 F Interior Zone Indoor DB = n/a

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BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	103,813	0
Glass Transmission	-81,279	0
Wall Transmission	-8,656	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	-9,508	0
Lighting (26,784 W Total)	79,987	0
Misc. Elec. (200,000 W Total)	682,600	0
People (10 People Total)	2,450	2,050
Miscellaneous Internal Loads	0	0
Infiltration	-1,768	457
Total Room Loads	767,640	2,507
Total Room Tons	63.97	0.21
Total Room sqft/ton	465.22	142,428.69
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	34,280 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

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TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	-20,394	8,352
Northeast Glass	0	0	0
East Glass	690	-6,831	6,539
Southeast Glass	1,380	-13,662	14,178
South Glass	1,380	-13,662	20,868
Southwest Glass	420	-4,158	12,248
West Glass	760	-7,524	21,445
Northwest Glass	1,520	-15,048	20,184
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	-1,802	-
Southeast Wall	3,260	-3,115	-
South Wall	3,260	-2,858	-
Southwest Wall	980	-882	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

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SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

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BIN DATA

Period : Unoccupied O.A. Humidity Ratio = 0.0063
Bin Number : 10 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = 45 F Interior Zone Indoor DB = n/a

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BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	95,370	0
Glass Transmission	-103,857	0
Wall Transmission	-11,228	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	-9,508	0
Lighting (26,784 W Total)	79,987	0
Misc. Elec. (200,000 W Total)	682,600	0
People (10 People Total)	2,450	2,050
Miscellaneous Internal Loads	0	0
Infiltration	-2,259	-106
Total Room Loads	733,556	1,944
Total Room Tons	61.13	0.16
Total Room sqft/ton	486.83	183,746.98
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	34,280 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

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TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	-26,059	7,629
Northeast Glass	0	0	0
East Glass	690	-8,729	6,000
Southeast Glass	1,380	-17,457	13,107
South Glass	1,380	-17,457	19,323
Southwest Glass	420	-5,313	11,259
West Glass	760	-9,614	19,646
Northwest Glass	1,520	-19,228	18,406
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	-2,242	-
Southeast Wall	3,260	-4,028	-
South Wall	3,260	-3,799	-
Southwest Wall	980	-1,160	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

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SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

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BIN DATA

Period : Unoccupied O.A. Humidity Ratio = 0.0052
Bin Number : 11 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = 40 F Interior Zone Indoor DB = n/a

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BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	86,927	0
Glass Transmission	-126,434	0
Wall Transmission	-13,800	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	-9,508	0
Lighting (26,784 W Total)	79,987	0
Misc. Elec. (200,000 W Total)	682,600	0
People (10 People Total)	2,450	2,050
Miscellaneous Internal Loads	0	0
Infiltration	-2,750	-582
Total Room Loads	699,472	1,468
Total Room Tons	58.29	0.12
Total Room sqft/ton	510.56	243,198.38
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	34,280 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

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TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	-31,724	6,907
Northeast Glass	0	0	0
East Glass	690	-10,626	5,461
Southeast Glass	1,380	-21,252	12,036
South Glass	1,380	-21,252	17,778
Southwest Glass	420	-6,468	10,269
West Glass	760	-11,704	17,847
Northwest Glass	1,520	-23,408	16,629
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	-2,683	-
Southeast Wall	3,260	-4,941	-
South Wall	3,260	-4,739	-
Southwest Wall	980	-1,438	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

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SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

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BIN DATA

Period : Unoccupied O.A. Humidity Ratio = 0.0043
Bin Number : 12 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = 35 F Interior Zone Indoor DB = n/a

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BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	78,483	0
Glass Transmission	-149,012	0
Wall Transmission	-16,372	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	-9,508	0
Lighting (26,784 W Total)	79,987	0
Misc. Elec. (200,000 W Total)	682,600	0
People (10 People Total)	2,450	2,050
Miscellaneous Internal Loads	0	0
Infiltration	-3,241	-981
Total Room Loads	665,388	1,069
Total Room Tons	55.45	0.09
Total Room sqft/ton	536.71	333,989.09
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	34,280 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

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TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	-37,389	6,184
Northeast Glass	0	0	0
East Glass	690	-12,524	4,923
Southeast Glass	1,380	-25,047	10,965
South Glass	1,380	-25,047	16,233
Southwest Glass	420	-7,623	9,279
West Glass	760	-13,794	16,049
Northwest Glass	1,520	-27,588	14,851
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	-3,123	-
Southeast Wall	3,260	-5,853	-
South Wall	3,260	-5,680	-
Southwest Wall	980	-1,715	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

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SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

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BIN DATA

Period : Unoccupied O.A. Humidity Ratio = 0.0035
Bin Number : 13 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = 30 F Interior Zone Indoor DB = n/a

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BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	70,040	0
Glass Transmission	-171,589	0
Wall Transmission	-18,944	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	-9,508	0
Lighting (26,784 W Total)	79,987	0
Misc. Elec. (200,000 W Total)	682,600	0
People (10 People Total)	2,450	2,050
Miscellaneous Internal Loads	0	0
Infiltration	-3,732	-1,335
Total Room Loads	631,304	715
Total Room Tons	52.61	0.06
Total Room sqft/ton	565.69	499,205.09
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	34,280 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

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TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	-43,054	5,462
Northeast Glass	0	0	0
East Glass	690	-14,421	4,384
Southeast Glass	1,380	-28,842	9,894
South Glass	1,380	-28,842	14,687
Southwest Glass	420	-8,778	8,289
West Glass	760	-15,884	14,250
Northwest Glass	1,520	-31,768	13,073
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	-3,564	-
Southeast Wall	3,260	-6,766	-
South Wall	3,260	-6,621	-
Southwest Wall	980	-1,993	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

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SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

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BIN DATA

Period : Unoccupied O.A. Humidity Ratio = 0.0028
Bin Number : 14 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = 25 F Interior Zone Indoor DB = n/a

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BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	61,596	0
Glass Transmission	-194,167	0
Wall Transmission	-21,516	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	-9,508	0
Lighting (26,784 W Total)	79,987	0
Misc. Elec. (200,000 W Total)	682,600	0
People (10 People Total)	2,450	2,050
Miscellaneous Internal Loads	0	0
Infiltration	-4,223	-1,648
Total Room Loads	597,220	402
Total Room Tons	49.77	0.03
Total Room sqft/ton	597.97	889,056.88
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	34,280 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

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TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	-48,719	4,740
Northeast Glass	0	0	0
East Glass	690	-16,319	3,845
Southeast Glass	1,380	-32,637	8,823
South Glass	1,380	-32,637	13,142
Southwest Glass	420	-9,933	7,299
West Glass	760	-17,974	12,451
Northwest Glass	1,520	-35,948	11,296
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	-4,004	-
Southeast Wall	3,260	-7,679	-
South Wall	3,260	-7,561	-
Southwest Wall	980	-2,271	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

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SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

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BIN DATA

Period : Unoccupied O.A. Humidity Ratio = 0.0022
Bin Number : 15 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = 20 F Interior Zone Indoor DB = n/a

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BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	53,153	0
Glass Transmission	-216,744	0
Wall Transmission	-24,088	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	-9,508	0
Lighting (26,784 W Total)	79,987	0
Misc. Elec. (200,000 W Total)	682,600	0
People (10 People Total)	2,450	2,050
Miscellaneous Internal Loads	0	0
Infiltration	-4,714	-1,901
Total Room Loads	563,136	149
Total Room Tons	46.93	0.01
Total Room sqft/ton	634.16	%2,397,631.00
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	34,280 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

****

TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	-54,384	4,017
Northeast Glass	0	0	0
East Glass	690	-18,216	3,307
Southeast Glass	1,380	-36,432	7,752
South Glass	1,380	-36,432	11,597
Southwest Glass	420	-11,088	6,310
West Glass	760	-20,064	10,653
Northwest Glass	1,520	-40,128	9,518
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	-4,445	-
Southeast Wall	3,260	-8,592	-
South Wall	3,260	-8,502	-
Southwest Wall	980	-2,549	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

****

SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

****

BIN DATA

Period : Unoccupied O.A. Humidity Ratio = 0.0017
Bin Number : 16 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = 15 F Interior Zone Indoor DB = n/a

****

BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	44,709	0
Glass Transmission	-239,322	0
Wall Transmission	-26,660	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	-9,508	0
Lighting (26,784 W Total)	79,987	0
Misc. Elec. (200,000 W Total)	682,600	0
People (10 People Total)	2,450	2,050
Miscellaneous Internal Loads	0	0
Infiltration	-5,205	-2,104
Total Room Loads	529,052	-54
Total Room Tons	44.09	-0.00
Total Room sqft/ton	675.02	%6,637,279.50
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	34,280 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

****

TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	-60,049	3,295
Northeast Glass	0	0	0
East Glass	690	-20,114	2,768
Southeast Glass	1,380	-40,227	6,681
South Glass	1,380	-40,227	10,052
Southwest Glass	420	-12,243	5,320
West Glass	760	-22,154	8,854
Northwest Glass	1,520	-44,308	7,740
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	-4,885	-
Southeast Wall	3,260	-9,505	-
South Wall	3,260	-9,443	-
Southwest Wall	980	-2,827	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

****

SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

****

BIN DATA

Period : Unoccupied O.A. Humidity Ratio = 0.0013
Bin Number : 17 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = 10 F Interior Zone Indoor DB = n/a

****

BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	36,266	0
Glass Transmission	-261,899	0
Wall Transmission	-29,232	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	-9,508	0
Lighting (26,784 W Total)	79,987	0
Misc. Elec. (200,000 W Total)	682,600	0
People (10 People Total)	2,450	2,050
Miscellaneous Internal Loads	0	0
Infiltration	-5,696	-2,266
Total Room Loads	494,968	-216
Total Room Tons	41.25	-0.02
Total Room sqft/ton	721.50	%1,655,430.88
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	34,280 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

****

TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	-65,714	2,572
Northeast Glass	0	0	0
East Glass	690	-22,011	2,229
Southeast Glass	1,380	-44,022	5,610
South Glass	1,380	-44,022	8,507
Southwest Glass	420	-13,398	4,330
West Glass	760	-24,244	7,055
Northwest Glass	1,520	-48,488	5,962
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	-5,326	-
Southeast Wall	3,260	-10,418	-
South Wall	3,260	-10,383	-
Southwest Wall	980	-3,105	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

****

SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

****

BIN DATA

Period : Unoccupied O.A. Humidity Ratio = 0.0010
Bin Number : 18 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = 5 F Interior Zone Indoor DB = n/a

****

BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	27,822	0
Glass Transmission	-284,477	0
Wall Transmission	-31,804	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	-9,508	0
Lighting (26,784 W Total)	79,987	0
Misc. Elec. (200,000 W Total)	682,600	0
People (10 People Total)	2,450	2,050
Miscellaneous Internal Loads	0	0
Infiltration	-6,187	-2,394
Total Room Loads	460,884	-344
Total Room Tons	38.41	-0.03
Total Room sqft/ton	774.86	%1,036,848.12
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	34,280 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

****

TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	-71,379	1,850
Northeast Glass	0	0	0
East Glass	690	-23,909	1,691
Southeast Glass	1,380	-47,817	4,539
South Glass	1,380	-47,817	6,961
Southwest Glass	420	-14,553	3,340
West Glass	760	-26,334	5,257
Northwest Glass	1,520	-52,668	4,185
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	-5,767	-
Southeast Wall	3,260	-11,331	-
South Wall	3,260	-11,324	-
Southwest Wall	980	-3,383	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

****

SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

****

BIN DATA

Period : Unoccupied O.A. Humidity Ratio = 0.0008
Bin Number : 19 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = 0 F Interior Zone Indoor DB = n/a

****

BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	19,379	0
Glass Transmission	-307,054	0
Wall Transmission	-34,376	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	-9,508	0
Lighting (26,784 W Total)	79,987	0
Misc. Elec. (200,000 W Total)	682,600	0
People (10 People Total)	2,450	2,050
Miscellaneous Internal Loads	0	0
Infiltration	-6,678	-2,496
Total Room Loads	426,800	-446
Total Room Tons	35.57	-0.04
Total Room sqft/ton	836.74	800,319.25
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	34,280 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

****

TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	-77,044	1,127
Northeast Glass	0	0	0
East Glass	690	-25,806	1,152
Southeast Glass	1,380	-51,612	3,468
South Glass	1,380	-51,612	5,416
Southwest Glass	420	-15,708	2,350
West Glass	760	-28,424	3,458
Northwest Glass	1,520	-56,848	2,407
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	-6,207	-
Southeast Wall	3,260	-12,244	-
South Wall	3,260	-12,264	-
Southwest Wall	980	-3,661	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

****

SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

****

BIN DATA

Period : Unoccupied O.A. Humidity Ratio = 0.0006
Bin Number : 20 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = -5 F Interior Zone Indoor DB = n/a

****

BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	10,936	0
Glass Transmission	-329,632	0
Wall Transmission	-36,948	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	-9,508	0
Lighting (26,784 W Total)	79,987	0
Misc. Elec. (200,000 W Total)	682,600	0
People (10 People Total)	2,450	2,050
Miscellaneous Internal Loads	0	0
Infiltration	-7,169	-2,576
Total Room Loads	392,716	-526
Total Room Tons	32.73	-0.04
Total Room sqft/ton	909.36	678,524.38
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	34,280 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

****

TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	-82,709	405
Northeast Glass	0	0	0
East Glass	690	-27,704	613
Southeast Glass	1,380	-55,407	2,397
South Glass	1,380	-55,407	3,871
Southwest Glass	420	-16,863	1,361
West Glass	760	-30,514	1,659
Northwest Glass	1,520	-61,028	629
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	-6,648	-
Southeast Wall	3,260	-13,157	-
South Wall	3,260	-13,205	-
Southwest Wall	980	-3,939	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

****

SINGLE BIN LOAD SUMMARY

Building Name : CCF SUBCONSTRUCT 2/4 Date : 11-25-86
Site: AURORA,IL FERMI, User Defined 60117862.0

****

BIN DATA

Period : Unoccupied O.A. Humidity Ratio = 0.0006
Bin Number : 21 Perimeter Zone Indoor DB = 68 F
Outdoor Dry Bulb = -6 F Interior Zone Indoor DB = n/a

****

BLOCK THERMAL LOAD SUMMARY

Load Component	Sensible(Btu/hr)	Latent(Btu/hr)
Solar Gain	9,247	0
Glass Transmission	-334,147	0
Wall Transmission	-37,463	0
Roof Transmission	0	0
Transmission Load For Wall Adjacent to Non-Cond Region	-9,508	0
Lighting (26,784 W Total)	79,987	0
Misc. Elec. (200,000 W Total)	682,600	0
People (10 People Total)	2,450	2,050
Miscellaneous Internal Loads	0	0
Infiltration	-7,267	-2,590
Total Room Loads	385,899	-540
Total Room Tons	32.16	-0.05
Total Room sqft/ton	925.42	661,179.06
Perimeter Zone Floor Area	29,760 sqft	
Interior Zone Floor Area	0 sqft	
Lighting Load to Plenum	34,280 Btu/hr	
Roof Load to Plenum	0 Btu/hr	

****

TRANSMISSION LOADS AND SOLAR GAINS BY EXPOSURE

Exposure	Area (Sqft)	Transmission (Btu/hr)	Solar Gain (Btu/hr)
North Glass	2,060	-83,842	260
Northeast Glass	0	0	0
East Glass	690	-28,083	506
Southeast Glass	1,380	-56,166	2,183
South Glass	1,380	-56,166	3,562
Southwest Glass	420	-17,094	1,163
West Glass	760	-30,932	1,300
Northwest Glass	1,520	-61,864	274
Perimeter Skylight	0	0	0
Interior Skylight	0	0	0
North Wall	0	0	-
Northeast Wall	0	0	-
East Wall	1,630	-6,736	-
Southeast Wall	3,260	-13,339	-
South Wall	3,260	-13,393	-
Southwest Wall	980	-3,994	-
West Wall	0	0	-
Northwest Wall	0	0	-
Perimeter Roof	0	0	-
Interior Roof	0	0	-

****

FERMILAB CENTRAL COMPUTING FACILITY

SUBCONSTRUCTION 2/4
SYSTEM COMPARISON PERFORMANCE SIMULATIONS

12 NOVEMBER, 1986

ANALYST: S.F.KRSTULOVICH

FERMILAB CONSTRUCTION ENGINEERING SERVICES

FERMILAB CENTRAL COMPUTING FACILITY

SUBCONSTRUCTION 2/4
OPERATIONAL PERFORMANCE SIMULATION

DESIGN BASIS SYSTEM
DX AC UNITS WITH FREE COOLING COILS AND HI EFFICIENCY 4-STEP COMPRESORS

12 NOVEMBER, 1986
ANALYST: S.F.KRSTULOVICH

FERMILAB CONSTRUCTION ENGINEERING SERVICES

SYSTEM INPUT SUMMARY

Job Name : CCF SUBCON 2/4 DESIGN SYS Page 1
Building Name : CCF SUBCONSTRUCT 2/4 (Complex) Date : 11-25-86
Site : AURORA,IL FERMI, User Defined 60117862.0
Scope of Analysis : Cooling and Heating Systems

****

A. AIR HANDLING SYSTEMS

>1. PERIMETER TERMINAL TYPE : CONSTANT VOLUME

Supply fan type : Backward inclined or airfoil

Supply fan total static pressure = 2.50 in. wg.

A return fan is not used.

Design supply air= 72000 cfm @ 52 F; Vent. air= 2360 cfm

Are cooling terminals used for heating ? <Y>

An economizer is not used.

Is a ventilation reclaim device used ? <Y>

Reclaim device: Efficiency = 90 % ; Input power = 0.2 kw

Are ventilation air dampers closed for unoccupied periods ? <N>

****

B. HEATING PLANTS

> 1 . PERIMETER PLANT : ELECTRICAL RESISTANCE

Is hydronic heating used ? <N>

****

SYSTEM INPUT SUMMARY

Job Name : CCF SUBCON 2/4 DESIGN SYS — Page 2
Building Name : CCF SUBCONSTRUCT 2/4 (Complex) — Date : 11-25-86
Site : AURORA,IL FERMI, User Defined — 60117862.0
Scope of Analysis : Cooling and Heating Systems

****

C. COOLING PLANTS

>1. PERIMETER PLANT : RECIPROCATING WATER COOLED
Capacity @ 85 F entering water = 120.0 tons
KW/Ton @ 85 F entering water = 0.58 kw/ton
Is hydronic cooling used ? <N>
Is hot gas bypass used ? <N>
Is condenser performance altitude adjusted ? <Y>
Is there one compressor per condenser circuit ? <N>
Heat sink type : Open cooling tower
Minimum entering water temperature = 35 F
Is a hydronic economizer used ? <Y> ; Economizer efficiency = 65 %

****

D. PUMPING SYSTEMS

System	PERIMETER dT, F	PERIMETER dP, ft wg	dT, F	dP, ft wg
Chilled water	0.00	0.00	0.00	0.00
Hot water	0.00	0.00	0.00	0.00
Condenser water	10.00	117.00	0.00	0.00
Ground water	0.00	0.00	0.00	0.00

****

E. NON-HVAC SYSTEMS

>1. NON-HVAC ELECTRICAL ENERGY USE
Lighting kw: Occupied = 29.8 kw; Unoccupied = 26.8 kw
Misc. kw : Occupied = 200.0 kw; Unoccupied = 200.0 kw
Other kw : Occupied = 0.0 kw; Unoccupied = 0.0 kw

>2. DHW SYSTEM (Not utilized in this system)

****

F. FUEL COSTS

>1. ELECTRICAL ENERGY USE	Period Occupied ($/kwh)	Period Unoccupied ($/kwh)
Compressor	0.050	0.050
Resistance	0.050	0.050
Inductive	0.050	0.050

>2. OTHER FUELS	Unit Cost
Natural Gas	n/a $/therm
Fuel Oil	n/a $/U.S.gal
Propane	n/a $/lb
Remote Heating	n/a $/MBTU
Remote Cooling	n/a $/MBTU

TOTAL BUILDING ENERGY SUMMARY

Job Name : CCF SUBCON 2/4 DESIGN SYS — Period : All
Building Name : CCF SUBCONSTRUCT 2/4 (Complex) — Zone : Block
Site : AURORA,IL FERMI, User Defined — Serial Number:
Date : 11-25-86 — 60117862.0

****

HVAC ENERGY Component	Annual Cost ($/yr)	Energy or Fuel Units Consumed	DOE RUF (1000 BTU)	DOE RIF (1000 BTU)
Electric (Occ)	10360	207207 kwh/yr	2403600	707197
Electric (Unocc)	17338	346768 kwh/yr	4022509	1183519
Natural Gas	0	0 therms/yr	0	0
Fuel Oil	0	0 U.S. gal/yr	0	0
Propane	0	0 lb/yr	0	0
Remote Heating	0	0 MBTU/yr	0	0
Remote Cooling	0	0 MBTU/yr	0	0
HVAC Total	27699		6426109	1890716
NON-HVAC ENERGY				
Electric (Occ)	35941	718827 kwh/yr	8338395	2453357
Electric (Unocc)	63856	1277111 kwh/yr	14814491	4358781
Non-HVAC Total	99797		23152886	6812138
Grand Total	127496		29578995	8702854
Total/Sq.Ft.	4.28		993.92	292.43

HVAC Summary:

HVAC Total Cost	=	0.93 $/Sq.Ft./yr
	=	21.73 % of Total Cost
Total HVAC Electrical Energy	=	18.61 kwh/Sq.Ft./yr
	=	21.73 % of Total Electrical Energy
Non-Electrical HVAC Energy	=	0.00 % of Total Energy

Key:

1 kwh	= 11600 BTU RUF; 3412 BTU RIF
1 therm nat gas	= 100000 BTU RUF and RIF
1 U.S. gal oil	= 138700 BTU RUF and RIF
1 Imp. gal oil	= 168000 BTU RUF and RIF
1 lb propane	= 21680 BTU RUF and RIF
RUF	= Resource utilization factor (Source value)
RIF	= Resource impact factor (Point of use value)
MBH	= 1000 BTU/hr
MBTU	= Million BTU

ANNUAL OPERATING COSTS

Job Name : CCF SUBCON 2/4 DESIGN SYS Page 1
Building Name : CCF SUBCONSTRUCT 2/4 (Complex) Date : 11-25-86
Site : AURORA,IL FERMI, User Defined 60117862.0
Scope of Analysis : Cooling and Heating Systems

****

A. AIR HANDLING SYSTEMS (ANNUAL FAN OPERATING COST = $17,102)

>1. PERIMETER TERMINAL TYPE : CONSTANT VOLUME

Supply fan type : Backward inclined or airfoil

Supply fan total static pressure = 2.50 in. wg.

A return fan is not used.

Design supply air= 72000 cfm @ 52 F; Vent. air= 2360 cfm

Are cooling terminals used for heating ? <Y>

An economizer is not used.

Is a ventilation reclaim device used ? <Y>

Reclaim device: Efficiency = 90 % ; Input power = 0.2 kw

Are ventilation air dampers closed for unoccupied periods ? <N>

****

B. HEATING PLANTS (ANNUAL HEATING PLANT OPERATING COST = $0)

> 1 . PERIMETER PLANT : ELECTRICAL RESISTANCE

Is hydronic heating used ? <N>

****

ANNUAL OPERATING COSTS

Job Name : CCF SUBCON 2/4 DESIGN SYS
Building Name : CCF SUBCONSTRUCT 2/4 (Complex) Date : 11-25-86
Site : AURORA,IL FERMI, User Defined 60117862.0
Scope of Analysis : Cooling and Heating Systems

****

C. COOLING PLANTS (ANNUAL COOLING PLANT OPERATING COST = $6,350)

>1. PERIMETER PLANT : RECIPROCATING WATER COOLED
Capacity @ 85 F entering water = 120.0 tons
KW/Ton @ 85 F entering water = 0.58 kw/ton
Is hydronic cooling used ? <N>
Is hot gas bypass used ? <N>
Is condenser performance altitude adjusted ? <Y>
Is there one compressor per condenser circuit ? <N>
Heat sink type : Open cooling tower
Minimum entering water temperature = 35 F
Is a hydronic economizer used ? <Y> ; Economizer efficiency = 65 %

****

D. PUMPING SYSTEMS (ANNUAL PUMP OPERATING COST = $4,247)

System	PERIMETER dT, F	PERIMETER dP, ft wg	dT, F	dP, ft wg
Chilled water	0.00	0.00	0.00	0.00
Hot water	0.00	0.00	0.00	0.00
Condenser water	10.00	117.00	0.00	0.00
Ground water	0.00	0.00	0.00	0.00

****

E. NON-HVAC SYSTEMS (ANNUAL NON-HVAC OPERATING COST = $99,797)

>1. NON-HVAC ELECTRICAL ENERGY USE
Lighting kw: Occupied = 29.8 kw; Unoccupied = 26.8 kw
Misc. kw : Occupied = 200.0 kw; Unoccupied = 200.0 kw
Other kw : Occupied = 0.0 kw; Unoccupied = 0.0 kw

>2. DHW SYSTEM (Not utilized in this system)

****

F. FUEL COSTS (GRAND TOTAL ANNUAL OPERATING COST = $127,496)

>1. ELECTRICAL ENERGY USE	Period Occupied ($/kwh)	Period Unoccupied ($/kwh)
Compressor	0.050	0.050
Resistance	0.050	0.050
Inductive	0.050	0.050

>2. OTHER FUELS	Unit Cost
Natural Gas	n/a $/therm
Fuel Oil	n/a $/U.S.gal
Propane	n/a $/lb
Remote Heating	n/a $/MBTU
Remote Cooling	n/a $/MBTU

COOLING PLANT COSTS

Job Name : CCF SUBCON 2/4 DESIGN SYS — Date : 11-25-86
Building Name : CCF SUBCONSTRUCT 2/4 (Complex) — Serial Number:
Site Name : AURORA,IL FERMI, User Defined — 60117862.0

Bin Temp (F)	Bin Hours hr/yr	Perimeter Cooling Plant Coil Load MBH	Input KW	Cost $/yr	No Interior Zone Exists
			OCCUPIED PERIOD		
90	25.8	1366.0	59.2	76.3	
85	59.4	1300.4	52.5	155.9	
80	145.3	1236.3	46.6	338.2	
75	237.7	1173.4	41.3	490.4	
70	270.6	1111.8	36.5	494.5	
65	264.5	1043.1	30.8	407.6	
60	255.0	995.0	23.4	298.1	
55	244.7	947.6	17.2	210.7	
50	232.1	900.2	10.0	115.9	
45	229.5	852.8	4.3	49.9	
40	237.6	805.4	1.6	19.5	
35	238.5	758.0	1.6	19.6	
30	218.2	710.6	1.6	18.0	
25	174.5	663.2	1.6	14.4	
20	122.4	615.8	1.6	10.1	
15	78.1	568.5	1.6	6.4	
10	46.1	521.1	1.6	3.8	
5	25.1	473.7	1.6	2.1	
0	12.7	426.3	1.6	1.0	
-5	6.2	378.9	1.6	0.5	
-6	4.6	369.4	1.6	0.4	
Total Costs				$2733.5	
			UNOCCUPIED PERIOD		
90	14.6	1347.0	57.8	42.2	
85	36.3	1282.1	51.3	93.1	
80	99.3	1218.5	45.5	225.8	
75	215.3	1156.2	40.3	434.0	
70	357.6	1095.0	35.7	638.6	
65	463.3	1028.5	30.1	696.4	
60	500.4	981.5	22.8	569.8	
55	482.0	934.4	16.7	403.2	
50	447.6	887.3	9.6	214.9	
45	422.7	840.3	4.0	84.9	
40	413.7	793.2	1.6	34.0	
35	417.0	746.1	1.6	34.3	
30	417.4	699.1	1.6	34.3	
25	395.2	652.0	1.6	32.5	
20	336.9	604.9	1.6	27.7	
15	252.8	557.9	1.6	20.8	
10	165.7	510.8	1.6	13.6	
5	96.3	463.8	1.6	7.9	
0	50.9	416.7	1.6	4.2	
-5	25.3	369.6	1.6	2.1	
-6	21.1	360.2	1.6	1.7	
Total Costs				$3616.3	

PERIMETER HEATING PLANT COSTS

Job Name : CCF SUBCON 2/4 DESIGN SYS — Date : 11-25-86

Building Name : CCF SUBCONSTRUCT 2/4 (Complex) — Serial Number:

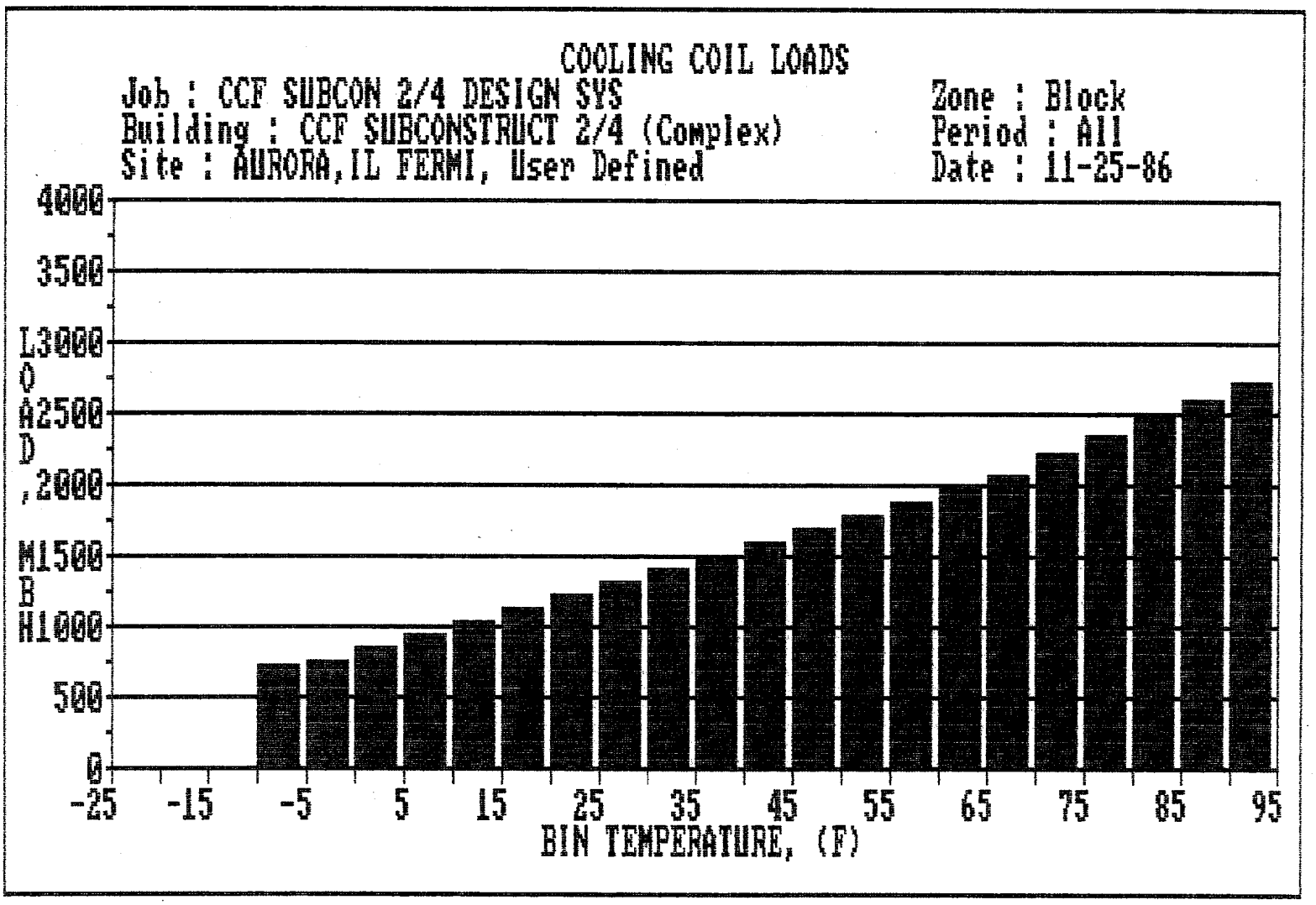
Site Name : AURORA,IL FERMI, User Defined — 60117862.0

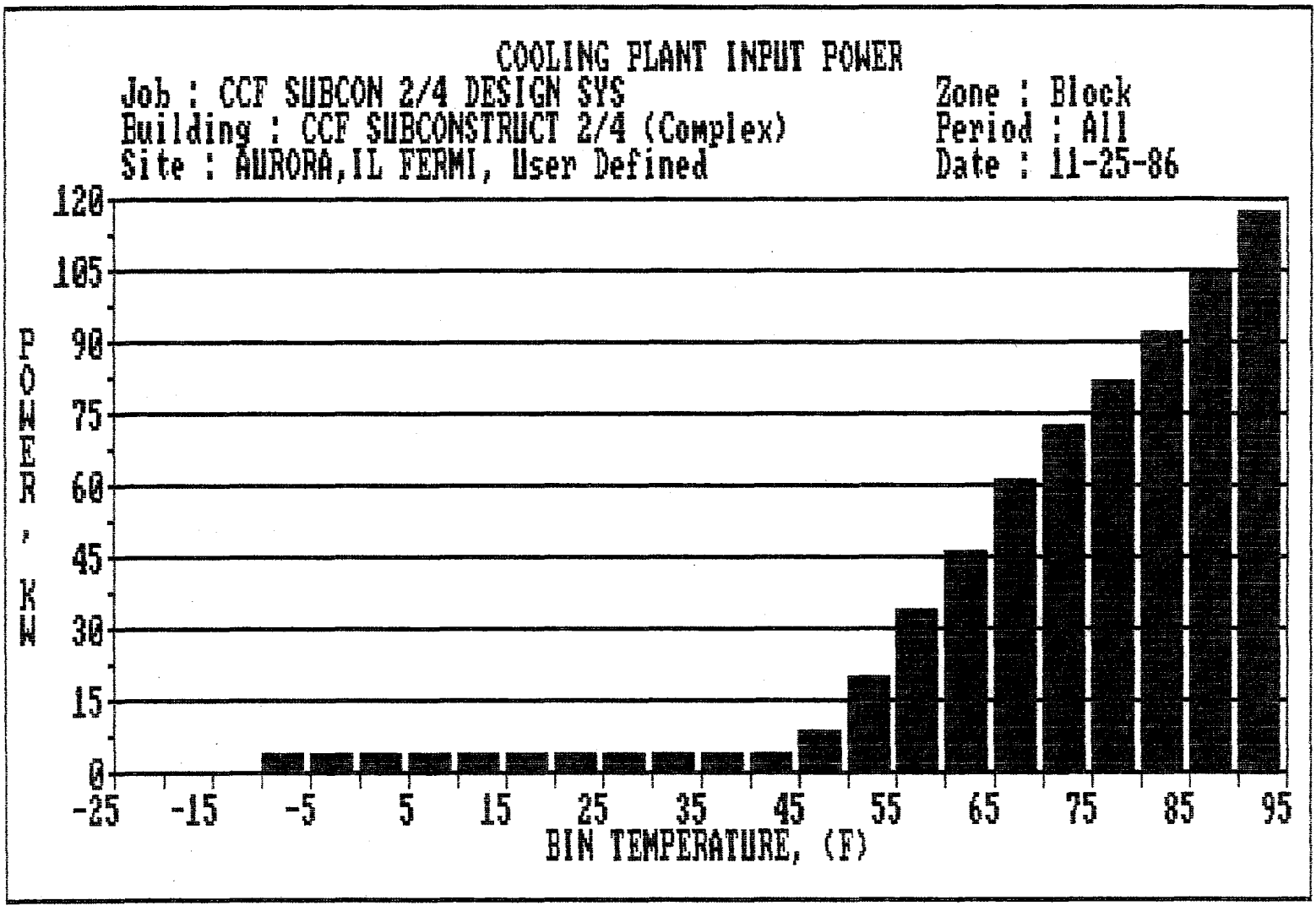
Bin Temp (F)	Bin Hours hr/yr	Coil Load MBH	Primary Plant Output MBH	Input KW	Cost $/yr	No Auxiliary Plant Used
			OCCUPIED PERIOD			
90	25.8	0.0	0.0	0.0	0.0	
85	59.4	0.0	0.0	0.0	0.0	
80	145.3	0.0	0.0	0.0	0.0	
75	237.7	0.0	0.0	0.0	0.0	
70	270.6	0.0	0.0	0.0	0.0	
65	264.5	0.0	0.0	0.0	0.0	
60	255.0	0.0	0.0	0.0	0.0	
55	244.7	0.0	0.0	0.0	0.0	
50	232.1	0.0	0.0	0.0	0.0	
45	229.5	0.0	0.0	0.0	0.0	
40	237.6	0.0	0.0	0.0	0.0	
35	238.5	0.0	0.0	0.0	0.0	
30	218.2	0.0	0.0	0.0	0.0	
25	174.5	0.0	0.0	0.0	0.0	
20	122.4	0.0	0.0	0.0	0.0	
15	78.1	0.0	0.0	0.0	0.0	
10	46.1	0.0	0.0	0.0	0.0	
5	25.1	0.0	0.0	0.0	0.0	
0	12.7	0.0	0.0	0.0	0.0	
-5	6.2	0.0	0.0	0.0	0.0	
-6	4.6	0.0	0.0	0.0	0.0	
Total Costs					$0.0	
			UNOCCUPIED PERIOD			
90	14.6	0.0	0.0	0.0	0.0	
85	36.3	0.0	0.0	0.0	0.0	
80	99.3	0.0	0.0	0.0	0.0	
75	215.3	0.0	0.0	0.0	0.0	
70	357.6	0.0	0.0	0.0	0.0	
65	463.3	0.0	0.0	0.0	0.0	
60	500.4	0.0	0.0	0.0	0.0	
55	482.0	0.0	0.0	0.0	0.0	
50	447.6	0.0	0.0	0.0	0.0	
45	422.7	0.0	0.0	0.0	0.0	
40	413.7	0.0	0.0	0.0	0.0	
35	417.0	0.0	0.0	0.0	0.0	
30	417.4	0.0	0.0	0.0	0.0	
25	395.2	0.0	0.0	0.0	0.0	
20	336.9	0.0	0.0	0.0	0.0	
15	252.8	0.0	0.0	0.0	0.0	
10	165.7	0.0	0.0	0.0	0.0	
5	96.3	0.0	0.0	0.0	0.0	
0	50.9	0.0	0.0	0.0	0.0	
-5	25.3	0.0	0.0	0.0	0.0	
-6	21.1	0.0	0.0	0.0	0.0	
Total Costs					$0.0	

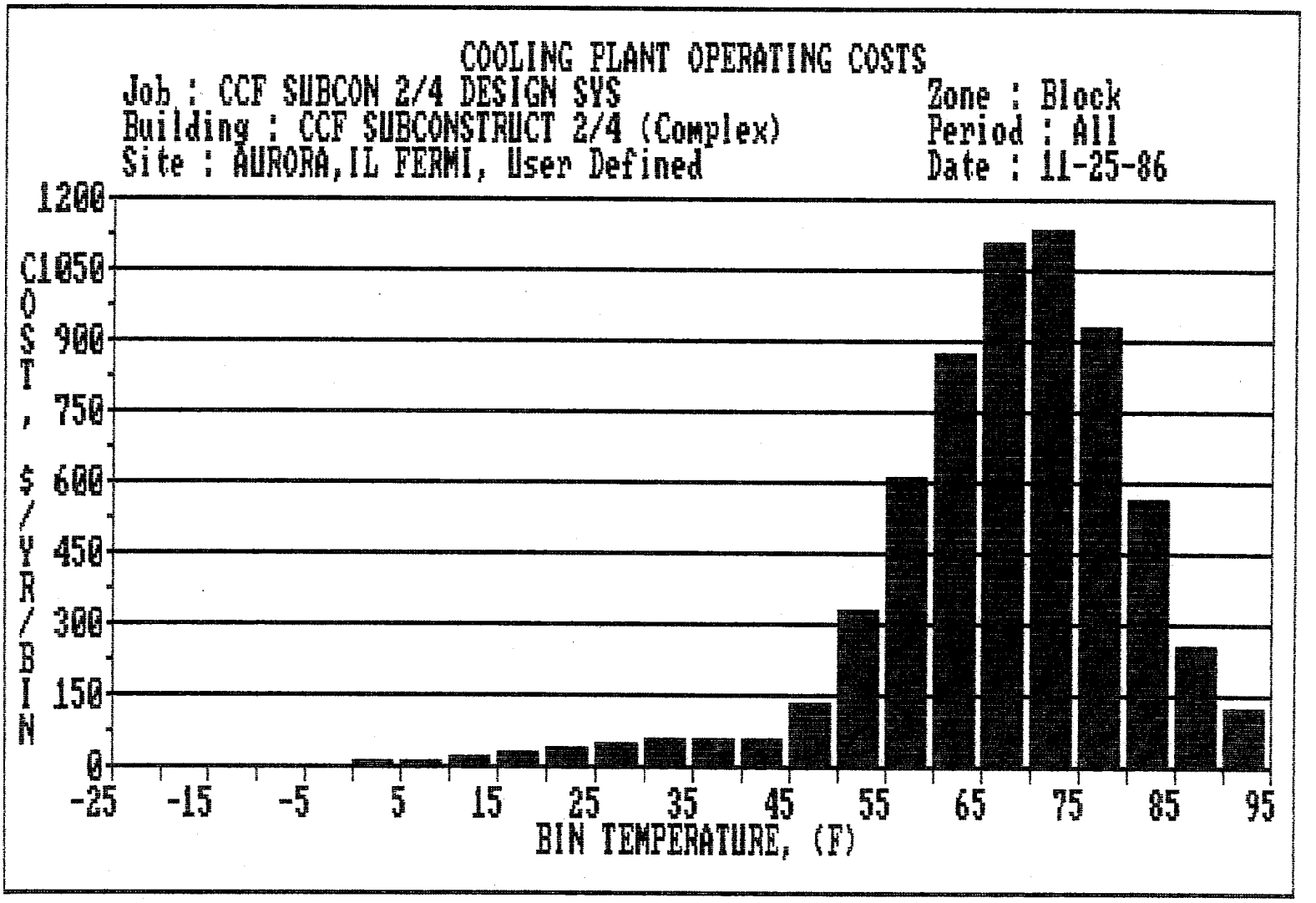
FAN AND PUMP COSTS

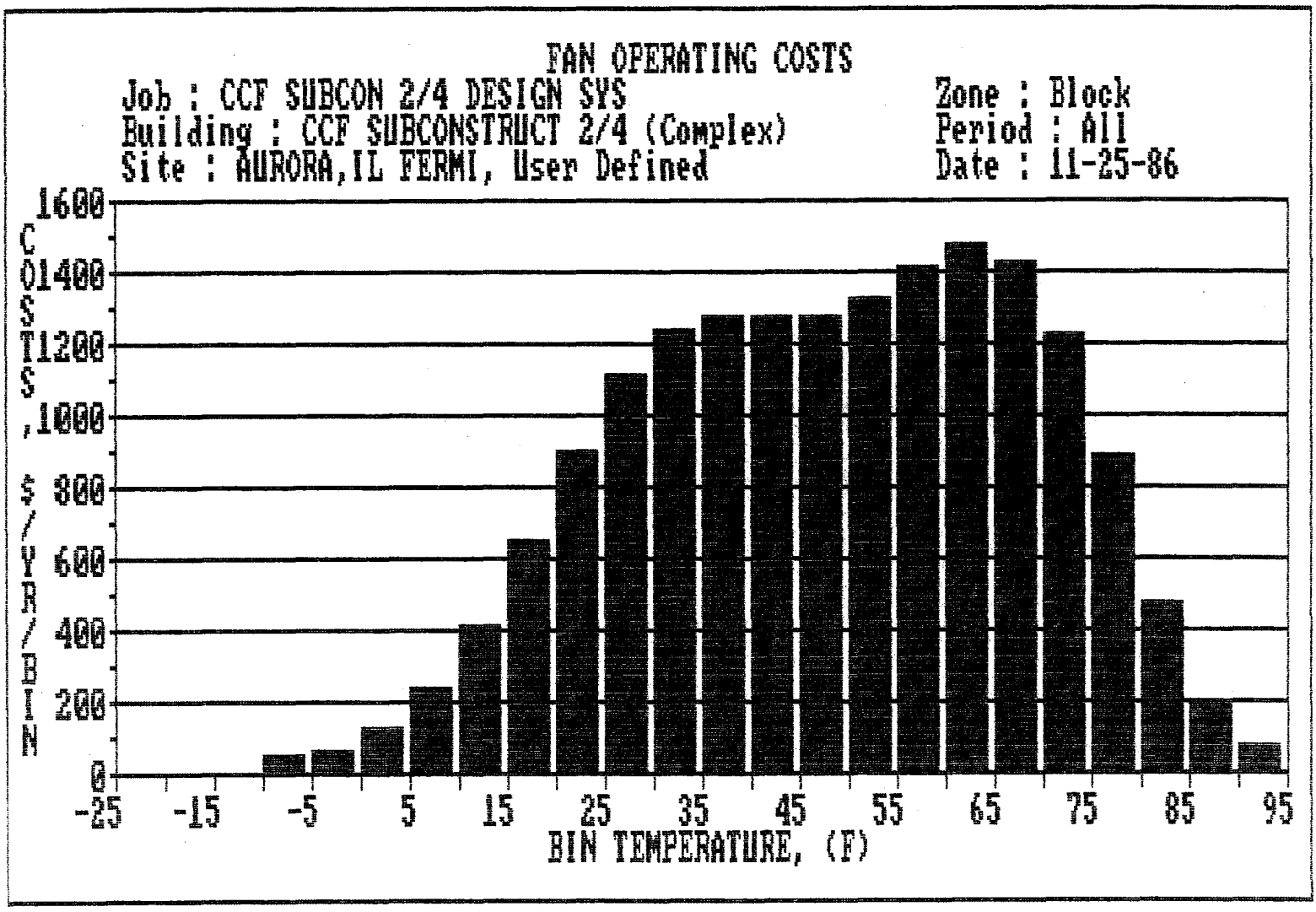
Job Name : CCF SUBCON 2/4 DESIGN SYS — Date : 11-25-86
Building Name : CCF SUBCONSTRUCT 2/4 (Complex) — Serial Number:
Site Name : AURORA,IL FERMI, User Defined — 60117862.0

Bin Temp (F)	Bin Hours hr/yr	Perimeter Input KW	Fans Cost $/yr	No Interior Zone	All Pumps Input KW	All Pumps Cost $/yr
			OCCUPIED PERIOD			
90	25.8	39.0	50.4		9.9	12.7
85	59.4	39.0	116.0		9.9	29.3
80	145.3	39.0	283.7		9.9	71.7
75	237.7	39.0	464.1		9.9	117.2
70	270.6	39.0	528.3		9.9	133.4
65	264.5	39.0	516.4		9.7	127.8
60	255.0	39.0	497.8		9.7	123.2
55	244.7	39.0	477.7		9.7	118.2
50	232.1	39.0	453.1		9.7	112.1
45	229.5	39.0	448.1		9.7	110.9
40	237.6	39.0	463.9		9.7	114.8
35	238.5	39.0	465.6		9.7	115.2
30	218.2	39.0	426.0		9.7	105.4
25	174.5	39.0	340.7		9.7	84.3
20	122.4	39.0	239.0		9.7	59.1
15	78.1	39.0	152.5		9.7	37.7
10	46.1	39.0	90.0		9.7	22.3
5	25.1	39.0	49.0		9.7	12.1
0	12.7	39.0	24.8		9.7	6.1
-5	6.2	39.0	12.1		9.7	3.0
-6	4.6	39.0	9.0		9.7	2.2
Total Costs			$6107.9			$1518.9
			UNOCCUPIED PERIOD			
90	14.6	39.0	28.5		9.9	7.2
85	36.3	39.0	70.9		9.9	17.9
80	99.3	39.0	193.9		9.9	49.0
75	215.3	39.0	420.3		9.9	106.2
70	357.6	39.0	698.1		9.9	176.3
65	463.3	39.0	904.5		9.7	223.8
60	500.4	39.0	976.9		9.7	241.8
55	482.0	39.0	941.0		9.7	232.9
50	447.6	39.0	873.8		9.7	216.3
45	422.7	39.0	825.2		9.7	204.2
40	413.7	39.0	807.7		9.7	199.9
35	417.0	39.0	814.1		9.7	201.5
30	417.4	39.0	814.9		9.7	201.7
25	395.2	39.0	771.5		9.7	190.9
20	336.9	39.0	657.7		9.7	162.8
15	252.8	39.0	493.5		9.7	122.1
10	165.7	39.0	323.5		9.7	80.1
5	96.3	39.0	188.0		9.7	46.5
0	50.9	39.0	99.4		9.7	24.6
-5	25.3	39.0	49.4		9.7	12.2
-6	21.1	39.0	41.2		9.7	10.2
Total Costs			$10994.2			$2728.0


COOLING COIL LOADS
Job : CCF SUBCON 2/4 DESIGN SYS
Building : CCF SUBCONSTRUCT 2/4 (Complex)
Site : AURORA,IL FERMI, User Defined
Zone : Block
Period : All
Date : 11-25-86
LOAD, MBH
4000
3500
3000
2500
2000
1500
1000
500
0
-25
-15
-5
5
15
25
35
45
55
65
75
85
95
BIN TEMPERATURE, (F)


COOLING PLANT INPUT POWER
Job : CCF SUBCON 2/4 DESIGN SYS
Building : CCF SUBCONSTRUCT 2/4 (Complex)
Site : AURORA,IL FERMI, User Defined
Zone : Block
Period : All
Date : 11-25-86
POWER, KW
120
105
90
75
60
45
30
15
0
-25
-15
-5
5
15
25
35
45
55
65
75
85
95
BIN TEMPERATURE, (F)


COOLING PLANT OPERATING COSTS
Job : CCF SUBCON 2/4 DESIGN SYS
Building : CCF SUBCONSTRUCT 2/4 (Complex)
Site : AURORA,IL FERMI, User Defined
Zone : Block
Period : All
Date : 11-25-86
COST, $/YR/BIN
1200
1050
900
750
600
450
300
150
0
-25
-15
-5
5
15
25
35
45
55
65
75
85
95
BIN TEMPERATURE, (F)


FAN OPERATING COSTS
Job : CCF SUBCON 2/4 DESIGN SYS
Building : CCF SUBCONSTRUCT 2/4 (Complex)
Site : AURORA,IL FERMI, User Defined
Zone : Block
Period : All
Date : 11-25-86
$/YR/BIN COSTS
1600
1400
1200
1000
800
600
400
200
0
-25
-15
-5
5
15
25
35
45
55
65
75
85
95
BIN TEMPERATURE, (F)

FERMILAB CENTRAL COMPUTING FACILITY

SUBCONSTRUCTION 2/4
OPERATIONAL PERFORMANCE SIMULATION

ALTERNATE COMPARISON SYSTEM NUMBER 1
DX AC UNITS WITH HI EFFICIENCY COMPRESSORS

12 NOVEMBER, 1986
ANALYST: S.F.KRSTULOVICH

FERMILAB CONSTRUCTION ENGINEERING SERVICES

SYSTEM INPUT SUMMARY

Job Name : CCF SUBCON 2/4 STD AC SYS Page 1
Building Name : CCF SUBCONSTRUCT 2/4 (Complex) Date : 11-25-86
Site : AURORA,IL FERMI, User Defined 60117862.0
Scope of Analysis : Cooling and Heating Systems

****

A. AIR HANDLING SYSTEMS

>1. PERIMETER TERMINAL TYPE : CONSTANT VOLUME
Supply fan type : Backward inclined or airfoil
Supply fan total static pressure = 2.50 in. wg.
A return fan is not used.
Design supply air= 72000 cfm @ 52 F; Vent. air= 2360 cfm
Are cooling terminals used for heating ? <Y>
An economizer is not used.
Is a ventilation reclaim device used ? <N>
Are ventilation air dampers closed for unoccupied periods ? <N>

****

B. HEATING PLANTS

> 1 . PERIMETER PLANT : ELECTRICAL RESISTANCE
Is hydronic heating used ? <N>

****

SYSTEM INPUT SUMMARY

Job Name : CCF SUBCON 2/4 STD AC SYS — Page 2
Building Name : CCF SUBCONSTRUCT 2/4 (Complex) — Date : 11-25-86
Site : AURORA,IL FERMI, User Defined — 60117862.0
Scope of Analysis : Cooling and Heating Systems

****

C. COOLING PLANTS

>1. PERIMETER PLANT : RECIPROCATING WATER COOLED
Capacity @ 85 F entering water = 120.0 tons
KW/Ton @ 85 F entering water = 0.76 kw/ton
Is hydronic cooling used ? <N>
Is hot gas bypass used ? <Y> ; Minimum percent unloading = 30 %
Is condenser performance altitude adjusted ? <Y>
Is there one compressor per condenser circuit ? <Y>
Are compressors cycled ? <N>
Heat sink type : Open cooling tower
Minimum entering water temperature = 35 F
Is a hydronic economizer used ? <N>

****

D. PUMPING SYSTEMS

System	PERIMETER dT, F	PERIMETER dP, ft wg	dT, F	dP, ft wg
Chilled water	0.00	0.00	0.00	0.00
Hot water	0.00	0.00	0.00	0.00
Condenser water	10.00	117.00	0.00	0.00
Ground water	0.00	0.00	0.00	0.00

****

E. NON-HVAC SYSTEMS

>1. NON-HVAC ELECTRICAL ENERGY USE
Lighting kw: Occupied = 29.8 kw; Unoccupied = 26.8 kw
Misc. kw : Occupied = 200.0 kw; Unoccupied = 200.0 kw
Other kw : Occupied = 0.0 kw; Unoccupied = 0.0 kw

>2. DHW SYSTEM (Not utilized in this system)

****

F. FUEL COSTS

>1. ELECTRICAL ENERGY USE	Period Occupied ($/kwh)	Period Unoccupied ($/kwh)
Compressor	0.050	0.050
Resistance	0.050	0.050
Inductive	0.050	0.050

>2. OTHER FUELS	Unit Cost
Natural Gas	n/a $/therm
Fuel Oil	n/a $/U.S.gal
Propane	n/a $/lb
Remote Heating	n/a $/MBTU
Remote Cooling	n/a $/MBTU

TOTAL BUILDING ENERGY SUMMARY

Job Name : CCF SUBCON 2/4 STD AC SYS
Building Name : CCF SUBCONSTRUCT 2/4 (Complex)
Site : AURORA,IL FERMI, User Defined
Date : 11-25-86

Period : All
Zone : Block
Serial Number:
60117862.0

****

HVAC ENERGY Component	Annual Cost ($/yr)	Energy or Fuel Units Consumed	DOE RUF (1000 BTU)	DOE RIF (1000 BTU)
Electric (Occ)	16101	322015 kwh/yr	3735375	1099037
Electric (Unocc)	27745	554894 kwh/yr	6436773	1893854
Natural Gas	0	0 therms/yr	0	0
Fuel Oil	0	0 U.S. gal/yr	0	0
Propane	0	0 lb/yr	0	0
Remote Heating	0	0 MBTU/yr	0	0
Remote Cooling	0	0 MBTU/yr	0	0
HVAC Total	43845		10172147	2992891
NON-HVAC ENERGY				
Electric (Occ)	35941	718827 kwh/yr	8338395	2453357
Electric (Unocc)	63856	1277111 kwh/yr	14814491	4358781
Non-HVAC Total	99797		23152886	6812138
Grand Total	143642		33325033	9805029
Total/Sq.Ft.	4.83		1119.79	329.47

HVAC Summary:

HVAC Total Cost	=	1.47 $/Sq.Ft./yr
	=	30.52 % of Total Cost
Total HVAC Electrical Energy	=	29.47 kwh/Sq.Ft./yr
	=	30.52 % of Total Electrical Energy
Non-Electrical HVAC Energy	=	0.00 % of Total Energy

Key:

1 kwh	= 11600 BTU RUF; 3412 BTU RIF
1 therm nat gas	= 100000 BTU RUF and RIF
1 U.S. gal oil	= 138700 BTU RUF and RIF
1 Imp. gal oil	= 168000 BTU RUF and RIF
1 lb propane	= 21680 BTU RUF and RIF
RUF	= Resource utilization factor (Source value)
RIF	= Resource impact factor (Point of use value)
MBH	= 1000 BTU/hr
MBTU	= Million BTU

ANNUAL OPERATING COSTS

Job Name : CCF SUBCON 2/4 STD AC SYS Page 1
Building Name : CCF SUBCONSTRUCT 2/4 (Complex) Date : 11-25-86
Site : AURORA,IL FERMI, User Defined 60117862.0
Scope of Analysis : Cooling and Heating Systems

****

A. AIR HANDLING SYSTEMS (ANNUAL FAN OPERATING COST = $17,102)

>1. PERIMETER TERMINAL TYPE : CONSTANT VOLUME

Supply fan type : Backward inclined or airfoil

Supply fan total static pressure = 2.50 in. wg.

A return fan is not used.

Design supply air= 72000 cfm @ 52 F; Vent. air= 2360 cfm

Are cooling terminals used for heating ? <Y>

An economizer is not used.

Is a ventilation reclaim device used ? <N>

Are ventilation air dampers closed for unoccupied periods ? <N>

****

B. HEATING PLANTS (ANNUAL HEATING PLANT OPERATING COST = $0)

> 1 . PERIMETER PLANT : ELECTRICAL RESISTANCE

Is hydronic heating used ? <N>

****

ANNUAL OPERATING COSTS

Job Name : CCF SUBCON 2/4 STD AC SYS
Building Name : CCF SUBCONSTRUCT 2/4 (Complex) Date : 11-25-86
Site : AURORA,IL FERMI, User Defined 60117862.0
Scope of Analysis : Cooling and Heating Systems

****

C. COOLING PLANTS (ANNUAL COOLING PLANT OPERATING COST = $22,325)

>1. PERIMETER PLANT : RECIPROCATING WATER COOLED
Capacity @ 85 F entering water = 120.0 tons
KW/Ton @ 85 F entering water = 0.76 kw/ton
Is hydronic cooling used ? <N>
Is hot gas bypass used ? <Y> ; Minimum percent unloading = 30 %
Is condenser performance altitude adjusted ? <Y>
Is there one compressor per condenser circuit ? <Y>
Are compressors cycled ? <N>
Heat sink type : Open cooling tower
Minimum entering water temperature = 35 F
Is a hydronic economizer used ? <N>

****

D. PUMPING SYSTEMS (ANNUAL PUMP OPERATING COST = $4,418)

System	PERIMETER dT, F	PERIMETER dP, ft wg	dT, F	dP, ft wg
Chilled water	0.00	0.00	0.00	0.00
Hot water	0.00	0.00	0.00	0.00
Condenser water	10.00	117.00	0.00	0.00
Ground water	0.00	0.00	0.00	0.00

****

E. NON-HVAC SYSTEMS (ANNUAL NON-HVAC OPERATING COST = $99,797)

>1. NON-HVAC ELECTRICAL ENERGY USE
Lighting kw: Occupied = 29.8 kw; Unoccupied = 26.8 kw
Misc. kw : Occupied = 200.0 kw; Unoccupied = 200.0 kw
Other kw : Occupied = 0.0 kw; Unoccupied = 0.0 kw

>2. DHW SYSTEM (Not utilized in this system)

****

F. FUEL COSTS (GRAND TOTAL ANNUAL OPERATING COST = $143,642)

>1. ELECTRICAL ENERGY USE	Period Occupied ($/kwh)	Period Unoccupied ($/kwh)
Compressor	0.050	0.050
Resistance	0.050	0.050
Inductive	0.050	0.050

>2. OTHER FUELS	Unit Cost
Natural Gas	n/a $/therm
Fuel Oil	n/a $/U.S.gal
Propane	n/a $/lb
Remote Heating	n/a $/MBTU
Remote Cooling	n/a $/MBTU

COOLING PLANT COSTS

Job Name : CCF SUBCON 2/4 STD AC SYS — Date : 11-25-86

Building Name : CCF SUBCONSTRUCT 2/4 (Complex) — Serial Number:

Site Name : AURORA,IL FERMI, User Defined — 60117862.0

Bin Temp (F)	Bin Hours hr/yr	Perimeter Cooling Plant Coil Load MBH	Input KW	Cost $/yr	No Interior Zone Exists
			OCCUPIED PERIOD		
90	25.8	1416.4	83.0	107.1	
85	59.4	1339.1	78.0	231.7	
80	145.3	1263.3	73.7	535.4	
75	237.7	1188.7	69.5	825.4	
70	270.6	1115.4	65.3	883.1	
65	264.5	1043.1	61.2	808.8	
60	255.0	995.0	58.4	744.8	
55	244.7	947.6	55.7	681.6	
50	232.1	900.2	53.0	615.2	
45	229.5	852.8	50.3	577.3	
40	237.6	805.4	47.6	565.6	
35	238.5	758.0	44.9	535.6	
30	218.2	710.6	42.2	460.5	
25	174.5	663.2	39.5	344.7	
20	122.4	615.8	36.8	225.3	
15	78.1	568.5	34.1	133.2	
10	46.1	521.1	31.4	72.4	
5	25.1	473.7	28.7	36.0	
0	12.7	426.3	26.3	16.7	
-5	6.2	378.9	26.3	8.2	
-6	4.6	369.4	26.3	6.1	
Total Costs				$8414.8	
			UNOCCUPIED PERIOD		
90	14.6	1397.5	81.8	59.7	
85	36.3	1320.9	77.0	139.7	
80	99.3	1245.6	72.7	360.9	
75	215.3	1171.6	68.5	737.1	
70	357.6	1098.7	64.3	1150.1	
65	463.3	1028.5	60.3	1397.4	
60	500.4	981.5	57.6	1442.2	
55	482.0	934.4	55.0	1324.6	
50	447.6	887.3	52.3	1170.0	
45	422.7	840.3	49.6	1048.2	
40	413.7	793.2	46.9	970.5	
35	417.0	746.1	44.2	922.3	
30	417.4	699.1	41.6	867.2	
25	395.2	652.0	38.9	768.1	
20	336.9	604.9	36.2	609.6	
15	252.8	557.9	33.5	423.5	
10	165.7	510.8	30.8	255.4	
5	96.3	463.8	28.1	135.5	
0	50.9	416.7	26.3	67.0	
-5	25.3	369.6	26.3	33.3	
-6	21.1	360.2	26.3	27.8	
Total Costs				$13910.2	

PERIMETER HEATING PLANT COSTS

Job Name : CCF SUBCON 2/4 STD AC SYS — Date : 11-25-86

Building Name : CCF SUBCONSTRUCT 2/4 (Complex) — Serial Number:

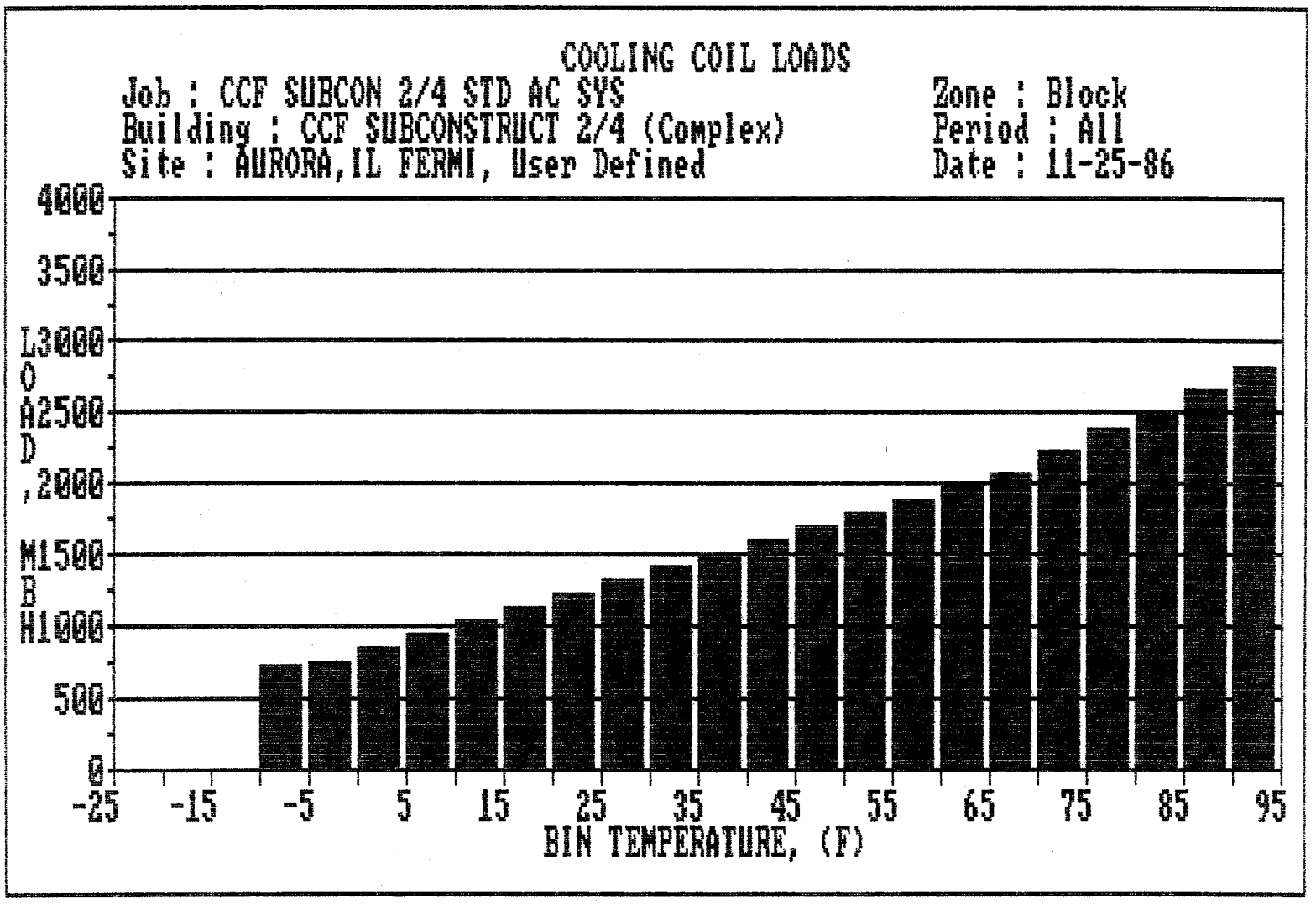
Site Name : AURORA,IL FERMI, User Defined — 60117862.0

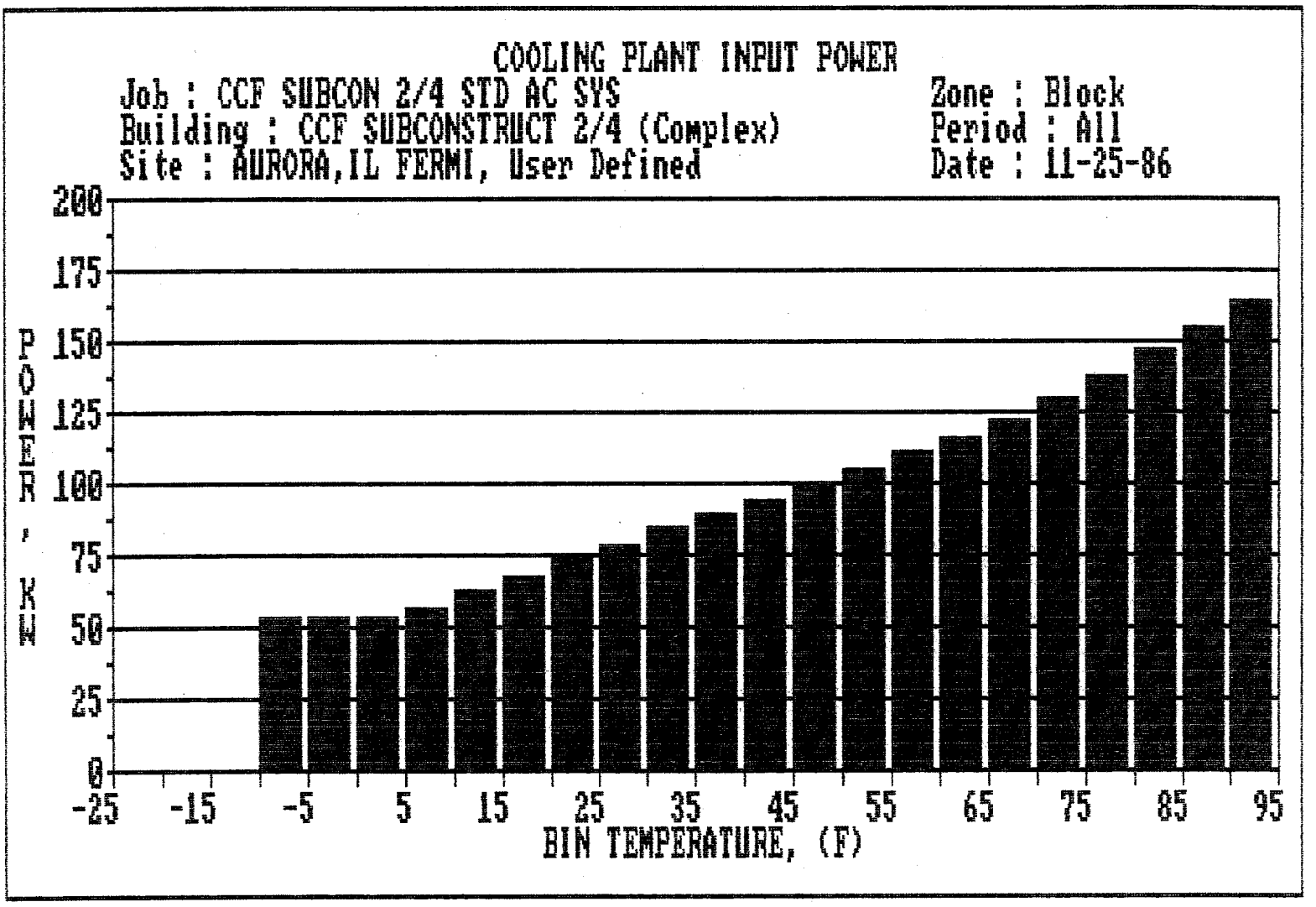
Bin Temp (F)	Bin Hours hr/yr	Coil Load MBH	Primary Plant Output MBH	Input KW	Cost $/yr	No Auxiliary Plant Used
			OCCUPIED PERIOD			
90	25.8	0.0	0.0	0.0	0.0	
85	59.4	0.0	0.0	0.0	0.0	
80	145.3	0.0	0.0	0.0	0.0	
75	237.7	0.0	0.0	0.0	0.0	
70	270.6	0.0	0.0	0.0	0.0	
65	264.5	0.0	0.0	0.0	0.0	
60	255.0	0.0	0.0	0.0	0.0	
55	244.7	0.0	0.0	0.0	0.0	
50	232.1	0.0	0.0	0.0	0.0	
45	229.5	0.0	0.0	0.0	0.0	
40	237.6	0.0	0.0	0.0	0.0	
35	238.5	0.0	0.0	0.0	0.0	
30	218.2	0.0	0.0	0.0	0.0	
25	174.5	0.0	0.0	0.0	0.0	
20	122.4	0.0	0.0	0.0	0.0	
15	78.1	0.0	0.0	0.0	0.0	
10	46.1	0.0	0.0	0.0	0.0	
5	25.1	0.0	0.0	0.0	0.0	
0	12.7	0.0	0.0	0.0	0.0	
-5	6.2	0.0	0.0	0.0	0.0	
-6	4.6	0.0	0.0	0.0	0.0	
Total Costs					$0.0	
			UNOCCUPIED PERIOD			
90	14.6	0.0	0.0	0.0	0.0	
85	36.3	0.0	0.0	0.0	0.0	
80	99.3	0.0	0.0	0.0	0.0	
75	215.3	0.0	0.0	0.0	0.0	
70	357.6	0.0	0.0	0.0	0.0	
65	463.3	0.0	0.0	0.0	0.0	
60	500.4	0.0	0.0	0.0	0.0	
55	482.0	0.0	0.0	0.0	0.0	
50	447.6	0.0	0.0	0.0	0.0	
45	422.7	0.0	0.0	0.0	0.0	
40	413.7	0.0	0.0	0.0	0.0	
35	417.0	0.0	0.0	0.0	0.0	
30	417.4	0.0	0.0	0.0	0.0	
25	395.2	0.0	0.0	0.0	0.0	
20	336.9	0.0	0.0	0.0	0.0	
15	252.8	0.0	0.0	0.0	0.0	
10	165.7	0.0	0.0	0.0	0.0	
5	96.3	0.0	0.0	0.0	0.0	
0	50.9	0.0	0.0	0.0	0.0	
-5	25.3	0.0	0.0	0.0	0.0	
-6	21.1	0.0	0.0	0.0	0.0	
Total Costs					$0.0	

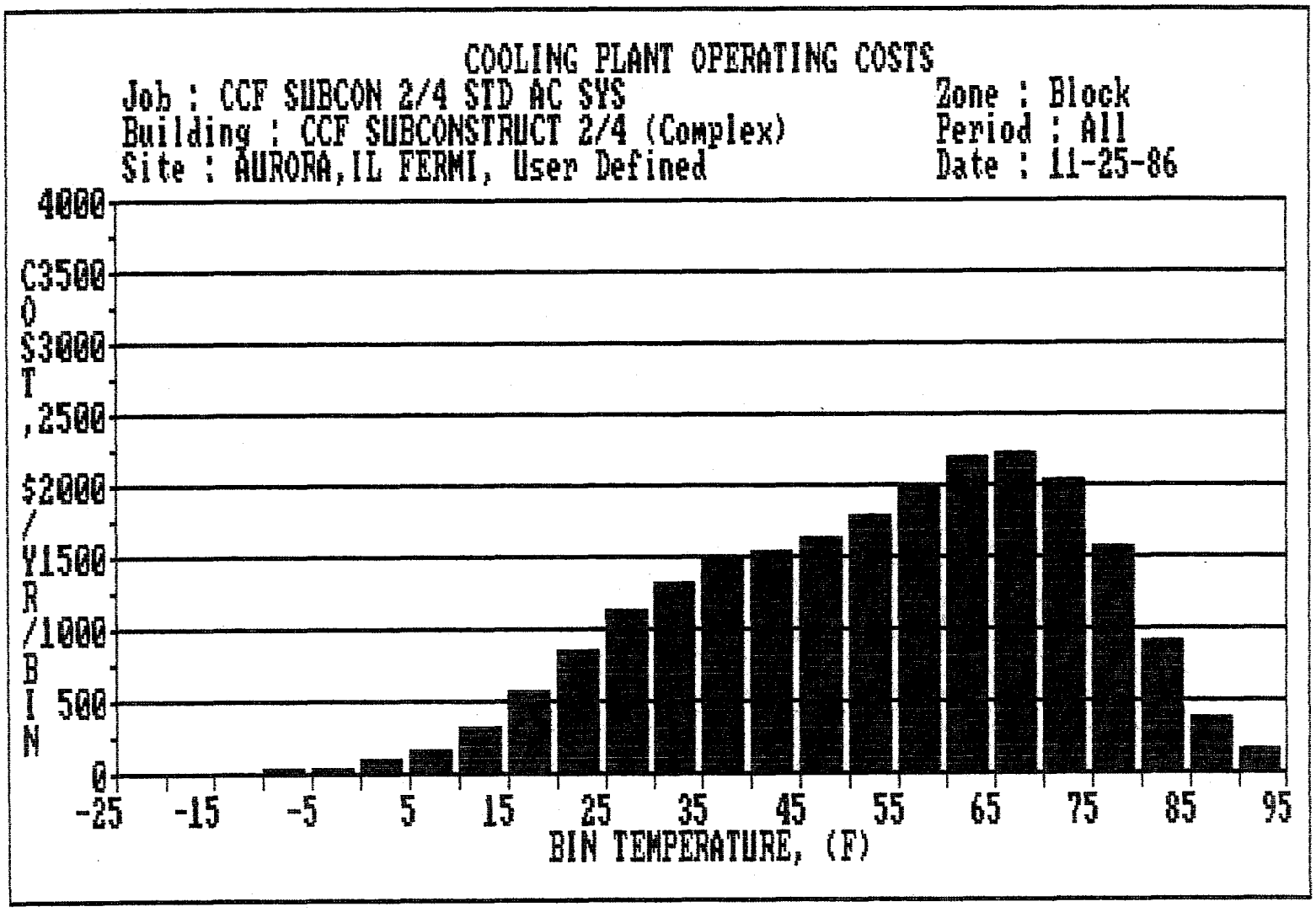
FAN AND PUMP COSTS

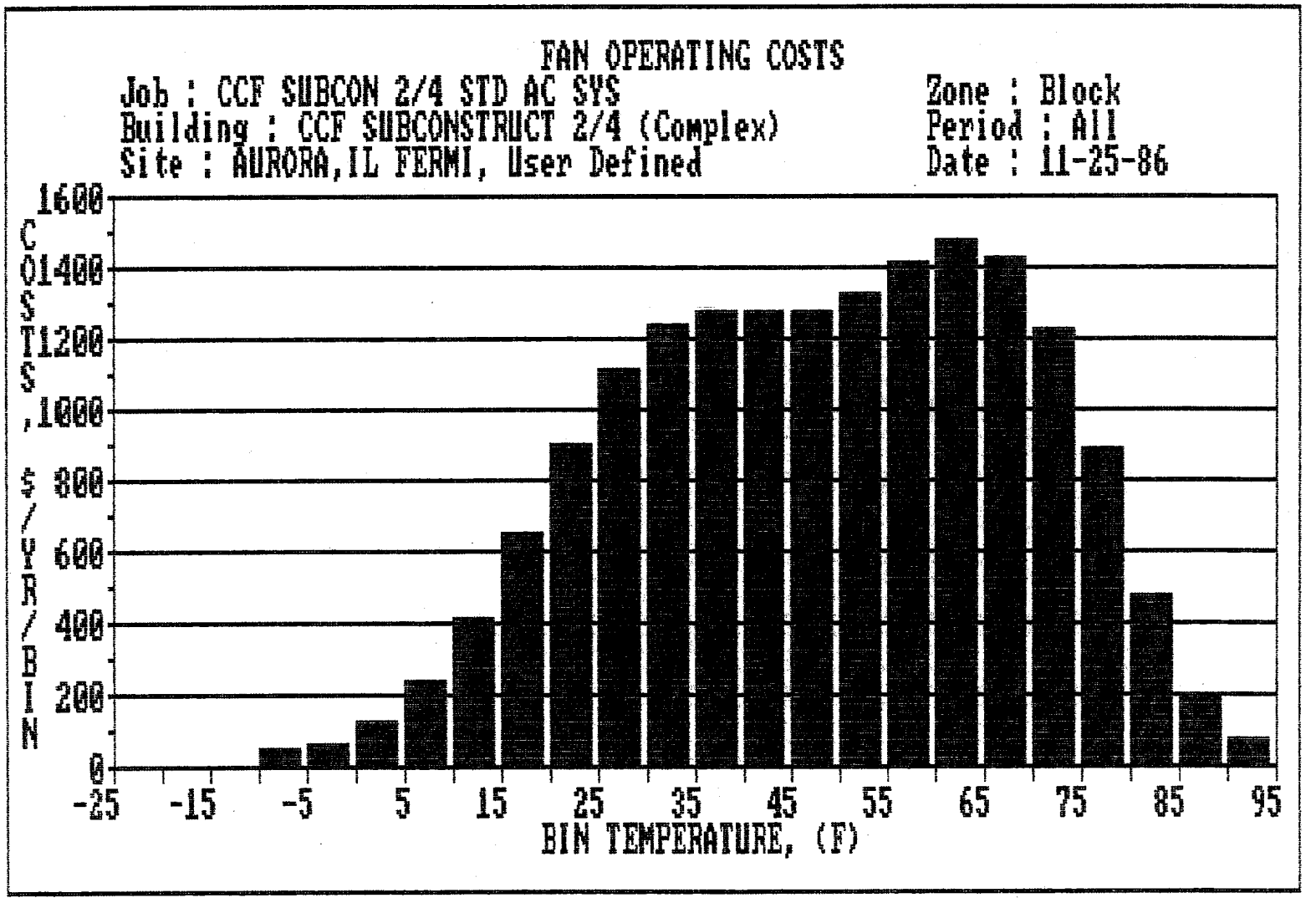
Job Name : CCF SUBCON 2/4 STD AC SYS — Date : 11-25-86
Building Name : CCF SUBCONSTRUCT 2/4 (Complex) — Serial Number:
Site Name : AURORA,IL FERMI, User Defined — 60117862.0

Bin Temp (F)	Bin Hours hr/yr	Perimeter Input KW	Fans Cost $/yr	No Interior Zone	All Pumps Input KW	All Pumps Cost $/yr
OCCUPIED PERIOD						
90	25.8	39.0	50.4		10.1	13.0
85	59.4	39.0	116.0		10.1	30.0
80	145.3	39.0	283.7		10.1	73.3
75	237.7	39.0	464.1		10.1	119.9
70	270.6	39.0	528.3		10.1	136.5
65	264.5	39.0	516.4		10.1	133.4
60	255.0	39.0	497.8		10.1	128.6
55	244.7	39.0	477.7		10.1	123.4
50	232.1	39.0	453.1		10.1	117.1
45	229.5	39.0	448.1		10.1	115.8
40	237.6	39.0	463.9		10.1	119.8
35	238.5	39.0	465.6		10.1	120.3
30	218.2	39.0	426.0		10.1	110.1
25	174.5	39.0	340.7		10.1	88.0
20	122.4	39.0	239.0		10.1	61.7
15	78.1	39.0	152.5		10.1	39.4
10	46.1	39.0	90.0		10.1	23.3
5	25.1	39.0	49.0		10.1	12.7
0	12.7	39.0	24.8		10.1	6.4
-5	6.2	39.0	12.1		10.1	3.1
-6	4.6	39.0	9.0		10.1	2.3
Total Costs			$6107.9			$1578.0
UNOCCUPIED PERIOD						
90	14.6	39.0	28.5		10.1	7.4
85	36.3	39.0	70.9		10.1	18.3
80	99.3	39.0	193.9		10.1	50.1
75	215.3	39.0	420.3		10.1	108.6
70	357.6	39.0	698.1		10.1	180.4
65	463.3	39.0	904.5		10.1	233.7
60	500.4	39.0	976.9		10.1	252.4
55	482.0	39.0	941.0		10.1	243.1
50	447.6	39.0	873.8		10.1	225.8
45	422.7	39.0	825.2		10.1	213.2
40	413.7	39.0	807.7		10.1	208.7
35	417.0	39.0	814.1		10.1	210.3
30	417.4	39.0	814.9		10.1	210.5
25	395.2	39.0	771.5		10.1	199.3
20	336.9	39.0	657.7		10.1	169.9
15	252.8	39.0	493.5		10.1	127.5
10	165.7	39.0	323.5		10.1	83.6
5	96.3	39.0	188.0		10.1	48.6
0	50.9	39.0	99.4		10.1	25.7
-5	25.3	39.0	49.4		10.1	12.8
-6	21.1	39.0	41.2		10.1	10.6
Total Costs			$10994.2			$2840.3


COOLING COIL LOADS
Job : CCF SUBCON 2/4 STD AC SYS
Building : CCF SUBCONSTRUCT 2/4 (Complex)
Site : AURORA,IL FERMI, User Defined
Zone : Block
Period : All
Date : 11-25-86
LOAD, MBH
4000
3500
3000
2500
2000
1500
1000
500
0
-25
-15
-5
5
15
25
35
45
55
65
75
85
95
BIN TEMPERATURE, (F)


COOLING PLANT INPUT POWER
Job : CCF SUBCON 2/4 STD AC SYS
Building : CCF SUBCONSTRUCT 2/4 (Complex)
Site : AURORA,IL FERMI, User Defined
Zone : Block
Period : All
Date : 11-25-86
POWER, KW
200
175
150
125
100
75
50
25
0
-25
-15
-5
5
15
25
35
45
55
65
75
85
95
BIN TEMPERATURE, (F)


COOLING PLANT OPERATING COSTS
Job : CCF SUBCON 2/4 STD AC SYS
Building : CCF SUBCONSTRUCT 2/4 (Complex)
Site : AURORA,IL FERMI, User Defined
Zone : Block
Period : All
Date : 11-25-86
COST, $/YR/BIN
4000
3500
3000
2500
2000
1500
1000
500
0
-25
-15
-5
5
15
25
35
45
55
65
75
85
95
BIN TEMPERATURE, (F)


FAN OPERATING COSTS
Job : CCF SUBCON 2/4 STD AC SYS
Building : CCF SUBCONSTRUCT 2/4 (Complex)
Site : AURORA,IL FERMI, User Defined
Zone : Block
Period : All
Date : 11-25-86
COSTS, $/YR/BIN
1600
1400
1200
1000
800
600
400
200
0
-25
-15
-5
5
15
25
35
45
55
65
75
85
95
BIN TEMPERATURE, (F)

FERMILAB CENTRAL COMPUTING FACILITY

SUBCONSTRUCTION 2/4
OPERATIONAL PERFORMANCE SIMULATION

ALTERNATE COMPARISON SYSTEM NUMBER 2
TYPICAL FY1975 DESIGN
DX AC UNITS WITH STANDARD COMPRESSORS AND COILS

12 NOVEMBER, 1986
ANALYST: S.F.KRSTULOVICH

FERMILAB CONSTRUCTION ENGINEERING SERVICES

SYSTEM INPUT SUMMARY

Job Name : CCF SUBCON 2/4 1975S SYS Page 1
Building Name : CCF SUBCONSTRUCT 2/4 (Complex) Date : 11-25-86
Site : AURORA,IL FERMI, User Defined 60117862.0
Scope of Analysis : Cooling and Heating Systems

****

A. AIR HANDLING SYSTEMS

>1. PERIMETER TERMINAL TYPE : CONSTANT VOLUME

Supply fan type : Backward inclined or airfoil

Supply fan total static pressure = 3.00 in. wg.

A return fan is not used.

Design supply air= 72000 cfm @ 52 F; Vent. air= 2360 cfm

Are cooling terminals used for heating ? <Y>

An economizer is not used.

Is a ventilation reclaim device used ? <N>

Are ventilation air dampers closed for unoccupied periods ? <N>

****

B. HEATING PLANTS

> 1 . PERIMETER PLANT : ELECTRICAL RESISTANCE

Is hydronic heating used ? <N>

****

SYSTEM INPUT SUMMARY

Job Name : CCF SUBCON 2/4 1975S SYS
Building Name : CCF SUBCONSTRUCT 2/4 (Complex) Date : 11-25-86
Site : AURORA,IL FERMI, User Defined 60117862.0
Scope of Analysis : Cooling and Heating Systems

****

C. COOLING PLANTS

>1. PERIMETER PLANT : RECIPROCATING WATER COOLED
Capacity @ 85 F entering water = 120.0 tons
KW/Ton @ 85 F entering water = 0.95 kw/ton
Is hydronic cooling used ? <N>
Is hot gas bypass used ? <Y> ; Minimum percent unloading = 30 %
Is condenser performance altitude adjusted ? <Y>
Is there one compressor per condenser circuit ? <Y>
Are compressors cycled ? <N>
Heat sink type : Open cooling tower
Minimum entering water temperature = 35 F
Is a hydronic economizer used ? <N>

****

D. PUMPING SYSTEMS

System	PERIMETER dT, F	PERIMETER dP, ft wg	dT, F	dP, ft wg
Chilled water	0.00	0.00	0.00	0.00
Hot water	0.00	0.00	0.00	0.00
Condenser water	10.00	117.00	0.00	0.00
Ground water	0.00	0.00	0.00	0.00

****

E. NON-HVAC SYSTEMS

>1. NON-HVAC ELECTRICAL ENERGY USE
Lighting kw: Occupied = 29.8 kw; Unoccupied = 26.8 kw
Misc. kw : Occupied = 200.0 kw; Unoccupied = 200.0 kw
Other kw : Occupied = 0.0 kw; Unoccupied = 0.0 kw

>2. DHW SYSTEM (Not utilized in this system)

****

F. FUEL COSTS

>1. ELECTRICAL ENERGY USE	Period Occupied ($/kwh)	Period Unoccupied ($/kwh)
Compressor	0.050	0.050
Resistance	0.050	0.050
Inductive	0.050	0.050

>2. OTHER FUELS	Unit Cost
Natural Gas	n/a $/therm
Fuel Oil	n/a $/U.S.gal
Propane	n/a $/lb
Remote Heating	n/a $/MBTU
Remote Cooling	n/a $/MBTU

TOTAL BUILDING ENERGY SUMMARY

Job Name : CCF SUBCON 2/4 1975S SYS
Building Name : CCF SUBCONSTRUCT 2/4 (Complex)
Site : AURORA,IL FERMI, User Defined
Date : 11-25-86

Period : All
Zone : Block
Serial Number:
60117862.0

****

HVAC ENERGY Component	Annual Cost ($/yr)	Energy or Fuel Units Consumed	DOE RUF (1000 BTU)	DOE RIF (1000 BTU)
Electric (Occ)	19742	394831 kwh/yr	4580044	1347559
Electric (Unocc)	33979	679575 kwh/yr	7883073	2319390
Natural Gas	0	0 therms/yr	0	0
Fuel Oil	0	0 U.S. gal/yr	0	0
Propane	0	0 lb/yr	0	0
Remote Heating	0	0 MBTU/yr	0	0
Remote Cooling	0	0 MBTU/yr	0	0
HVAC Total	53720		12463117	3666950
NON-HVAC ENERGY				
Electric (Occ)	35941	718827 kwh/yr	8338395	2453357
Electric (Unocc)	63856	1277111 kwh/yr	14814491	4358781
Non-HVAC Total	99797		23152886	6812138
Grand Total	153517		35616003	10479088
Total/Sq.Ft.	5.16		1196.77	352.12

HVAC Summary:

HVAC Total Cost	=	1.81	$/Sq.Ft./yr
	=	34.99	% of Total Cost
Total HVAC Electrical Energy	=	36.10	kwh/Sq.Ft./yr
	=	34.99	% of Total Electrical Energy
Non-Electrical HVAC Energy	=	0.00	% of Total Energy

Key:

1 kwh	= 11600 BTU RUF; 3412 BTU RIF
1 therm nat gas	= 100000 BTU RUF and RIF
1 U.S. gal oil	= 138700 BTU RUF and RIF
1 Imp. gal oil	= 168000 BTU RUF and RIF
1 lb propane	= 21680 BTU RUF and RIF
RUF	= Resource utilization factor (Source value)
RIF	= Resource impact factor (Point of use value)
MBH	= 1000 BTU/hr
MBTU	= Million BTU

ANNUAL OPERATING COSTS

Job Name : CCF SUBCON 2/4 1975S SYS
Building Name : CCF SUBCONSTRUCT 2/4 (Complex) Date : 11-25-86
Site : AURORA,IL FERMI, User Defined 60117862.0
Scope of Analysis : Cooling and Heating Systems

****

A. AIR HANDLING SYSTEMS (ANNUAL FAN OPERATING COST = $20,523)

>1. PERIMETER TERMINAL TYPE : CONSTANT VOLUME

Supply fan type : Backward inclined or airfoil

Supply fan total static pressure = 3.00 in. wg.

A return fan is not used.

Design supply air= 72000 cfm @ 52 F; Vent. air= 2360 cfm

Are cooling terminals used for heating ? <Y>

An economizer is not used.

Is a ventilation reclaim device used ? <N>

Are ventilation air dampers closed for unoccupied periods ? <N>

****

B. HEATING PLANTS (ANNUAL HEATING PLANT OPERATING COST = $0)

> 1 . PERIMETER PLANT : ELECTRICAL RESISTANCE

Is hydronic heating used ? <N>

****

ANNUAL OPERATING COSTS

Job Name : CCF SUBCON 2/4 1975S SYS
Building Name : CCF SUBCONSTRUCT 2/4 (Complex) Date : 11-25-86
Site : AURORA,IL FERMI, User Defined 60117862.0
Scope of Analysis : Cooling and Heating Systems

****

C. COOLING PLANTS (ANNUAL COOLING PLANT OPERATING COST = $28,583)

>1. PERIMETER PLANT : RECIPROCATING WATER COOLED
Capacity @ 85 F entering water = 120.0 tons
KW/Ton @ 85 F entering water = 0.95 kw/ton
Is hydronic cooling used ? <N>
Is hot gas bypass used ? <Y> ; Minimum percent unloading = 30 %
Is condenser performance altitude adjusted ? <Y>
Is there one compressor per condenser circuit ? <Y>
Are compressors cycled ? <N>
Heat sink type : Open cooling tower
Minimum entering water temperature = 35 F
Is a hydronic economizer used ? <N>

****

D. PUMPING SYSTEMS (ANNUAL PUMP OPERATING COST = $4,615)

System	PERIMETER dT, F	PERIMETER dP, ft wg	dT, F	dP, ft wg
Chilled water	0.00	0.00	0.00	0.00
Hot water	0.00	0.00	0.00	0.00
Condenser water	10.00	117.00	0.00	0.00
Ground water	0.00	0.00	0.00	0.00

****

E. NON-HVAC SYSTEMS (ANNUAL NON-HVAC OPERATING COST = $99,797)

>1. NON-HVAC ELECTRICAL ENERGY USE
Lighting kw: Occupied = 29.8 kw; Unoccupied = 26.8 kw
Misc. kw : Occupied = 200.0 kw; Unoccupied = 200.0 kw
Other kw : Occupied = 0.0 kw; Unoccupied = 0.0 kw

>2. DHW SYSTEM (Not utilized in this system)

****

F. FUEL COSTS (GRAND TOTAL ANNUAL OPERATING COST = $153,517)

>1. ELECTRICAL ENERGY USE	Period Occupied ($/kwh)	Period Unoccupied ($/kwh)
Compressor	0.050	0.050
Resistance	0.050	0.050
Inductive	0.050	0.050

>2. OTHER FUELS	Unit Cost
Natural Gas	n/a $/therm
Fuel Oil	n/a $/U.S.gal
Propane	n/a $/lb
Remote Heating	n/a $/MBTU
Remote Cooling	n/a $/MBTU

COOLING PLANT COSTS

Job Name : CCF SUBCON 2/4 1975S SYS — Date : 11-25-86
Building Name : CCF SUBCONSTRUCT 2/4 (Complex) — Serial Number:
Site Name : AURORA,IL FERMI, User Defined — 60117862.0

Bin Temp (F)	Bin Hours hr/yr	Perimeter Coil Load MBH	Cooling Plant Input KW	Cost $/yr	No Interior Zone Exists
			OCCUPIED PERIOD		
90	25.8	1444.2	105.6	136.2	
85	59.4	1367.0	99.2	294.5	
80	145.3	1291.2	93.8	681.2	
75	237.7	1216.7	88.5	1051.3	
70	270.6	1143.3	83.2	1126.1	
65	264.5	1071.1	78.1	1032.7	
60	255.0	1021.6	74.6	950.7	
55	244.7	974.2	71.2	871.0	
50	232.1	926.8	67.8	786.9	
45	229.5	879.5	64.4	739.4	
40	237.6	832.1	61.1	725.4	
35	238.5	784.7	57.7	687.9	
30	218.2	737.3	54.3	592.5	
25	174.5	689.9	50.9	444.4	
20	122.4	642.5	47.6	291.1	
15	78.1	595.1	44.2	172.5	
10	46.1	547.7	40.8	94.1	
5	25.1	500.3	37.4	47.0	
0	12.7	452.9	34.1	21.6	
-5	6.2	405.5	32.6	10.1	
-6	4.6	396.1	32.6	7.5	
Total Costs				$10763.9	
			UNOCCUPIED PERIOD		
90	14.6	1425.4	104.1	76.0	
85	36.3	1348.8	97.9	177.6	
80	99.3	1273.5	92.5	459.3	
75	215.3	1199.5	87.2	939.1	
70	357.6	1126.7	82.0	1467.0	
65	463.3	1055.2	77.0	1782.6	
60	500.4	1008.1	73.6	1841.4	
55	482.0	961.0	70.2	1692.9	
50	447.6	914.0	66.9	1497.1	
45	422.7	866.9	63.5	1343.0	
40	413.7	819.9	60.2	1245.0	
35	417.0	772.8	56.8	1185.1	
30	417.4	725.7	53.5	1116.2	
25	395.2	678.7	50.1	990.6	
20	336.9	631.6	46.8	788.0	
15	252.8	584.5	43.4	548.9	
10	165.7	537.5	40.1	332.0	
5	96.3	490.4	36.7	176.8	
0	50.9	443.3	33.4	84.9	
-5	25.3	396.3	32.6	41.2	
-6	21.1	386.9	32.6	34.4	
Total Costs				$17819.3	

PERIMETER HEATING PLANT COSTS

Job Name : CCF SUBCON 2/4 1975S SYS — Date : 11-25-86

Building Name : CCF SUBCONSTRUCT 2/4 (Complex) — Serial Number:

Site Name : AURORA,IL FERMI, User Defined — 60117862.0

Bin Temp (F)	Bin Hours hr/yr	Coil Load MBH	Primary Plant Output MBH	Input KW	Cost $/yr	No Auxiliary Plant Used
			OCCUPIED PERIOD			
90	25.8	0.0	0.0	0.0	0.0	
85	59.4	0.0	0.0	0.0	0.0	
80	145.3	0.0	0.0	0.0	0.0	
75	237.7	0.0	0.0	0.0	0.0	
70	270.6	0.0	0.0	0.0	0.0	
65	264.5	0.0	0.0	0.0	0.0	
60	255.0	0.0	0.0	0.0	0.0	
55	244.7	0.0	0.0	0.0	0.0	
50	232.1	0.0	0.0	0.0	0.0	
45	229.5	0.0	0.0	0.0	0.0	
40	237.6	0.0	0.0	0.0	0.0	
35	238.5	0.0	0.0	0.0	0.0	
30	218.2	0.0	0.0	0.0	0.0	
25	174.5	0.0	0.0	0.0	0.0	
20	122.4	0.0	0.0	0.0	0.0	
15	78.1	0.0	0.0	0.0	0.0	
10	46.1	0.0	0.0	0.0	0.0	
5	25.1	0.0	0.0	0.0	0.0	
0	12.7	0.0	0.0	0.0	0.0	
-5	6.2	0.0	0.0	0.0	0.0	
-6	4.6	0.0	0.0	0.0	0.0	
Total Costs					$0.0	
			UNOCCUPIED PERIOD			
90	14.6	0.0	0.0	0.0	0.0	
85	36.3	0.0	0.0	0.0	0.0	
80	99.3	0.0	0.0	0.0	0.0	
75	215.3	0.0	0.0	0.0	0.0	
70	357.6	0.0	0.0	0.0	0.0	
65	463.3	0.0	0.0	0.0	0.0	
60	500.4	0.0	0.0	0.0	0.0	
55	482.0	0.0	0.0	0.0	0.0	
50	447.6	0.0	0.0	0.0	0.0	
45	422.7	0.0	0.0	0.0	0.0	
40	413.7	0.0	0.0	0.0	0.0	
35	417.0	0.0	0.0	0.0	0.0	
30	417.4	0.0	0.0	0.0	0.0	
25	395.2	0.0	0.0	0.0	0.0	
20	336.9	0.0	0.0	0.0	0.0	
15	252.8	0.0	0.0	0.0	0.0	
10	165.7	0.0	0.0	0.0	0.0	
5	96.3	0.0	0.0	0.0	0.0	
0	50.9	0.0	0.0	0.0	0.0	
-5	25.3	0.0	0.0	0.0	0.0	
-6	21.1	0.0	0.0	0.0	0.0	
Total Costs					$0.0	

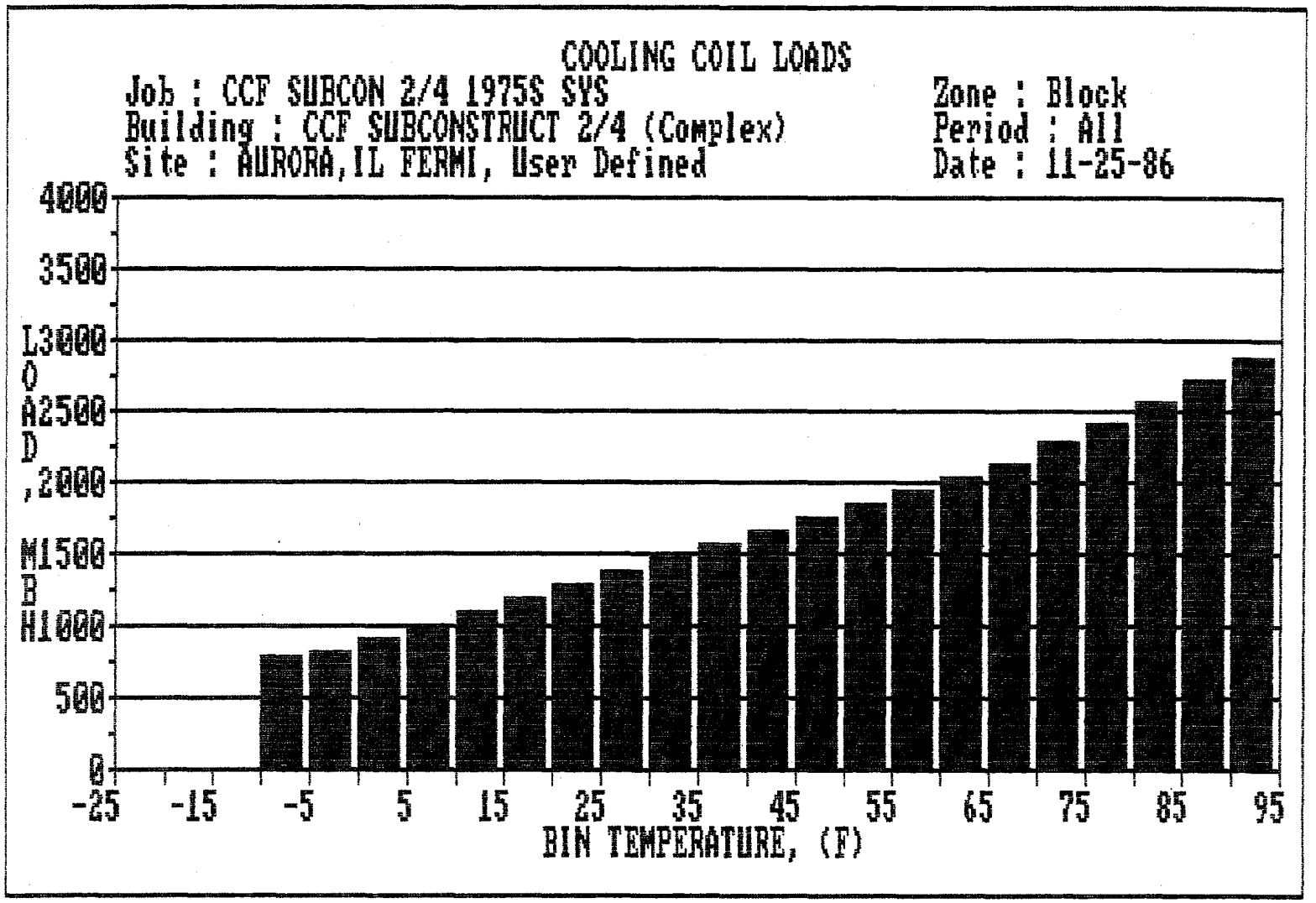
FAN AND PUMP COSTS

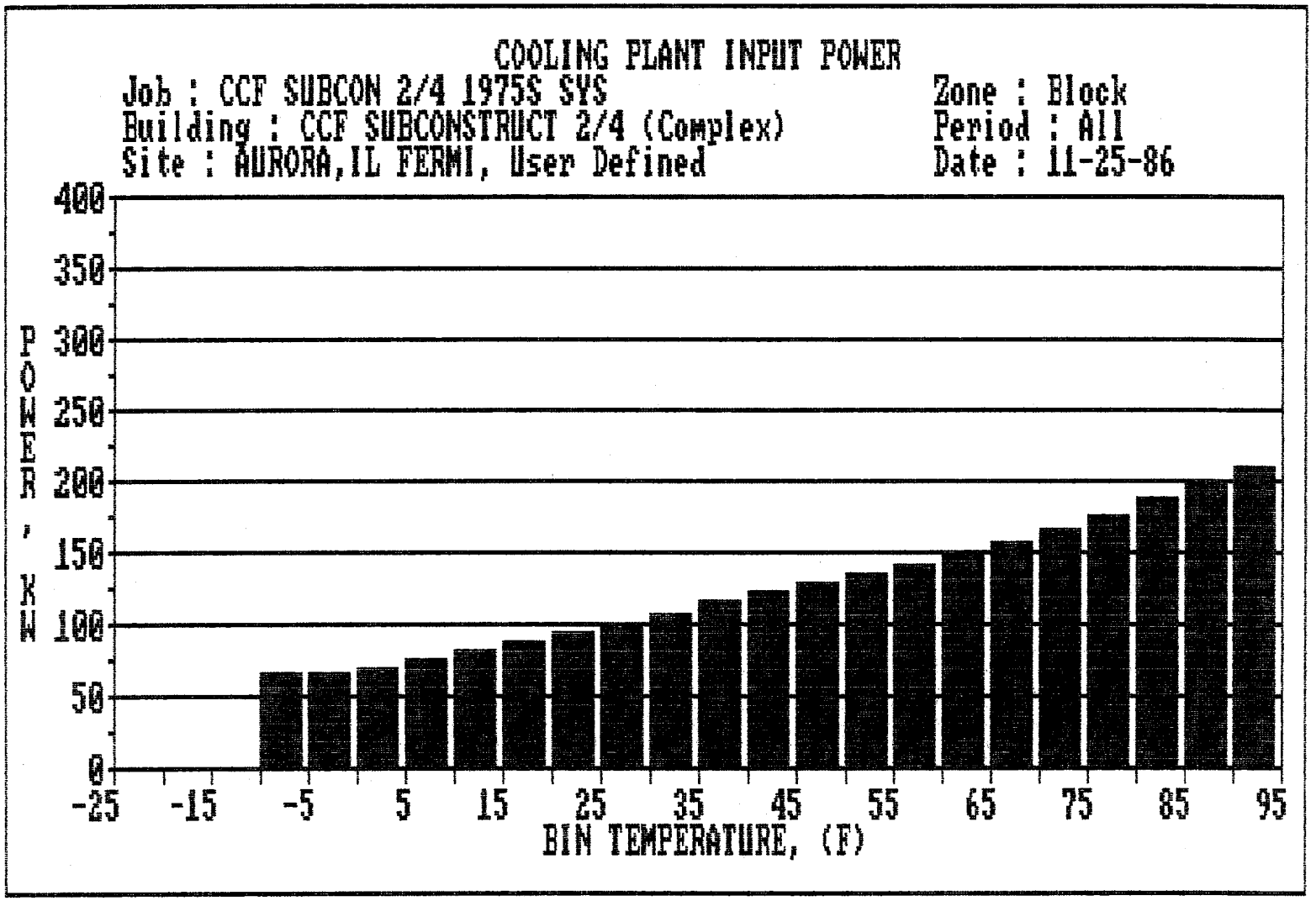
Job Name : CCF SUBCON 2/4 1975S SYS — Date : 11-25-86

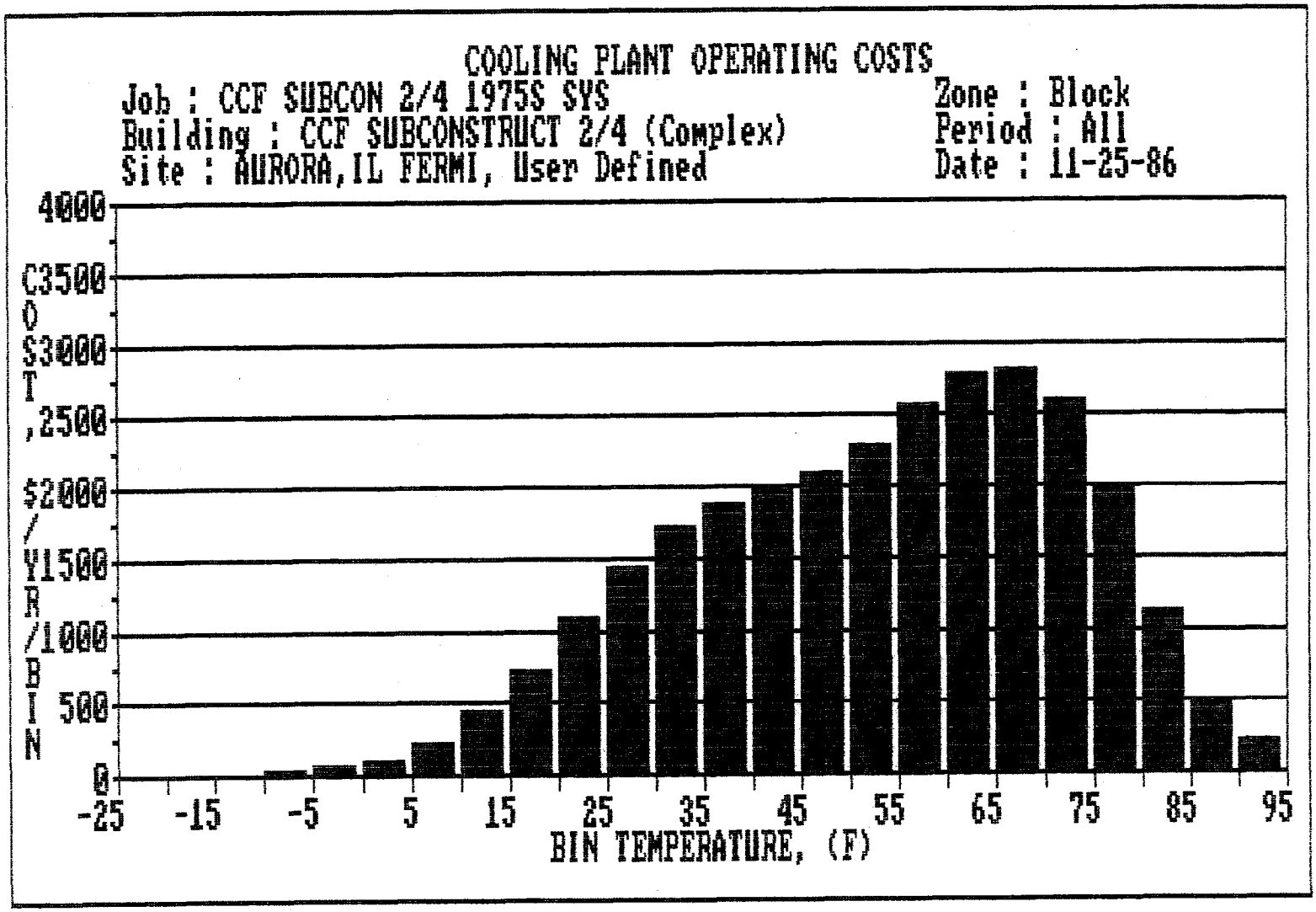
Building Name : CCF SUBCONSTRUCT 2/4 (Complex) — Serial Number: 60117862.0

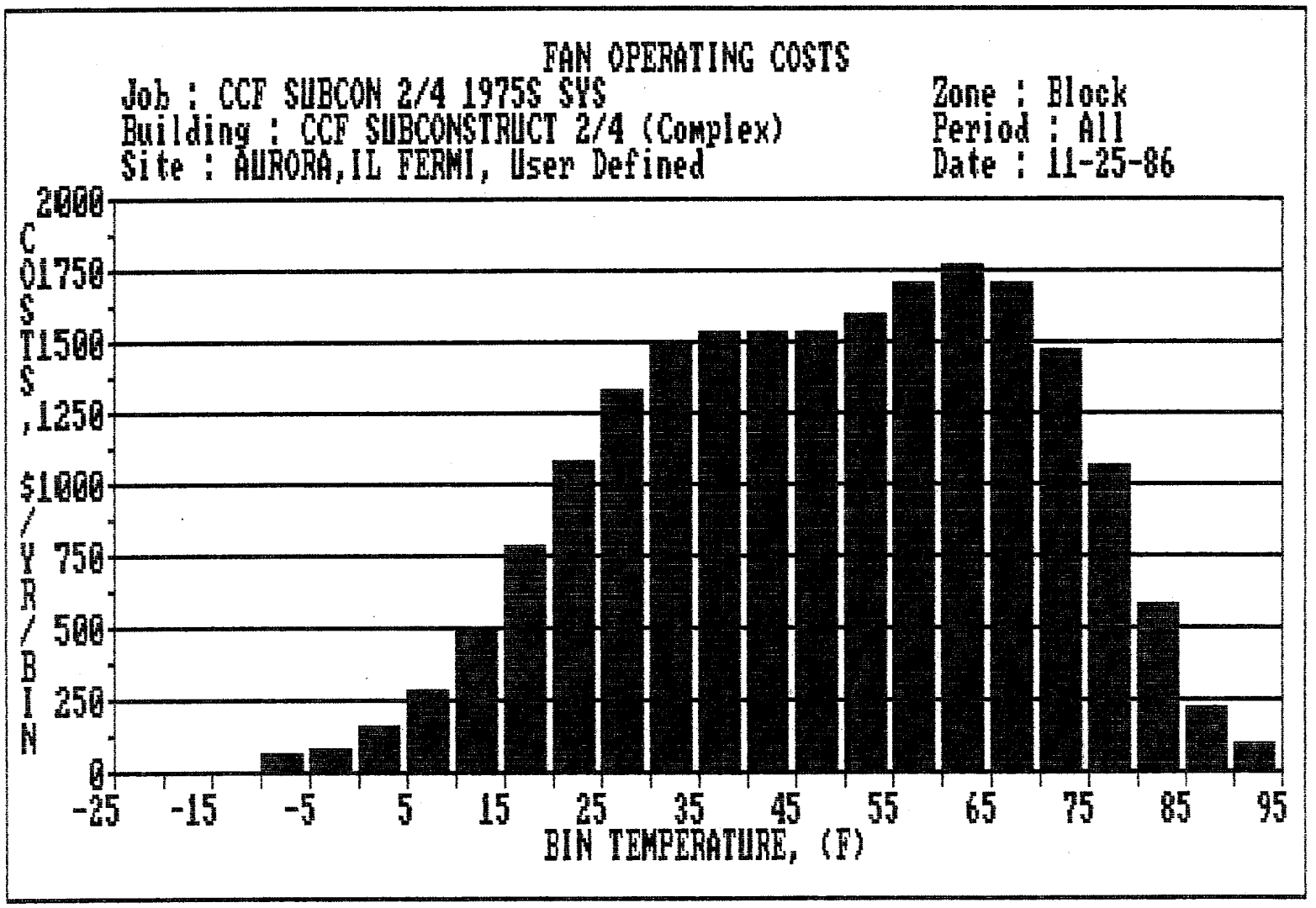
Site Name : AURORA,IL FERMI, User Defined

Bin Temp (F)	Bin Hours hr/yr	Perimeter Input KW	Fans Cost $/yr	No Interior Zone	All Pumps Input KW	All Pumps Cost $/yr
OCCUPIED PERIOD						
90	25.8	46.9	60.4		10.5	13.6
85	59.4	46.9	139.2		10.5	31.3
80	145.3	46.9	340.4		10.5	76.5
75	237.7	46.9	556.9		10.5	125.2
70	270.6	46.9	633.9		10.5	142.5
65	264.5	46.9	619.7		10.5	139.3
60	255.0	46.9	597.4		10.5	134.3
55	244.7	46.9	573.3		10.5	128.9
50	232.1	46.9	543.8		10.5	122.3
45	229.5	46.9	537.7		10.5	120.9
40	237.6	46.9	556.6		10.5	125.2
35	238.5	46.9	558.7		10.5	125.6
30	218.2	46.9	511.2		10.5	114.9
25	174.5	46.9	408.8		10.5	91.9
20	122.4	46.9	286.8		10.5	64.5
15	78.1	46.9	183.0		10.5	41.1
10	46.1	46.9	108.0		10.5	24.3
5	25.1	46.9	58.8		10.5	13.2
0	12.7	46.9	29.8		10.5	6.7
-5	6.2	46.9	14.5		10.5	3.3
-6	4.6	46.9	10.8		10.5	2.4
Total Costs			$7329.5			$1648.1
UNOCCUPIED PERIOD						
90	14.6	46.9	34.2		10.5	7.7
85	36.3	46.9	85.0		10.5	19.1
80	99.3	46.9	232.6		10.5	52.3
75	215.3	46.9	504.4		10.5	113.4
70	357.6	46.9	837.8		10.5	188.4
65	463.3	46.9	1085.4		10.5	244.1
60	500.4	46.9	1172.3		10.5	263.6
55	482.0	46.9	1129.2		10.5	253.9
50	447.6	46.9	1048.6		10.5	235.8
45	422.7	46.9	990.3		10.5	222.7
40	413.7	46.9	969.2		10.5	217.9
35	417.0	46.9	976.9		10.5	219.7
30	417.4	46.9	977.9		10.5	219.9
25	395.2	46.9	925.9		10.5	208.2
20	336.9	46.9	789.3		10.5	177.5
15	252.8	46.9	592.2		10.5	133.2
10	165.7	46.9	388.2		10.5	87.3
5	96.3	46.9	225.6		10.5	50.7
0	50.9	46.9	119.2		10.5	26.8
-5	25.3	46.9	59.3		10.5	13.3
-6	21.1	46.9	49.4		10.5	11.1
Total Costs			$13193.0			$2966.5


COOLING COIL LOADS
Job : CCF SUBCON 2/4 1975S SYS
Building : CCF SUBCONSTRUCT 2/4 (Complex)
Site : AURORA,IL FERMI, User Defined
Zone : Block
Period : All
Date : 11-25-86
LOAD, MBH
4000
3500
3000
2500
2000
1500
1000
500
0
-25
-15
-5
5
15
25
35
45
55
65
75
85
95
BIN TEMPERATURE, (F)


COOLING PLANT INPUT POWER
Job : CCF SUBCON 2/4 1975$ SYS
Building : CCF SUBCONSTRUCT 2/4 (Complex)
Site : AURORA,IL FERMI, User Defined
Zone : Block
Period : All
Date : 11-25-86
POWER, KW
400
350
300
250
200
150
100
50
0
-25
-15
-5
5
15
25
35
45
55
65
75
85
95
BIN TEMPERATURE, (F)


COOLING PLANT OPERATING COSTS
Job : CCF SUBCON 2/4 1975S SYS
Building : CCF SUBCONSTRUCT 2/4 (Complex)
Site : AURORA,IL FERMI, User Defined
Zone : Block
Period : All
Date : 11-25-86
COST, $/YR/BIN
4000
3500
3000
2500
2000
1500
1000
500
0
-25
-15
-5
5
15
25
35
45
55
65
75
85
95
BIN TEMPERATURE, (F)


FAN OPERATING COSTS
Job : CCF SUBCON 2/4 1975$ SYS
Building : CCF SUBCONSTRUCT 2/4 (Complex)
Site : AURORA,IL FERMI, User Defined
Zone : Block
Period : All
Date : 11-25-86
COSTS, $/YR/BIN
2000
1750
1500
1250
1000
750
500
250
0
-25
-15
-5
5
15
25
35
45
55
65
75
85
95
BIN TEMPERATURE, (F)

FERMILAB CENTRAL COMPUTING FACILITY

SUBCONSTRUCTION 2/4
SYSTEMS LIFE CYCLE COST ANALYSIS
AND
PAYBACK CALCULATIONS

12 NOVEMBER, 1986

ANALYST: S.F.KRSTULOVICH

FERMILAB CONSTRUCTION ENGINEERING SERVICES

FERMILAB CENTRAL COMPUTING FACILITY

SUBCONSTRUCTION 2/4
LIFE CYCLE COST ANALYSIS
FOR
DESIGN BASIS SYSTEM
DX AC UNITS WITH FREE COOLING AND FOUR STEP HI-EFF. COMPRESSORS

12 NOVEMBER,1986
ANALYST: S.F.KRSTULOVICH

FERMILAB CONSTRUCTION ENGINEERING SERVICES

PROJECT NAME : CCF SUBCON 2/4 DESIGN SYS
ANALYST : S.F.KRSTULOVICH
COMMENTS : $387000 PER UNIT COSTS

ESTIMATE YEAR : 1986
COMMISSION YEAR : 1988
LAST STUDY YEAR : 2008

**** NON-FINANCED CASH DEBITS/CREDITS ****

YEAR	AMOUNT
1986	387000.00

**** FINANCE INSTRUMENTS ****

NOTE 1 PRINCIPAL (1986 EST.) = $ 0.00
(0 EST.) = $ 0.00
INSTRUMENT = NONE

NOTE 2 PRINCIPAL (1986 EST.) = $ 0.00
(0 EST.) = $ 0.00
INSTRUMENT = NONE

**** FUEL COSTS ****

1986 EST. OF FUEL 1 = $ 27699.00 (ELEC.)
2 = $ 0.00
3 = $ 0.00

**** MAINTENANCE COST ****

1986 EST. OF MAINT. = $ 2000.00

**** DISCOUNT/INTEREST/ESCALATION RATES ****

		FINANCE %		ESCALATION %			
YEAR	% DISC.	LOAN1	LOAN2	FUEL1	FUEL2	FUEL3	MAIN.
1986	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1987	7.90	0.00	0.00	8.40	0.00	0.00	9.00
1988	7.90	0.00	0.00	8.40	0.00	0.00	9.00
1989	7.90	0.00	0.00	8.80	0.00	0.00	9.00
1990	7.90	0.00	0.00	8.80	0.00	0.00	9.00
1991	7.90	0.00	0.00	8.80	0.00	0.00	9.00
1992	7.90	0.00	0.00	8.80	0.00	0.00	9.00
1993	7.90	0.00	0.00	8.80	0.00	0.00	9.00
1994	7.90	0.00	0.00	8.80	0.00	0.00	9.00
1995	7.90	0.00	0.00	8.80	0.00	0.00	9.00
1996	7.90	0.00	0.00	8.80	0.00	0.00	9.00
1997	7.90	0.00	0.00	8.80	0.00	0.00	9.00
1998	7.90	0.00	0.00	8.80	0.00	0.00	9.00
1999	7.90	0.00	0.00	8.80	0.00	0.00	9.00
2000	7.90	0.00	0.00	8.80	0.00	0.00	9.00
2001	7.90	0.00	0.00	8.80	0.00	0.00	9.00
2002	7.90	0.00	0.00	8.80	0.00	0.00	9.00
2003	7.90	0.00	0.00	8.80	0.00	0.00	9.00
2004	7.90	0.00	0.00	8.80	0.00	0.00	9.00
2005	7.90	0.00	0.00	8.80	0.00	0.00	9.00
2006	7.90	0.00	0.00	8.80	0.00	0.00	9.00
2007	7.90	0.00	0.00	8.80	0.00	0.00	9.00
2008	7.90	0.00	0.00	8.80	0.00	0.00	9.00

**** UNIFIED PRESENT WORTH LIFE CYCLE COST ****

PROJECT NAME : CCF SUBCON 2/4 DESIGN SYS
ANALYST NAME : S.F.KRSTULOVICH
COMMENTS : $387000 PER UNIT COSTS

YEAR		1986	1987	1988	1989	1990
CASH	$	387000.00	0.00	0.00	0.00	0.00
MORT.1	$	0.00	0.00	0.00	0.00	0.00
MORT.2	$	0.00	0.00	0.00	0.00	0.00
FUEL 1	$	0.00	0.00	27956.30	28189.49	28424.62
FUEL 2	$	0.00	0.00	0.00	0.00	0.00
FUEL 3	$	0.00	0.00	0.00	0.00	0.00
MAINT.	$	0.00	0.00	2040.99	2061.79	2082.81
YEAR'S	$	387000.00	0.00	29997.29	30251.28	30507.43
CUM.	$	387000.00	387000.00	416997.28	447248.56	477756.00

YEAR		1991	1992	1993	1994	1995
CASH	$	0.00	0.00	0.00	0.00	0.00
MORT.1	$	0.00	0.00	0.00	0.00	0.00
MORT.2	$	0.00	0.00	0.00	0.00	0.00
FUEL 1	$	28661.71	28900.78	29141.85	29384.92	29630.02
FUEL 2	$	0.00	0.00	0.00	0.00	0.00
FUEL 3	$	0.00	0.00	0.00	0.00	0.00
MAINT.	$	2104.05	2125.50	2147.16	2169.05	2191.17
YEAR'S	$	30765.76	31026.28	31289.01	31553.98	31821.19
CUM.	$	508521.75	539548.00	570837.00	602391.00	634212.19

YEAR		1996	1997	1998	1999	2000
CASH	$	0.00	0.00	0.00	0.00	0.00
MORT.1	$	0.00	0.00	0.00	0.00	0.00
MORT.2	$	0.00	0.00	0.00	0.00	0.00
FUEL 1	$	29877.17	30126.38	30377.67	30631.05	30886.55
FUEL 2	$	0.00	0.00	0.00	0.00	0.00
FUEL 3	$	0.00	0.00	0.00	0.00	0.00
MAINT.	$	2213.51	2236.07	2258.87	2281.90	2305.16
YEAR'S	$	32090.68	32362.45	32636.54	32912.95	33191.70
CUM.	$	666302.88	698665.31	731301.88	764214.81	797406.50

YEAR		2001	2002	2003	2004	2005
CASH	$	0.00	0.00	0.00	0.00	0.00
MORT.1	$	0.00	0.00	0.00	0.00	0.00
MORT.2	$	0.00	0.00	0.00	0.00	0.00
FUEL 1	$	31144.17	31403.95	31665.89	31930.02	32196.35
FUEL 2	$	0.00	0.00	0.00	0.00	0.00
FUEL 3	$	0.00	0.00	0.00	0.00	0.00
MAINT.	$	2328.66	2352.40	2376.38	2400.61	2425.08
YEAR'S	$	33472.83	33756.35	34042.27	34330.63	34621.43
CUM.	$	830879.31	864635.69	898677.94	933008.56	967630.00

YEAR		2006	2007	2008	2009	2010
CASH	$	0.00	0.00	0.00	0.00	0.00
MORT.1	$	0.00	0.00	0.00	0.00	0.00
MORT.2	$	0.00	0.00	0.00	0.00	0.00
FUEL 1	$	32464.90	32735.69	33008.74	0.00	0.00
FUEL 2	$	0.00	0.00	0.00	0.00	0.00
FUEL 3	$	0.00	0.00	0.00	0.00	0.00
MAINT.	$	2449.80	2474.78	2500.01	0.00	0.00
YEAR'S	$	34914.70	35210.47	35508.75	0.00	0.00
CUM.	$	1002544.69	1037755.12	1073263.88	1073263.88	1073263.88

FERMILAB COST ESTIMATE	PROJECT TITLE: CENTRAL COMPUTING FACILITY - TITLE 2 PHASE 2 - SUPERSTRUCTURE	PROJECT NO. 10-5-3	DATE 10 SEPT. 86	REVISION DATE 16 SEPT. 86	PAGE 19/27
SECTION CES	QUANTITIES BY JG	PRICES BY JG	CHECKED BY WN		

DISTRIBUTION OF ITEMIZED COST

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	(1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
8.3	COOLING/HEATING WATER SYSTEM								
	CHILLERS 100 TON REFRIG.	2	EA	31,000	62,000				
	INSTALL CHILLERS	2	EA	6,000	12,000				
	HT. EXCHANGER, CHW. PLATE & FR. 300GPM	1	EA		6,000				
	HT. EXCH. CW, PL. & FR. 1500GPM	1	EA		~~15,000~~		20,000		
	AUX. CHEC. BOILER, 210 KW	1	EA		8,100				
	ICW FILTER, 30 MICRON, 1000GPM	1	EA		~~18,000~~		24,000		
	COOLING WTR. PUMP	2	EA	2800	~~5600~~		7000		
	EXPANSION TANKS 50GAL.	2	EA	300	~~600~~		300		
	AUXILIARY STEEL SUPPORTS	LS			30,000		~~10,000~~ 9,000		
8.4	COMPUTER RM. A/C UNIT								
	PACKAGE, SELF CONT. 10TON	12	EA	14,700	176,400				
	INSTALL SELF CONT. UNITS	12	EA	1,100	13,200				
	CEILING A/C UNITS, SELF CONT. 2TON	~~12~~ 2	EA	~~4260~~ 3500	~~[illegible]~~		7000		
	WATER DETECTORS	~~12~~ 24	EA	150	~~1800~~ 3600		3600		
							~~24,000~~		

TOTAL COSTS = $387,000
(ACTUAL EST.)

FERMILAB COST ESTIMATE	PROJECT TITLE: CENTRAL COMPUTING FACILITY - TITLE 2 PHASE 2 - SUPERSTRUCTURE	PROJECT NO. 10-5-3	DATE 10 SEPT. 86	REVISION DATE 16 SEPT. 86	PAGE 20/27
SECTION CES	QUANTITIES BY JG / PRICES BY JG	CHECKED BY WN			

DISTRIBUTION OF ITEMIZED COST

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	(1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
8.5	AIR HANDLING UNITS								
	GEN'L. VENTILATION UNITS								
	FAN, AXIAL, SUPPLY, 8000 CFM	1	EA		3000	2 SPEED			
	FAN, " EXHAUST 4000 CFM	1	EA		2500	2 SPEED "			
	HT. RECOVERY WHEEL	1	EA		8000				
	FREE HTG. COIL	~~2~~	~~EA~~	~~1500~~	~~4500~~	~~[illegible]~~	1500		
	HUMIDIFIER	2	EA	2500	~~2500~~	~~[illegible]~~	5000		
	FILTER SET (PRE & HE)	1	EA	1000	~~2000~~	~~1000~~	1000		
	COMPUTER RM. VENT. UNITS								
	FANS, AXIAL, S.&E. 4000 CFM	2	EA	2500	5000	2 SPEED			
	HT. RECOVERY WHEEL	1	EA		5000				
	FREE HTG. COILS	1	EA		1000				
	HUMIDIFIER, 100 LB.	2	EA	2500	~~2500~~		5000		
	FILTER SET, (PRE & HE)	1	EA		1000				
	TOILET EXH. FAN, AXIAL, 4000 CFM	1	EA		2500	2 SPEED			
	WALL EXH. FANS, 1000 CFM	2	EA	500	1000				
	WALL LOUVERS, 42x42	3	EA	200	600				
	UNIT HEATERS 25 KW	2	EA	1200	2400				
	UNIT HEATERS 5 KW	10	EA	400	4000		44,000		
8.6	HEAT PUMP UNITS								
	~~3/4 TON~~ 1 TON	6	EA	1200	7200				
	~~1 1/2 TON~~ 1 1/2 TON	9 ~~27~~	EA	1400	~~49,400~~		12,600		
	2 TON	21 ~~23~~	EA	1500	~~34,500~~		31,500		
	3 TON	24 ~~25~~	EA	1800	30,600		43,200		
	5 TON	13	EA	3500			45,500		~~101,700~~

FERMILAB COST ESTIMATE	PROJECT TITLE: CENTRAL COMPUTING FACILITY - TITLE 2 PHASE 2 - SUPERSTRUCTURE	PROJECT NO. 10-5-3	DATE 10 SEPT. 86	REVISION DATE 16 SEPT. 86	PAGE 21/27
SECTION CES	QUANTITIES BY JG	PRICES BY JG	CHECKED BY WN		

DISTRIBUTION OF ITEMIZED COST

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	(1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
8.7	HVAC DUCTWORK:								
	TOILET EXH. DUCTWORK 12x12x200'	1200	LB	3.50	4200	UNLINED			
	GRILLES 12x12	14	EA	25	300				
	FIRE DAMPERS 12x12	4	EA	25	100				
	COMP. ROOM DUCTWORK, 16x16x400'	3400	LB	3.50	11,900	INTERN. LINED			
	LIEBERT UNIT OUTLET ELBOWS	12	EA	500	6000				
	FLEX DUCT 12"ϕ	70	L.F.	5.00	400				
	DUCT INSUL. 1"	2200	S.F.	1.75	3900				
	FIRE DAMPERS	7	EA	25	200				
	GRILLES	12	EA	25	300				
	GEN'L. VENT. DUCTS, 16x16x250'	2200	LB	3.50	7700		1300		
	" 8x12x600'	3300	LB	3.50	11,600		2000		
	" 36x8x250	3000	LB	3.50	10,500		2000		
	INSULATE DUCT 1"	4300	S.F.	1.75	7500				
	FLEX. DUCT 6"ϕ	400	L.F	4.00	1600				
	DAMPERS 6"ϕ	78	EA	15	1200				
	VOLUME DAMPERS MOTORIZED	6	EA	150	600				
	FIRE DAMPERS MOTORIZED	8	EA	200	1600				
	HEAT PUMP DUCTWORK	73							
	RETURN PLENUM 24x24	~~66~~	EA	100	~~6600~~	7300			
	OUTLET DUCTS 16x16x850'	8300 ~~7500~~	LB	3.50	~~26,300~~	29,100	1800		
	FLEX DUCT 12"ϕ	1800 ~~1600~~	L.F	5.00	8000	9000			
	DUCT INSUL. 1"	5000 ~~4400~~	S.F	1.75	~~7700~~	8800			
	GRILLES	300 ~~240~~	EA	25	~~6000~~	7500			
	FIRE DAMPERS	21 ~~19~~	EA	25	~~600~~	500	~~125,400~~		
	FIRE/SMOKE DAMPERS	14	EA	500	7000				

FERMILAB COST ESTIMATE	PROJECT TITLE: CENTRAL COMPUTING FACILITY - TITLE 2 PHASE 2 - SUPERSTRUCTURE	PROJECT NO. 10-5-3	DATE 10 SEPT. 86	REVISION DATE 16 SEPT. 86	PAGE 22/27
SECTION CES	QUANTITIES BY JG / PRICES BY JG	CHECKED BY WN			

DISTRIBUTION OF ITEMIZED COST

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	(1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
8.8	COOLING/HEATING WATER PIPING								
	RW PIPING								
	8"ϕ SCHED. 10 VICTOLIC	~~50~~ 100	L.F.	38	~~1900~~	3800			
	6"d " "	200	L.F.	28	5600				
	2"ϕ " "	60	L.F.	10	600				
	VALVES, 8" BUTT. BFY	10	EA	450	4500				
	" 6" "	10	EA	350	3500				
	" 2 1/2 "	8	EA	250	2000				
	" 2" BALL	10	EA	40	400				
	" 8 PRESS. REG.	1	EA		2500				
	ACCESSORIES	LOT			5000				
	INSULATION 8" PIPE	100	L.F.	8.00	~~400~~	800			
	" 6" "	200	L.F.	6.00	1200				
	CHW PIPING, SCHED. 10 VICT. 4"ϕ	100	L.F.	17	1700				
	VALVES, 4"ϕ BUTT.	16	EA	250	4000				
	ACCESSORIES & MISC. VALVES	LOT			3000				
	PIPE INSUL. 4"	100	L.F.	5.00	500				
	CW PIPING, SCHED VICT. 6"ϕ	300	L.F.	28	8400				
	" " 4"ϕ	300	L.F.	17	5100				
	" " 3"ϕ	100	L.F.	14	1400				
	" " 1 1/2"ϕ	350	L.F.	8.00	2800				
	VALVES, 6" BUTT.	10	EA	350	3500				
	1 1/2 BALL	24	EA	35	800				
	ACCESSORIES & MISC. VALVES	LOT			3000				
	PIPE INSUL. 4" ϕ	700	L.F.	5.00	3500				
	" 1 1/2 ϕ	350	L.F.	3.00	1100				

FERMILAB COST ESTIMATE	PROJECT TITLE: CENTRAL COMPUTING FACILITY - TITLE 2 PHASE 2 - SUPERSTRUCTURE	PROJECT NO. 10-5-3	DATE 10 SEPT. 86	REVISION DATE 16 SEPT. 86	PAGE 23/27
SECTION CES	QUANTITIES BY JG	PRICES BY JG	CHECKED BY WN		

DISTRIBUTION OF ITEMIZED COST

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	(1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
B.8	COOLING/HTG. WTR. PIPING, CONT.	1000							
	H.R. PIPING, SCH. 10 VICT. 6"ϕ	~~700~~	L.F.	28	~~19600~~	28,000			
	" " 4"ϕ	500	L.F.	17	8500				
	" " 3"ϕ	400	L.F.	13	5200				
	" " 2½"ϕ	200	L.F.	12	2400				
	" " 2"ϕ	800 ~~200~~	L.F.	10	~~2000~~	8000			
	" SCH. 40, BLK 1½"ϕ	200	L.F.	8	1600				
	" 1"ϕ	300	L.F.	5.00	1500				
	" ¾"ϕ	600	L.F.	4.00	2400				
	VALVES, 6"ϕ BUTT.	10	EA	350	3500				
	¾ϕ BALL 200	~~140~~	EA	15	~~2100~~	3000			
	ACCESS. & MISC. VALVES	LOT			4000				
	HUMIDIFIER WATER PIPING	1400							
	½"ϕ COPPER "K"	~~1200~~	L.F.	6.00	~~7200~~	8400			
	½"ϕ INSUL.	~~1400~~	L.F.	3.00	~~4200~~	4200			
	½"ϕ BALL VALVES	~~30~~ 20	EA	25	~~500~~	800			
	CONDENSATE DRAIN PIPING	1600							
	1¼"ϕ COPPER "K"	~~1200~~	L.F.	11.00	~~13200~~	17,600			
	½"ϕ COPPER "K" 1000	~~1000~~	L.F.	6.00	~~6000~~	6000	147,300		
B.9	HVAC CONTROLS								
	D.D.C. CONTROLS				~~15000~~	~~20000~~	20000		
	LIEBERT CONTROLS				~~15000~~	15000			

FERMILAB CENTRAL COMPUTING FACILITY

SUBCONSTRUCTION 2/4
LIFE CYCLE COST ANALYSIS
FOR
ALTERNATE SYSTEM NUMBER 1
DX AC UNITS WITH HI-EFFICIENCY COMPRESSORS

12 NOVEMBER, 1986
ANALYST: S.F.KRSTULOVICH

FERMILAB CONSTRUCTION ENGINEERING SERVICES

PROJECT NAME : CCF SUBCON 2/4 STD AC SYS
ANALYST : S.F.KRSTULOVICH
COMMENTS : 367000 PER UNIT COSTS

ESTIMATE YEAR : 1986
COMMISSION YEAR : 1988
LAST STUDY YEAR : 2008

**** NON-FINANCED CASH DEBITS/CREDITS ****

YEAR	AMOUNT
1986	367000.00

**** FINANCE INSTRUMENTS ****

NOTE 1 PRINCIPAL (1986 EST.) = $ 0.00
(0 EST.) = $ 0.00
INSTRUMENT = NONE

NOTE 2 PRINCIPAL (1986 EST.) = $ 0.00
(0 EST.) = $ 0.00
INSTRUMENT = NONE

**** FUEL COSTS ****

1986 EST. OF FUEL 1 = $ 43845.00 (ELEC.)
2 = $ 0.00
3 = $ 0.00

**** MAINTENANCE COST ****

1986 EST. OF MAINT. = $ 2000.00

**** DISCOUNT/INTEREST/ESCALATION RATES ****

		FINANCE %		ESCALATION %			
YEAR	% DISC.	LOAN1	LOAN2	FUEL1	FUEL2	FUEL3	MAIN.
1986	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1987	7.90	0.00	0.00	8.40	0.00	0.00	9.00
1988	7.90	0.00	0.00	8.40	0.00	0.00	9.00
1989	7.90	0.00	0.00	8.80	0.00	0.00	9.00
1990	7.90	0.00	0.00	8.80	0.00	0.00	9.00
1991	7.90	0.00	0.00	8.80	0.00	0.00	9.00
1992	7.90	0.00	0.00	8.80	0.00	0.00	9.00
1993	7.90	0.00	0.00	8.80	0.00	0.00	9.00
1994	7.90	0.00	0.00	8.80	0.00	0.00	9.00
1995	7.90	0.00	0.00	8.80	0.00	0.00	9.00
1996	7.90	0.00	0.00	8.80	0.00	0.00	9.00
1997	7.90	0.00	0.00	8.80	0.00	0.00	9.00
1998	7.90	0.00	0.00	8.80	0.00	0.00	9.00
1999	7.90	0.00	0.00	8.80	0.00	0.00	9.00
2000	7.90	0.00	0.00	8.80	0.00	0.00	9.00
2001	7.90	0.00	0.00	8.80	0.00	0.00	9.00
2002	7.90	0.00	0.00	8.80	0.00	0.00	9.00
2003	7.90	0.00	0.00	8.80	0.00	0.00	9.00
2004	7.90	0.00	0.00	8.80	0.00	0.00	9.00
2005	7.90	0.00	0.00	8.80	0.00	0.00	9.00
2006	7.90	0.00	0.00	8.80	0.00	0.00	9.00
2007	7.90	0.00	0.00	8.80	0.00	0.00	9.00
2008	7.90	0.00	0.00	8.80	0.00	0.00	9.00

**** UNIFIED PRESENT WORTH LIFE CYCLE COST ****

PROJECT NAME : CCF SUBCON 2/4 STD AC SYS
ANALYST NAME : S.F.KRSTULOVICH
COMMENTS : 367000 PER UNIT COSTS

YEAR		1986	1987	1988	1989	1990
CASH	$	367000.00	0.00	0.00	0.00	0.00
MORT.1	$	0.00	0.00	0.00	0.00	0.00
MORT.2	$	0.00	0.00	0.00	0.00	0.00
FUEL 1	$	0.00	0.00	44252.29	44621.40	44993.59
FUEL 2	$	0.00	0.00	0.00	0.00	0.00
FUEL 3	$	0.00	0.00	0.00	0.00	0.00
MAINT.	$	0.00	0.00	2040.99	2061.79	2082.81
YEAR'S	$	367000.00	0.00	46293.28	46683.20	47076.41
CUM.	$	367000.00	367000.00	413293.28	459976.47	507052.88

YEAR		1991	1992	1993	1994	1995
CASH	$	0.00	0.00	0.00	0.00	0.00
MORT.1	$	0.00	0.00	0.00	0.00	0.00
MORT.2	$	0.00	0.00	0.00	0.00	0.00
FUEL 1	$	45368.89	45747.32	46128.90	46513.67	46901.64
FUEL 2	$	0.00	0.00	0.00	0.00	0.00
FUEL 3	$	0.00	0.00	0.00	0.00	0.00
MAINT.	$	2104.05	2125.50	2147.16	2169.05	2191.17
YEAR'S	$	47472.94	47872.82	48276.07	48682.72	49092.81
CUM.	$	554525.81	602398.62	650674.69	699357.44	748450.25

YEAR		1996	1997	1998	1999	2000
CASH	$	0.00	0.00	0.00	0.00	0.00
MORT.1	$	0.00	0.00	0.00	0.00	0.00
MORT.2	$	0.00	0.00	0.00	0.00	0.00
FUEL 1	$	47292.85	47687.32	48085.09	48486.17	48890.60
FUEL 2	$	0.00	0.00	0.00	0.00	0.00
FUEL 3	$	0.00	0.00	0.00	0.00	0.00
MAINT.	$	2213.51	2236.07	2258.87	2281.90	2305.16
YEAR'S	$	49506.36	49923.40	50343.96	50768.07	51195.76
CUM.	$	797956.62	847880.00	898223.94	948992.00	1000187.75

YEAR		2001	2002	2003	2004	2005
CASH	$	0.00	0.00	0.00	0.00	0.00
MORT.1	$	0.00	0.00	0.00	0.00	0.00
MORT.2	$	0.00	0.00	0.00	0.00	0.00
FUEL 1	$	49298.40	49709.60	50124.23	50542.32	50963.90
FUEL 2	$	0.00	0.00	0.00	0.00	0.00
FUEL 3	$	0.00	0.00	0.00	0.00	0.00
MAINT.	$	2328.66	2352.40	2376.38	2400.61	2425.08
YEAR'S	$	51627.06	52062.00	52500.61	52942.93	53388.98
CUM.	$	1051814.75	1103876.75	1156377.38	1209320.25	1262709.25

YEAR		2006	2007	2008	2009	2010
CASH	$	0.00	0.00	0.00	0.00	0.00
MORT.1	$	0.00	0.00	0.00	0.00	0.00
MORT.2	$	0.00	0.00	0.00	0.00	0.00
FUEL 1	$	51388.99	51817.63	52249.85	0.00	0.00
FUEL 2	$	0.00	0.00	0.00	0.00	0.00
FUEL 3	$	0.00	0.00	0.00	0.00	0.00
MAINT.	$	2449.80	2474.78	2500.01	0.00	0.00
YEAR'S	$	53838.79	54292.41	54749.86	0.00	0.00
CUM.	$	1316548.00	1370840.38	1425590.25	1425590.25	1425590.25

FERMILAB CENTRAL COMPUTING FACILITY

SUBCINSTRUCTION 2/4
LIFE CYCLE COST ANALYSIS
FOR
ALTERNATE SYSTEM NUMBER 2
FY1975 DX AC UNITS

12 NOVEMBER, 1986
ANALYST: S.F.KRSTULOVICH

FERMILAB CONSTRUCTION ENGINEERING SERVICES

PROJECT NAME : CCF SUBCON 2/4 1975S SYS
ANALYST : S.F.KRSTULOVICH
COMMENTS : 353000

ESTIMATE YEAR : 1986
COMMISSION YEAR : 1988
LAST STUDY YEAR : 2008

**** NON-FINANCED CASH DEBITS/CREDITS ****

YEAR	AMOUNT
1986	353000.00

**** FINANCE INSTRUMENTS ****

NOTE 1 PRINCIPAL (1986 EST.) = $ 0.00
(0 EST.) = $ 0.00
INSTRUMENT = NONE

NOTE 2 PRINCIPAL (1986 EST.) = $ 0.00
(0 EST.) = $ 0.00
INSTRUMENT = NONE

**** FUEL COSTS ****

1986 EST. OF FUEL 1 = $ 53720.00 (ELEC.)
2 = $ 0.00
3 = $ 0.00

**** MAINTENANCE COST ****

1986 EST. OF MAINT. = $ 2000.00

**** DISCOUNT/INTEREST/ESCALATION RATES ****

		FINANCE %		ESCALATION %			
YEAR	% DISC.	LOAN1	LOAN2	FUEL1	FUEL2	FUEL3	MAIN.
1986	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1987	7.90	0.00	0.00	8.40	0.00	0.00	9.00
1988	7.90	0.00	0.00	8.40	0.00	0.00	9.00
1989	7.90	0.00	0.00	8.80	0.00	0.00	9.00
1990	7.90	0.00	0.00	8.80	0.00	0.00	9.00
1991	7.90	0.00	0.00	8.80	0.00	0.00	9.00
1992	7.90	0.00	0.00	8.80	0.00	0.00	9.00
1993	7.90	0.00	0.00	8.80	0.00	0.00	9.00
1994	7.90	0.00	0.00	8.80	0.00	0.00	9.00
1995	7.90	0.00	0.00	8.80	0.00	0.00	9.00
1996	7.90	0.00	0.00	8.80	0.00	0.00	9.00
1997	7.90	0.00	0.00	8.80	0.00	0.00	9.00
1998	7.90	0.00	0.00	8.80	0.00	0.00	9.00
1999	7.90	0.00	0.00	8.80	0.00	0.00	9.00
2000	7.90	0.00	0.00	8.80	0.00	0.00	9.00
2001	7.90	0.00	0.00	8.80	0.00	0.00	9.00
2002	7.90	0.00	0.00	8.80	0.00	0.00	9.00
2003	7.90	0.00	0.00	8.80	0.00	0.00	9.00
2004	7.90	0.00	0.00	8.80	0.00	0.00	9.00
2005	7.90	0.00	0.00	8.80	0.00	0.00	9.00
2006	7.90	0.00	0.00	8.80	0.00	0.00	9.00
2007	7.90	0.00	0.00	8.80	0.00	0.00	9.00
2008	7.90	0.00	0.00	8.80	0.00	0.00	9.00

**** UNIFIED PRESENT WORTH LIFE CYCLE COST ****

PROJECT NAME : CCF SUBCON 2/4 1975S SYS
ANALYST NAME : S.F.KRSTULOVICH
COMMENTS : 353000

YEAR		1986	1987	1988	1989	1990
CASH	$	353000.00	0.00	0.00	0.00	0.00
MORT.1	$	0.00	0.00	0.00	0.00	0.00
MORT.2	$	0.00	0.00	0.00	0.00	0.00
FUEL 1	$	0.00	0.00	54219.02	54671.26	55127.28
FUEL 2	$	0.00	0.00	0.00	0.00	0.00
FUEL 3	$	0.00	0.00	0.00	0.00	0.00
MAINT.	$	0.00	0.00	2040.99	2061.79	2082.81
YEAR'S	$	353000.00	0.00	56260.01	56733.06	57210.10
CUM.	$	353000.00	353000.00	409260.00	465993.06	523203.16

YEAR		1991	1992	1993	1994	1995
CASH	$	0.00	0.00	0.00	0.00	0.00
MORT.1	$	0.00	0.00	0.00	0.00	0.00
MORT.2	$	0.00	0.00	0.00	0.00	0.00
FUEL 1	$	55587.11	56050.76	56518.29	56989.72	57465.07
FUEL 2	$	0.00	0.00	0.00	0.00	0.00
FUEL 3	$	0.00	0.00	0.00	0.00	0.00
MAINT.	$	2104.05	2125.50	2147.16	2169.05	2191.17
YEAR'S	$	57691.15	58176.26	58665.45	59158.77	59656.24
CUM.	$	580894.31	639070.56	697736.00	756894.75	816551.00

YEAR		1996	1997	1998	1999	2000
CASH	$	0.00	0.00	0.00	0.00	0.00
MORT.1	$	0.00	0.00	0.00	0.00	0.00
MORT.2	$	0.00	0.00	0.00	0.00	0.00
FUEL 1	$	57944.39	58427.71	58915.06	59406.47	59901.99
FUEL 2	$	0.00	0.00	0.00	0.00	0.00
FUEL 3	$	0.00	0.00	0.00	0.00	0.00
MAINT.	$	2213.51	2236.07	2258.87	2281.90	2305.16
YEAR'S	$	60157.90	60663.78	61173.93	61688.37	62207.15
CUM.	$	876708.88	937372.62	998546.56	1060234.88	1122442.00

YEAR		2001	2002	2003	2004	2005
CASH	$	0.00	0.00	0.00	0.00	0.00
MORT.1	$	0.00	0.00	0.00	0.00	0.00
MORT.2	$	0.00	0.00	0.00	0.00	0.00
FUEL 1	$	60401.64	60905.45	61413.47	61925.72	62442.25
FUEL 2	$	0.00	0.00	0.00	0.00	0.00
FUEL 3	$	0.00	0.00	0.00	0.00	0.00
MAINT.	$	2328.66	2352.40	2376.38	2400.61	2425.08
YEAR'S	$	62730.30	63257.85	63789.85	64326.33	64867.32
CUM.	$	1185172.25	1248430.12	1312220.00	1376546.38	1441413.75

YEAR		2006	2007	2008	2009	2010
CASH	$	0.00	0.00	0.00	0.00	0.00
MORT.1	$	0.00	0.00	0.00	0.00	0.00
MORT.2	$	0.00	0.00	0.00	0.00	0.00
FUEL 1	$	62963.09	63488.27	64017.83	0.00	0.00
FUEL 2	$	0.00	0.00	0.00	0.00	0.00
FUEL 3	$	0.00	0.00	0.00	0.00	0.00
MAINT.	$	2449.80	2474.78	2500.01	0.00	0.00
YEAR'S	$	65412.88	65963.05	66517.84	0.00	0.00
CUM.	$	1506826.62	1572789.62	1639307.50	1639307.50	1639307.50

FERMILAB CENTRAL COMPUTING FACILITY

SUBCONSTRUCTION 2/4
LIFE CYCLE COST ANALYSIS
UNIFIED PRESENT WORTH COMPARISONS
FOR ALL SYSTEMS

12 NOVEMBER, 1986
ANALYST: S.F.KRSTULOVICH

FERMILAB CONSTRUCTION ENGINEERING SERVICES

**** UPW LIFE CYCLE COST COMPARISON ****

FILE NO. : LCC6.DAT
PROJECT : CCF SUBCON 2/4 DESIGN SYS
ANALYST : S.F.KRSTULOVICH
COMMENTS : $387000 PER UNIT COSTS

FILE NO. : LCC7.DAT
PROJECT : CCF SUBCON 2/4 STD AC SYS
ANALYST : S.F.KRSTULOVICH
COMMENTS : 367000 PER UNIT COSTS

YEAR	(A) FILE 1 $	(B) FILE 2 $	(A-B) YR'S $	(A-B) CUM. $
1986	387000.00	367000.00	20000.00	20000.00
1987	0.00	0.00	0.00	20000.00
1988	29997.29	46293.28	-16295.99	3704.01
1989	30251.28	46683.20	-16431.92	-12727.91
1990	30507.43	47076.41	-16568.98	-29296.89
1991	30765.76	47472.94	-16707.18	-46004.07
1992	31026.28	47872.82	-16846.54	-62850.61
1993	31289.01	48276.07	-16987.06	-79837.67
1994	31553.98	48682.72	-17128.74	-96966.41
1995	31821.19	49092.81	-17271.62	-114238.03
1996	32090.68	49506.36	-17415.68	-131653.72
1997	32362.45	49923.40	-17560.95	-149214.67
1998	32636.54	50343.96	-17707.42	-166922.09
1999	32912.95	50768.07	-17855.12	-184777.20
2000	33191.70	51195.76	-18004.06	-202781.27
2001	33472.83	51627.06	-18154.23	-220935.50
2002	33756.35	52062.00	-18305.65	-239241.16
2003	34042.27	52500.61	-18458.34	-257699.48
2004	34330.63	52942.93	-18612.30	-276311.78
2005	34621.43	53388.98	-18767.55	-295079.31
2006	34914.70	53838.79	-18924.09	-314003.41
2007	35210.47	54292.41	-19081.94	-333085.34
2008	35508.75	54749.86	-19241.11	-352326.44

*** APPARENT BREAK-EVEN YEAR = 1989 ***

**** UPW LIFE CYCLE COST COMPARISON ****

FILE NO. : LCC6.DAT
PROJECT : CCF SUBCON 2/4 DESIGN SYS
ANALYST : S.F.KRSTULOVICH
COMMENTS : $387000 PER UNIT COSTS

FILE NO. : LCC8.DAT
PROJECT : CCF SUBCON 2/4 1975S SYS
ANALYST : S.F.KRSTULOVICH
COMMENTS : 353000

YEAR	(A) FILE 1 $	(B) FILE 2 $	(A-B) YR'S $	(A-B) CUM. $
1986	387000.00	353000.00	34000.00	34000.00
1987	0.00	0.00	0.00	34000.00
1988	29997.29	56260.01	-26262.72	7737.28
1989	30251.28	56733.06	-26481.78	-18744.50
1990	30507.43	57210.10	-26702.67	-45447.17
1991	30765.76	57691.15	-26925.39	-72372.56
1992	31026.28	58176.26	-27149.98	-99522.55
1993	31289.01	58665.45	-27376.44	-126898.99
1994	31553.98	59158.77	-27604.79	-154503.78
1995	31821.19	59656.24	-27835.05	-182338.83
1996	32090.68	60157.90	-28067.22	-210406.03
1997	32362.45	60663.78	-28301.33	-238707.36
1998	32636.54	61173.93	-28537.39	-267244.75
1999	32912.95	61688.37	-28775.42	-296020.19
2000	33191.70	62207.15	-29015.45	-325035.66
2001	33472.83	62730.30	-29257.47	-354293.12
2002	33756.35	63257.85	-29501.50	-383794.62
2003	34042.27	63789.85	-29747.58	-413542.19
2004	34330.63	64326.33	-29995.70	-443537.88
2005	34621.43	64867.32	-30245.89	-473783.75
2006	34914.70	65412.88	-30498.18	-504281.94
2007	35210.47	65963.05	-30752.58	-535034.50
2008	35508.75	66517.84	-31009.09	-566043.62

*** APPARENT BREAK-EVEN YEAR = 1989 ***

FERMILAB CENTRAL COMPUTING FACILITY

SUBCONSTRUCTION 2/4
SIMPLE PAYBACK CALCULATIONS
FOR
ALL SYSTEMS

12 NOVEMBER, 1986
ANALYST: S.F.KRSTULOVICH

FERMILAB CONSTRUCTION ENGINEERING SERVICES

CCF SUBCONSTRUCT 2/4
SIMPLE PAYBACK

INPUT VALUES	DESIGN SYS	STD AC SYS
INITIAL TOTAL COST	$ 387,000	$ 367,000
ANNUAL OPERATING COST	$ 27,699	$ 43,845
ANNUAL MAINTENANCE COST	$ 2,000	$ 2,000
SALVAGE VALUE AT YEAR 20	$ 0	$ 0

	DESIGN SYS EXPENSES		STD AC SYS EXPENSES	
YEAR	ANNUAL	CUMULATIVE	ANNUAL	CUMULATIVE
INITIAL	$ 387,000	$ 387,000	$ 367,000	$ 367,000
1	$ 29,699	$ 416,699	$ 45,845	$ 412,845
**********				
2	$ 29,699	$ 446,398	$ 45,845	$ 458,690
3	$ 29,699	$ 476,097	$ 45,845	$ 504,535
4	$ 29,699	$ 505,796	$ 45,845	$ 550,380
5	$ 29,699	$ 535,495	$ 45,845	$ 596,225
6	$ 29,699	$ 565,194	$ 45,845	$ 642,070
7	$ 29,699	$ 594,893	$ 45,845	$ 687,915
8	$ 29,699	$ 624,592	$ 45,845	$ 733,760
9	$ 29,699	$ 654,291	$ 45,845	$ 779,605
10	$ 29,699	$ 683,990	$ 45,845	$ 825,450
11	$ 29,699	$ 713,689	$ 45,845	$ 871,295
12	$ 29,699	$ 743,388	$ 45,845	$ 917,140
13	$ 29,699	$ 773,087	$ 45,845	$ 962,985
14	$ 29,699	$ 802,786	$ 45,845	$1,008,830
15	$ 29,699	$ 832,485	$ 45,845	$1,054,675
16	$ 29,699	$ 862,184	$ 45,845	$1,100,520
17	$ 29,699	$ 891,883	$ 45,845	$1,146,365
18	$ 29,699	$ 921,582	$ 45,845	$1,192,210
19	$ 29,699	$ 951,281	$ 45,845	$1,238,055
20	$ 29,699	$ 980,980	$ 45,845	$1,283,900
SALVAGE	($ 0)	$ 980,980	($ 0)	$1,283,900

PAYBACK FOR DESIGN SYS OCCURS AFTER 1.2 YEARS ($ 423,788)

TOTAL COST OF DESIGN SYS FOR 20 YEARS IS $ 980,980
TOTAL COST OF STD AC SYS FOR 20 YEARS IS $1,283,900

CCF SUBCONSTRUCT 2/4
SIMPLE PAYBACK

INPUT VALUES	DESIGN SYS	1975S SYS
INITIAL TOTAL COST	$ 387,000	$ 353,000
ANNUAL OPERATING COST	$ 27,699	$ 53,720
ANNUAL MAINTENANCE COST	$ 2,000	$ 2,000
SALVAGE VALUE AT YEAR 20	$ 0	$ 0

	DESIGN SYS EXPENSES		1975S SYS EXPENSES	
YEAR	ANNUAL	CUMULATIVE	ANNUAL	CUMULATIVE
INITIAL	$ 387,000	$ 387,000	$ 353,000	$ 353,000
1	$ 29,699	$ 416,699	$ 55,720	$ 408,720
**********				
2	$ 29,699	$ 446,398	$ 55,720	$ 464,440
3	$ 29,699	$ 476,097	$ 55,720	$ 520,160
4	$ 29,699	$ 505,796	$ 55,720	$ 575,880
5	$ 29,699	$ 535,495	$ 55,720	$ 631,600
6	$ 29,699	$ 565,194	$ 55,720	$ 687,320
7	$ 29,699	$ 594,893	$ 55,720	$ 743,040
8	$ 29,699	$ 624,592	$ 55,720	$ 798,760
9	$ 29,699	$ 654,291	$ 55,720	$ 854,480
10	$ 29,699	$ 683,990	$ 55,720	$ 910,200
11	$ 29,699	$ 713,689	$ 55,720	$ 965,920
12	$ 29,699	$ 743,388	$ 55,720	$1,021,640
13	$ 29,699	$ 773,087	$ 55,720	$1,077,360
14	$ 29,699	$ 802,786	$ 55,720	$1,133,080
15	$ 29,699	$ 832,485	$ 55,720	$1,188,800
16	$ 29,699	$ 862,184	$ 55,720	$1,244,520
17	$ 29,699	$ 891,883	$ 55,720	$1,300,240
18	$ 29,699	$ 921,582	$ 55,720	$1,355,960
19	$ 29,699	$ 951,281	$ 55,720	$1,411,680
20	$ 29,699	$ 980,980	$ 55,720	$1,467,400
SALVAGE	($ 0)	$ 980,980	($ 0)	$1,467,400

PAYBACK FOR DESIGN SYS OCCURS AFTER 1.3 YEARS ($ 425,806)

TOTAL COST OF DESIGN SYS FOR 20 YEARS IS $ 980,980
TOTAL COST OF 1975S SYS FOR 20 YEARS IS $1,467,400

FERMILAB CENTRAL COMPUTING FACILITY

SUBCONSTRUCTION 2/4
DX AC UNITS OPERATIONAL DATA

12 NOVEMBER, 1986

ANALYST: S.F.KRSTULOVICH

FERMILAB CONSTRUCTION ENGINEERING SERVICES

TYPICAL OPERATING EFFICIENCIES FOR COMPUTER ROOM AIR CONDITIONERS
(DX SYSTEMS MANDATORY TO ATTAIN 42F DEWPOINT FOR 68F DB AT 45% RH)

TYPICAL STATE-OF-THE-ART UNITS WITH COMPRESSOR UNLOADERS AND A-COIL

COMPRESSOR PERFORMANCE PROFILE

4 STEPS FULL LOADED:	0.76KW/TON	100% CAPACITY
FIRST STEP UNLOADED:	0.67KW/TON	88% CAPACITY
SECOND STEP UNLOADED:	0.54KW/TON	76% CAPACITY
THIRD STEP UNLOADED:	0.57KW/TON	38% CAPACITY

FAN PERFORMANCE PROFILE

STATIC PRESSURE DROP WITH A-COIL CONFIGURATION: 2.50 INCHES WC

TYPICAL STATE-OF-THE-ART UNITS W/ STANDARD HI EFFICIENCY COMPRESSORS AND A-COIL

COMPRESSOR PERFORMANCE PROFILE

COMPRESSORS LOADED:	0.76KW/TON	100% capacity

FAN PERFORMANCE PROFILE

STATIC PRESSURE DROP WITH A-COIL CONFIGURATION: 2.50 INCHES WC

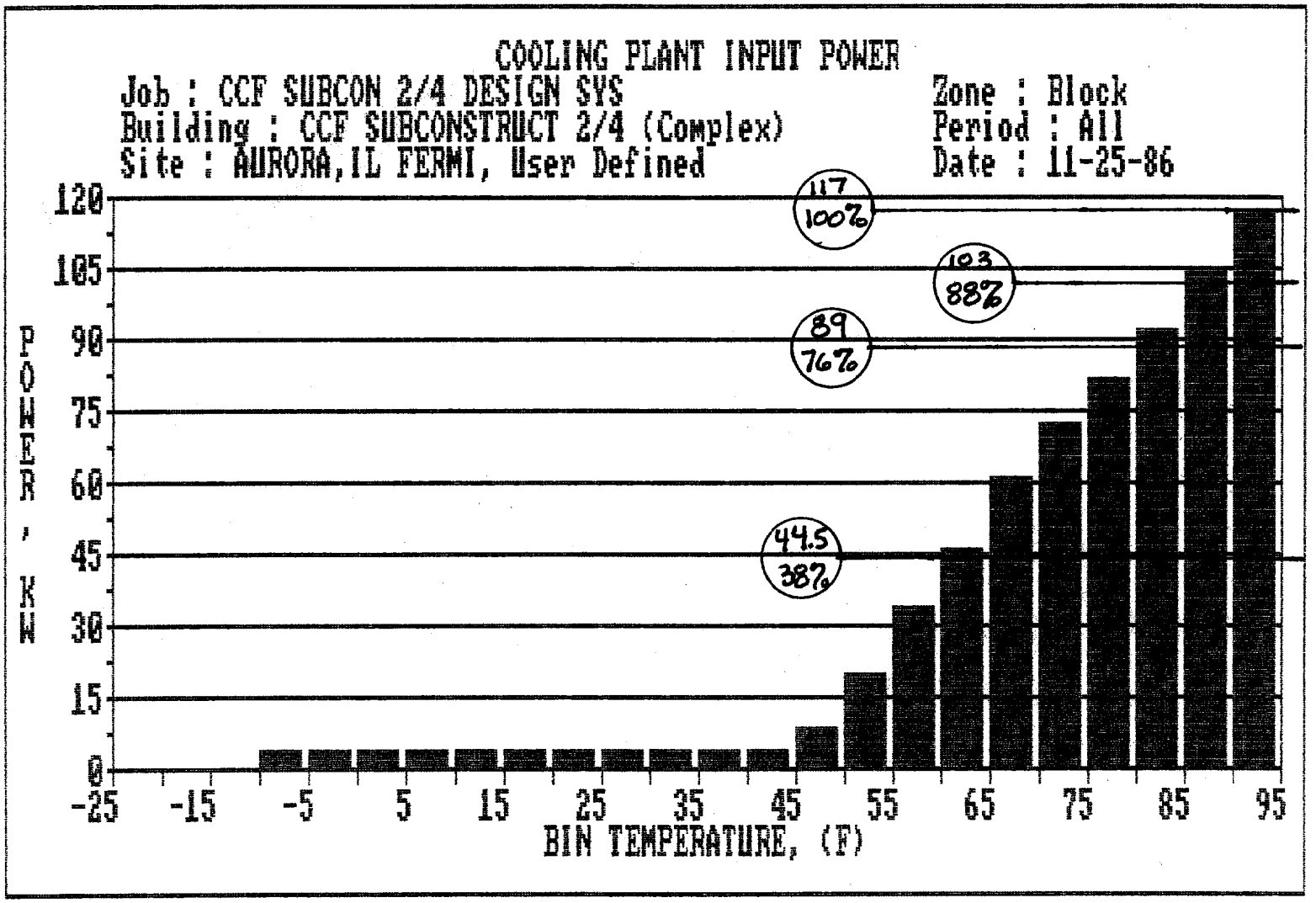
TYPICAL 1975 STYLE UNITS WITH STANDARD COMPRESSORS AND SLAB-COIL

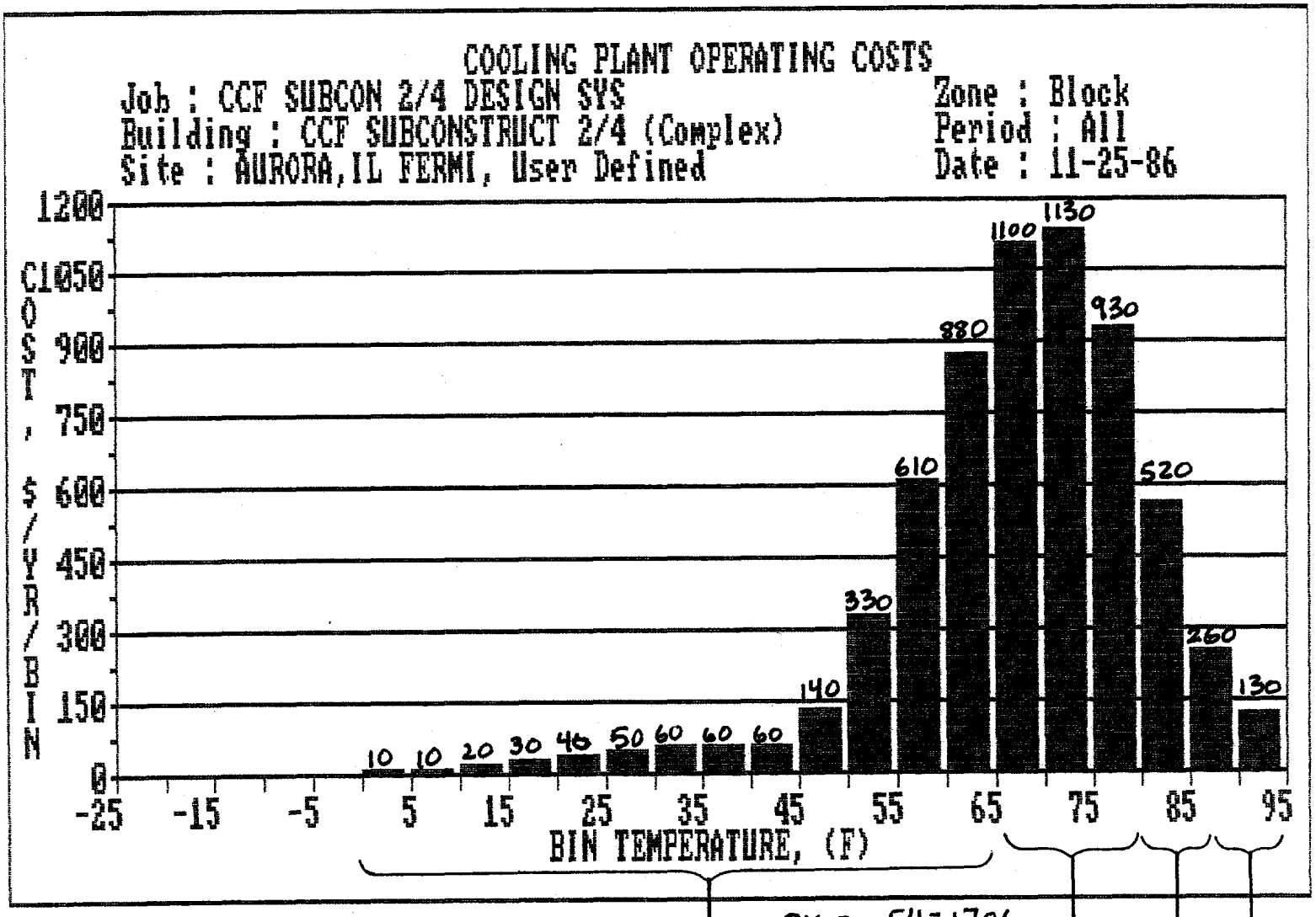
COMPRESSOR PERFORMANCE PROFILE

COMPRESSORS LOADED:	0.95KW/TON	100% CAPACITY

FAN PERFORMANCE PROFILE

STATIC PRESSURE DROP WITH SLAB-COIL CONFIGURATION: 3.00 INCHES WC


COOLING PLANT INPUT POWER
Job : CCF SUBCON 2/4 DESIGN SYS
Building : CCF SUBCONSTRUCT 2/4 (Complex)
Site : AURORA,IL FERMI, User Defined
Zone : Block
Period : All
Date : 11-25-86
117
100%
103
88%
89
76%
44.5
38%
POWER, KW
120
105
90
75
60
45
30
15
0
-25
-15
-5
5
15
25
35
45
55
65
75
85
95
BIN TEMPERATURE, (F)



2300 x .57 = 1311

3160 x .54 = 1706

700 x .67 = 469

260 x .76 = 198

TOTAL = 3684 ÷ 6420 = .57 KW/TON AVG.