

**ENERGY SAVINGS OPPORTUNITY SURVEY
FORT BELVOIR, ALEXANDRIA, VIRGINIA**

**A/E CONTRACT NO.
DACA 31-89-C-0198**

**FINAL SUBMITTAL
VOLUME III**

Calculations

19971017 181

Prepared for

**DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT CORPS OF ENGINEERS
BALTIMORE, MARYLAND**

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By

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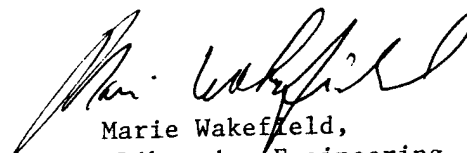


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**VOLUME III
CALCULATIONS**

Summer Steam Use Evaluation (300 Area)

Building 307

Building 309

Building 317

Building 327

Building 331

Building 334

Building 357

Building 362

Building 363

Building 365

300 AREA BUILDINGS

300 SERIES BUILDINGS

TABLE OF CONTENTS

ECOs INVESTIGATED	300
ALTERNATIVE #1	300-1
ALTERNATIVE #2	300-2
ALTERNATIVE #3	300-22
ALTERNATIVE #4	300-38
COMPUTER SIMULATION	
#307	307-1
#309	309-1
#317	317-1
#327	327-1
#331	331-1
#334	334-1
#357	357-1
#362	362-1
#363	363-1
#365	365-1

ECOs INVESTIGATED

In the 300 area buildings, namely building numbers 307, 309, 317, 327, 331, 334, 357, 362, 363, and 365, summer steam requirements were evaluated. Four alternatives were considered and are as follows:

Alternative 1. Install a new boiler at central heating plant #332 to handle only the summer load allowing the large boiler to be shut down.

Alternative 2. Install a new boiler at each building for summer load allowing central heating plant #332 to be shut down.

Alternative 3. Install a new steam and condensate main, sized for summer load, from the central heating plant #1422 to the 300 area distribution system allowing the central plant #332 to be shut down.

Alternative 4. Install a new steam and condensate main, sized for year-round load, from the central heating plant #1422 to the 300 area allowing the central plant #332 to be permanently closed.

ALTERNATIVE # 1

SUMMER BOILER AT CENTRAL HEATING PLANT # 332
TO SHUT DOWN LARGE BOILER FROM MID-APR. TO MID-OCT.

MAXIMUM ESTIMATED PEAK LOADS
DURING NON-HEATING MONTHS MID-APR. TO MID-OCT.

BLDG. NO.	BLDG. SIDE LOADS (FROM E20 SIMULATIONS)
# 307	763 MBH
# 309	1395 MBH
# 317	831
# 327	888
# 331	1625
# 334	173
# 357	3273
# 362	241
# 363	3052
# 365	152

$$\underline{12,393 \text{ MBH}} / 33.4 \text{ MBH/Bohp} = 371 \text{ Bohp}$$

THIS LOAD ALONE IS 371 Bohp w/o ADDITIONAL LOAD FROM DISTRIBUTION SYSTEM LOSSES OR THE NEW BOILERS EFFICIENCY.

THE SIZE OF A NON-HEATING SEASON BOILER WILL BE WITHIN 20% OF THE EXISTING SMALLER 332 PLANT BOILER THEREFORE THE SAVINGS REALIZED WITH THIS ALTERNATIVE WILL NOT JUSTIFY THE EXPENSE OF IMPLEMENTATION.

THERE IS NO ADVANTAGE CONTINUING WITH THIS ECO

CLIENT:	EAC / ENGINEERING APPLICATIONS CONSULTANTS			
#332 SUMMER STEAM ALTERNATIVES				
PROJECT: ENERGY SAVINGS	MADE	CHK.	REV	JOB
OPPORTUNITY SURVEY	REF	VP		SHT M-
SUBJECT: CENTRAL SUMMER BOILER				

300 SERIES BUILDINGS

Local Boilers and Water Heaters in 300 Area

Description - Buildings 307, 309, 317, 327, 331, 334, 357, 362, 363, and 365 in the Belvoir Research, Development, and Engineering Center require steam during the summer for air-conditioning re-heat, and domestic hot water generation. This evaluation addresses the feasibility of installing a local boiler in eight buildings and domestic hot water heaters in the remaining two buildings, thus obviating the need to keep a central heating plant in Building 332 running during non-heating months.

Energy Saved	= 30,459	MBTU/year
Cost	= \$575,562	(incl. SIOH)
SIR	= 11.6	

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: FORT BELVOIR REGION NO. 3 PROJECT NUMBER DACA-31-89-C-0198
 PROJECT TITLE: ENERGY SAVINGS OPPORTUNITY SURVEY FISCAL YR. 199
 DISCRETE PORTION NAME #300 AREA - LOCAL BOILERS VS. #332
 ANALYSIS DATE August '91 ECONOMIC LIFE 25 YEARS PREPARED BY EAC

1. INVESTMENT

A.	CONSTRUCTION COST	\$ <u>545,562</u>
B.	SIOH	\$ <u>30,000</u>
C.	DESIGN COST	\$ <u>32,750</u>
D.	SALVAGE VALUE	\$ _____
E.	TOTAL INVESTMENT (1A + 1B + 1C - 1D)	\$ <u>608,312</u>

2. ENERGY SAVINGS (+) / COST (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST AND DISCOUNTED SAVINGS

FUEL	COST \$/MBTU/YR (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELEC	\$ <u>18.05</u>	<u>566</u>	\$ <u>10216</u>	<u>15.61</u>	\$ <u>159472</u>
B. DIST	\$ <u>7.43</u>	<u>-19702</u>	\$ <u>-146386</u>	<u>21.66</u>	\$ <u>-3170721</u>
C. RESID	\$ <u>6.62</u>	<u>49595</u>	\$ <u>328318</u>	<u>26.51</u>	\$ <u>8703710</u>
D. NG	\$ <u>5.33</u>	_____	\$ _____	_____	\$ _____
E. COAL	\$ _____	_____	\$ _____	_____	\$ _____
TOTAL		<u>30,459</u>	\$ <u>192148</u>		\$ <u>5,692,461</u>

NONENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)

(1)	DISCOUNT FACTOR (TABLE A)	<u>14.53</u>	\$ <u>96,130*</u>
(2)	DISCOUNTED SAVING/COST (3A X 3A1)		\$ <u>1,396,769</u>

B. NONRECURRING SAVINGS (+) / COST (-)

ITEM	SAVINGS (+) COST (-) (1)	YEAR OF OCCUR. (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAV- INGS (+) COST (-) (4)
(1)	\$ _____	_____	_____	\$ _____
(2)	\$ _____	_____	_____	\$ _____
(3)	\$ _____	_____	_____	\$ _____
(4)	TOTAL \$ _____			\$ _____

C. TOTAL NONENERGY DISCOUNTED SAVINGS (+)/COST (-) (3A2+3Bd4) \$ 1,396,769

D. PROJECT NONENERGY QUALIFICATION TEST

(1)	25% MAX NONENERGY CALC (2F5 x .33)	<u>\$ 1,878,512</u>	
a.	IF 3D1 IS = OR > 3C GO TO ITEM 4		
b.	IF 3D1 IS < 3C CALC S1R = (2F5+3D1) - 1E = _____		
c.	IF 3D1 IS = > 1 GO TO ITEM 4		
d.	IF 3D1 IS < 1 PROJECT DOES NOT QUALIFY		

4. FIRST YEAR DOLLAR SAVINGS 2F3 + 3A + (3B1d ÷ YEARS ECONOMIC LIFE) \$ 288,278

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) \$ 7,089,230

DISCOUNTED SAVINGS RATION (IF < 1 PROJECT DOES NOT QUALIFY) (S1R) = (5-1E) = 11.6

SIMPLE PAYBACK PERIOD (YEARS) = 2.1

* See attached sheet

LOCAL BOILERS VERSUS #332

NON-ENERGY ANNUAL SAVINGS(+)/COST(-)

#332 OP & MAINT.	106090
WATER MAKEUP & TREAT	5240
STARTUP \$\$ ADJUST	-3120
MONITOR SYSTEMS / WK	-6080
COLD START-UP REPAIR	-6000
TOTAL	96130

PROJECT: ENERGY SAVINGS OPPORTUNITY SURVEY
 300 AREA SUMMER STEAM USE EVALUATION

LOCATION: FT BELVOIR, VA.

PREPARED BY: Engineering Applications Consultants

300 AREA CENTRAL STEAM SYSTEM OPERATING COSTS

CENTRAL HEATING PLANT BUILDING 332	/YEAR	MID-APRIL MID-OCTOBER
OPERATION and MAINTENANCE		
Current O & M Contract = \$211,020./Yr	\$211,020.	
\$ 17,585./Mo		
Mid-April thru Mid-October =		\$106,090.
Job Orders		
Based on 7 months in 1990 = \$15,720./Yr	\$ 15,720.	
Mid-April thru Mid-October =	(\$7,860.)	N/A
MAKE-UP WATER & TREATMENT =	\$ 12,028.	\$ 5,240.
FUEL COST		
No. 6 Oil, 901,940 GALS x .99 = \$892,921.	\$892,921.	
Mid-April thru Mid-October (Actual)		
351,180 GALS x .99 =		\$347,668.
ELECTRIC COSTS =	\$ 23,740.	\$ 11,870.
BRDEC STEAM DISTRIBUTION SYSTEM MAINTENANCE		
Based on Ft. Belvoir user charge of		
\$ 9.97 / 1000 lbs of steam		
- fuel and plant costs =		
\$ 1.59 / 1000 lbs x 95,907 k lbs = \$152,492.	\$152,492.	
Mid-April thru Mid-October =	(\$ 76,664.)	N/A

SUB-TOTALS	\$ 1,307,921.	\$470,868.

PROJECT: ENERGY SAVINGS OPPORTUNITY SURVEY
 300 AREA SUMMER STEAM ALTERNATIVES

LOCATION: FT BELVOIR, VA.

PREPARED BY: Engineering Applications Consultants

CENTRAL HEATING PLANT BUILDING 332 STEAM PRODUCTION
 (Actual - Based on Facilities Engineering Log)
 (October 1989 thru September 1990)

Year	Month	Steam 1000 lbs	Low	24 Hours Avg	High	Gallons No. 6	
1989	Oct	6,503	149	209.8	283	62,150	27,260
	Nov	8,046	195	268.2	351	70,840	
	Dec	11,336	274	365.7	460	122,440	
1990	Jan	9,427	247	304.1	367	103,570	
	Feb	8,810	136	314.6	503	87,617	
	Mar	10,220	249	329.7	426	89,563	
	Apr	8,694	233	280.5	374	76,890	35,050
	May	7,523	203	242.7	305	68,550	
	Jun	6,249	134	208.3	362	58,470	
	Jul	6,898	182	222.5	254	52,600	
	Aug	5,849	104	188.7	234	55,760	
	Sep	6,352	152	204.9	244	53,490	

12 Month Total = 95,907,000 lbs 901,940 gals x \$.99 = \$892,920.
 Winter Total = 56,473,000 lbs 550,760 gals x \$.99 = \$545,252.
 Summer Total = 39,434,000 lbs 351,180 gals x \$.99 = \$347,668.

BLDG. # 332 HEATING PLANT AND CENTRAL STEAM
DISTRIBUTION SYSTEM MAINTENANCE ESTIMATE.

BASED ON FT. BELVOIR CHARGE OF \$9.97 / 1000 lbs STM,
TO USERS.

FUEL COST

901,940 GAL. #6 EXPENDED TO PRODUCE 95,907,000 lbs of STM
= 106.33 lbs / GAL

∴ 1000 lbs STM = 9.4 GALS #6 @ .64 = \$6.02 / 1000 lbs

9.97 / 1000 lbs

- 6.02 #6 COST

3.95 LEFT FOR PLANT & DST. SYSTEM MAINTENANCE

332 HEATING PLANT OPERATION & MAINTENANCE / YR

\$211,020. CONTRACT + 15,720. = 226,740 / 95,907 Klbs = \$2.36 / 1000 lbs

3.95

- 2.36 / 1000 lbs

\$1.59 / 1000 lbs FOR DISTRIBUTION SYSTEM MAINTENANCE

BRADL STEAM DISTRIBUTION SYSTEM MAINTENANCE:

\$1.59 / 1000 lbs X 95,907 Klbs = 152,492 / YR = 12,708 / Mo.

CENTRAL HEATING PLANT #332

PLANT EFFICIENCY

OVERALL - 12 MONTHS OCT 1989 → SEPT 1990

95,907 K lbs STM. PRODUCED w/901,940 GALS #6 OIL

$$\frac{95,907,000}{901,940} = 106.33 \text{ lbs / GAL}$$

$$\frac{106,330 \text{ BTU}}{149,700 \text{ BTU/GAL} \#6} = 71.02 \% \text{ EFF.}$$

CLIENT:	EAC / ENGINEERING APPLICATIONS CONSULTANTS			
#332 SUMMER STEAM ALTERNATIVES	MADE	CHK.	REV	JOB
PROJECT: ENERGY SAVINGS OPPORTUNITY SURVEY	REF	VP		SHT M-
SUBJECT: #332 PLANT EFFICIENCY				

(18.05 / MTR)

BOILER #1 (1965)
30000 KGS / HR @ 130 PSI (DESIGN)

ELECTRICAL CONSUMPTION

HIGH TEMP. INDUCED DRAFT FAN	(89)	16,900 CFM @ 600°F	10 HP
		8.54 KW	
FORCED DRAFT FAN	(88)	8000 CFM	7½ HP
		6.48	
FEED WATER PUMP	(90)		50 HP
		20.52	
BOOSTER PUMP	(88)		7½ HP
		6.48	
OIL PUMP SET	(84)	500 GPH	3 HP
		2.71	
CHEMICAL FEED PUMP	(84)		¼ HP
		.22	
PROPELLER FAN	(84)	26200 CFM	3 HP
		2.71	

ELECTRICAL CONSUMPTION

			<u>\$</u>	<u>MBTU</u>
8.54 x 4044 = 34,535	x .0616 /KWH	=	2127	117.83
6.48 x 4044 = 26,205	x	=	1614	89.41
20.52 x 4044 = 82,982	x	=	5111	233.15
6.48 x 4044 = 26,205	x	=	1614	89.41
2.71 x 4044 = 10,959	x	=	675	37.39
.22 x 4044 = 889	x	=	54	2.99
2.71 x 4044 = 10,959	x	=	<u>675</u>	<u>37.39</u>
			\$ 11,870	657.6

INDIVIDUAL BOILERS

INITIAL INVESTMENT COST: \$545,562. (SEE BLDG CALCULATIONS FOR INDIVIDUAL COSTS)

BOILER MAINTENANCE: (10 BLDGS)

YEALY CHECK OUT, CLEANUP, START-UP & ADJUSTMENT = \$3120,

WEEKLY MONITORING OF SYSTEMS \$6080,

EXISTING DISTRIBUTION SYSTEM START-UP REPAIR/MAINT. \$6000.

FUEL COSTS (#2 OIL) (10 BLDGS)

142,048 GALS x 1.03 =

\$146,310.

ELECTRIC COST

\$1,660.

\$163,170

LOCAL BOILER OR HOT WATER HEATER
INITIAL INVESTMENT COSTS:

# 307	#48,910
# 309	85,175
# 317	53,075
# 327	58,891
# 331	50,670
# 334	5,700
# 357	110,625
# 362	41,930
# 363	82,466
# 365	8,120

545,562

(INDIVIDUAL ESTIMATES FOLLOWING CALCULATIONS FOR EACH
BUILDING, HEREINAFTER.)

LOCAL BOILER (ASSOCIATED MAINTENANCE COST)

-REPAIR AND MAINTENANCE OF EXISTING DISTRIBUTION SYSTEM BECAUSE OF 26 WEEKS OF NON-USE AND A COLD START-UP.

$$LS = \$6,000.$$

- REPACK	15 VALVES	25		
- REPLACE	20 LF OF 6" PIPING	15.35	13.54	
- REPLACE	20 LF OF 2" PIPING	5.55	2.91	
- REPLACE	(2) 90° ELS - 6"	110.	37.	
- REPLACE	(2) 90° ELS - 2"	19.75	10.30	
- REPLACE	15 GASKET SETS	150.	25.	
		<u>3366</u>	<u>799</u>	4165
		707	36	<u>743</u>
				4908
				+0.42 =
				→ # 5940.

SAY # 6000.

(#18.05 / MBTU)

LOCAL BOILERS

ELECTRICAL CONSUMPTION

WORST CASE

$$\begin{aligned} \text{BURNER} \quad 1\frac{1}{2} \text{ HP} & \quad \times .746 / .84 = 1.33 \times 2022 = 2694 \text{ KWH} \\ & \quad 2694 \times .0616 = 166. \quad = 9.2 \text{ MBTU} \end{aligned}$$

$$\begin{aligned} & \quad \times 10 \text{ BLDGS} \quad = 92 \text{ MBTU} \\ & \quad \quad \quad \quad = \$1660. \end{aligned}$$

PROJECT: ENERGY SAVINGS OPPORTUNITY SURVEY
 300 AREA SUMMER STEAM ALTERNATIVES

LOCATION: FT BELVOIR, VA.

PREPARED BY: Engineering Applications Consultants

E20 COMPUTER ESTIMATED FUEL EXPENDED
 FOR SUMMER OPERATION FROM MID-APRIL THRU MID-OCTOBER
 FOR AIR CONDITIONING REHEAT, DOMESTIC HOT WATER & PROCESS

GALLONS #2 FUEL OIL								
BLDG	APR	MAY	JUN	JULY	AUG	SEPT	OCT	TOTAL

#307	1260	1640	1036	931	1007	1394	1182	8456
#309	3016	5319	4399	4221	4373	4990	2981	29299
#317	1603	2080	1188	898	999	1574	1499	9841
#327	1910	3210	2867	2874	2882	3075	1722	18540
#331	544	1088	1039	1039	1137	941	593	6381
#334	24	50	48	48	52	44	26	270
#357	5704	10709	9495	9307	9606	10199	5833	60853
#362	462	679	559	540	559	625	423	3847
#363	610	766	406	323	370	640	606	4237
#365	27	55	53	53	58	49	29	324

Total GALS = 142048

351,180 gals #6 x \$0.99 =	\$347,668.20	52,571.68 MBTU
142,048 gals #2 x \$1.03 =	\$146,309.44	19,702.05 MBTU
	-----	-----
Savings in fuel =	\$201,358.76	32,869.63 MBTU

PROJECT: ENERGY SAVINGS OPPORTUNITY SURVEY
300 AREA SUMMER STEAM USE EVALUATION

LOCATION: FT BELVOIR, VA.

PREPARED BY: Engineering Applications Consultants

Additional 300 Area buildings that use summer steam

BLDG. #	LBS/HR
314	45
315	45
316	70
318	115
324	115
325	70
326	20

480 lbs/HR x 24 = 11,520 lbs/DAY

x 183.5 days = 2,114,400 lbs/summer

ENERGY EXPENDED FROM CENTRAL PLANT #332

w/ 332 @ 71 percent efficiency = 106.33 lbs/GAL #6 oil

2,114,400/106.33 = 19,886 gals #6 x 149,700 BTU/GAL

= -2976.8 MBTU by 332 for other 7 bldgs

PROJECT: ENERGY SAVINGS OPPORTUNITY SURVEY
300 AREA SUMMER STEAM USE EVALUATION

LOCATION: FT BELVOIR, VA.

PREPARED BY: Engineering Applications Consultants

ESTIMATE OF DISTRIBUTION SYSTEM ENERGY LOSSES

Central Heating Plant #332

Mid-April through Mid-October

Total steam produced = 39,434,000 lbs stm

Total #6 fuel oil expended = 351,180 gals

39,434,000 lbs stm (actual steam produced as per log)
-20,030,000 lbs stm (E20 estimated energy use for 10 bldgs)

19,404,000 lbs stm
- 2,114,400 lbs stm (estimated energy for other 7 bldgs)

17,289,600 lbs stm (distribution system losses =
43.8 percent of total production)

MAKEUP WATER RATE

The actual average rate from April '89 thru Sept '90 =
46.3 percent of feedwater which seems to enforce a poor
distribution system theory.

BASELINE ENERGY

300 AREA BLDGS FROM MID-APRIL THRU MID-OCTOBER

307, 309, 317, 327, 331, 334, 357, 362, 363 & 365

(314, 315, 316, 318, 324, 325, 326)

39,434,000 lbs w/ 351,180 GALS #6 x 149,700 BTU/GAL =

52,571.6 MBTU

#6 OIL SAVING BY 332 PLANT SHUT
DOWN MID-APRIL → MID OCT.

	MBTU	
FOR 10 BLDGS IN SCOPE =	52,571.6	TOT
	<u>- 2,976.8</u>	OTHER TELLER
CORRECTED BASELINE ENERGY =	49,594.8	MBTU

300 SERIES BUILDINGS

Shutdown #322 Plant in Non-heating Months & Supply Steam From #1422

Description - Buildings 307, 309, 317, 327, 331, 334, 357, 362, 363, and 365 in the Belvoir Research, Development, and Engineering Center require steam during the summer for air-conditioning re-heat, and domestic hot water generation. This evaluation addresses the feasibility of connecting 300 area to #1422 boiler plant and shutting down #322 plant during **non-heating** months only.

Energy Saved	= -937	MBTU/year
Cost	= \$1,368,180	(incl. SIOH)
SIR	= 0.69	

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: FORT BELVOIR REGION NO. 3 PROJECT NUMBER DACA-31-89-C-0198
 PROJECT TITLE: ENERGY SAVINGS OPPORTUNITY SURVEY FISCAL YR. 199
 DISCRETE PORTION NAME #300 AREA - CONNECT #1422 VS. CONNECT #332
 ANALYSIS DATE August '91 ECONOMIC LIFE 25 YEARS PREPARED BY EAC

1. INVESTMENT
 A. CONSTRUCTION COST \$ 1,296,850
 B. SIOH \$ 71,330
 C. DESIGN COST \$ 77,800
 D. SALVAGE VALUE - \$ _____
 E. TOTAL INVESTMENT (1A + 1B + 1C - 1D) \$ 1,445,980

2. ENERGY SAVINGS (+) / COST (-)
 ANALYSIS DATE ANNUAL SAVINGS, UNIT COST AND DISCOUNTED SAVINGS

FUEL	COST \$/MBTU/YR(1)	SAVINGS MBTU/YR(2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELEC	\$ <u>18.05</u>	<u>658</u>	\$ <u>11,870</u>	<u>15.61</u>	\$ <u>185,291</u>
B. DIST	\$ <u>7.43</u>		\$ _____		\$ _____
C. RESID	\$ <u>6.62</u>	<u>-1595</u>	\$ <u>-10559</u>	<u>26.51</u>	\$ <u>-279,919</u>
D. NG	\$ <u>5.33</u>		\$ _____		\$ _____
E. COAL	\$ _____		\$ _____		\$ _____
TOTAL		<u>-937</u>	\$ <u>1311</u>		\$ <u>-94,628</u>

NONENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)
 (1) DISCOUNT FACTOR (TABLE A) 14.53
 (2) DISCOUNTED SAVING/COST (3A X 3A1) \$ 75,090*
 \$ 1,091,058

B. NONRECURRING SAVINGS (+) / COST (-)

ITEM	SAVINGS (+) COST (-)(1)	YEAR OF OCCUR.(2)	DISCOUNT FACTOR(3)	DISCOUNTED SAVINGS(+)-COST(-)(4)
(1)	\$ _____	_____	_____	\$ _____
(2)	\$ _____	_____	_____	\$ _____
(3)	\$ _____	_____	_____	\$ _____
(4) TOTAL	\$ _____			\$ _____

C. TOTAL NONENERGY DISCOUNTED SAVINGS(+)/COST(-) (3A2+3Bd4) \$ 1,091,058

D. PROJECT NONENERGY QUALIFICATION TEST
 (1) 25% MAX NONENERGY CALC (2F5 x .33) \$ -31,227
 a. IF 3D1 IS = OR > 3C GO TO ITEM 4
 b. IF 3D1 IS < 3C CALC S1R = (2F5+3D1) ÷ 1E = -0.09
 c. IF 3D1 IS = > 1 GO TO ITEM 4
 (D) IF 3D1 IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3 + 3A + (3B1d ÷ YEARS ECONOMIC LIFE) \$ 76,401

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) \$ 996,430

DISCOUNTED SAVINGS RATION (IF < 1 PROJECT DOES NOT QUALIFY) (S1R) = (5-1E) = 0.69

SIMPLE PAYBACK PERIOD (YEARS) 18.9

* See attached sheet

JDG 1422 CONNECT VERSUS #332

ANNUAL MAINTENANCE, REPAIR & CUSTODIAL COSTS

#332 OP & MAINT.	106090
COLD START-UP REPAIR	-6000
#1422 ADDL. O&M	-25000
TOTAL	75090

PROJECT: ENERGY SAVINGS OPPORTUNITY SURVEY
 300 AREA SUMMER STEAM USE EVALUATION
 LOCATION: Fort Belvoir, Virginia
 PREPARED BY: Engineering Applications Consultants, P.C.

300 AREA CENTRAL STEAM SYSTEM OPERATING COSTS

CENTRAL HEATING PLANT BUILDING 332

OPERATION and MAINTENANCE	/YEAR	MID-APR- MID-OCT
Current O & M Contract = \$211,020/Yr	\$211,020	
\$ 17,585/Mo		
Mid-April thru Mid-October =	(\$25,000)	\$ 81,090
Job Orders		
Based on 7 months in 1990 = \$15,720/Yr	\$ 15,720	
Mid-April thru Mid-October =	(\$7,860)	N/A
MAKE-UP WATER & TREATMENT =	\$ 12,028	
FUEL COST		
No. 6 Oil, 901,940 GALS X .99 = \$892,921	\$892,921	
Mid-April thru Mid-October (Actual)		
361,832 GALS X .99 =		\$358,214
ELECTRIC COSTS =	\$ 23,740	\$ 11,870
BRDEC STEAM DISTRIBUTION SYSTEM MAINTENANCE		
Based on Ft. Belvoir user charge of		
\$9.97/1000 lbs of steam		
- fuel and plant costs =		
\$1.59/1000 lbs X 95,907 k lbs = \$152,492	\$152,492	
Mid-April thru Mid-October =	(\$76,664)	N/A
SUB-TOTALS	\$1,307,921	\$451,174

PROJECT: ENERGY SAVINGS OPPORTUNITY SURVEY
 300 AREA SUMMER STEAM USE EVALUATION

LOCATION: FT BELVOIR, VA.

PREPARED BY: Engineering Applications Consultants

CENTRAL HEATING PLANT BUILDING 332 MAKE-UP WATER USAGE
 (Actual - Based on Facilities Engineering Log)
 (October 1989 thru September 1990)

Year	Month	Feedwater 1000 lb	Gallons	Make-up Gallons	%
1989	Oct	6,535	784,513	297,260	37.9
	Nov	8,077	969,627	359,029	37.02
	Dec	11,367	1,364,585	642,971	47.1
1990	Jan	9,462	1,135,894	669,670	58.95
	Feb	8,838	1,060,984	445,111	41.95
	Mar	10,251	1,230,612	498,100	40.47
	Apr	8,724	1,047,298	475,404	45.39
	May	7,554	906,842	472,611	52.1
	Jun	6,287	754,741	382,270	50.6
	Jul	6,329	759,783	406,260	53.4
	Aug	5,880	705,882	354,130	50.1
	Sep	6,382	766,146	319,721	45.29
		95,686 lbs		5,322,537 gals	46.3%
			11,486,915 gals		

WATER COST

Mid-April thru Mid-October = 2,318,116 gals
 2,318,116 gals x \$ 1.28 / 1000 gals = \$ 2,967.

WATER TREATMENT

2,318,116 GALS X \$.98 / 1000 gals = \$ 2,273.

\$ 5,240.

PROJECT: ENERGY SAVINGS OPPORTUNITY SURVEY
 300 AREA SUMMER STEAM ALTERNATIVES

LOCATION: FT BELVOIR, VA.

PREPARED BY: Engineering Applications Consultants

CENTRAL HEATING PLANT BUILDING 332 STEAM PRODUCTION
 (Actual - Based on Facilities Engineering Log)
 (October 1989 thru September 1990)

Year	Month	Steam 1000 lbs	Low	24 Hours Avg	High	Gallons No. 6	
1989	Oct	6,503	149	209.8	283	62,150	27,260
	Nov	8,046	195	268.2	351	70,840	
	Dec	11,336	274	365.7	460	122,440	
1990	Jan	9,427	247	304.1	367	103,570	
	Feb	8,810	136	314.6	503	87,617	
	Mar	10,220	249	329.7	426	89,563	
	Apr	8,694	233	280.5	374	76,890	35,050
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	Jun	6,249	134	208.3	362	58,470	
	Jul	6,898	182	222.5	254	52,600	
	Aug	5,849	104	188.7	234	55,760	
	Sep	6,352	152	204.9	244	53,490	

12 Month Total = 95,907,000 lbs 901,940 gals x \$.99 = \$892,920.
 Winter Total = 56,473,000 lbs 550,760 gals x \$.99 = \$545,252.
 Summer Total = 39,434,000 lbs 351,180 gals x \$.99 = \$347,668.

BLDG. # 332 HEATING PLANT AND CENTRAL STEAM
DISTRIBUTION SYSTEM MAINTENANCE ESTIMATE.

BASED ON FT. BELVOIR CHARGE OF \$9.97 / 1000 lbs STM.
TO USERS.

FUEL COST

901,940 GAL. #6 EXPENDED TO PRODUCE 95,907,000 lbs of STM
= 106.33 lbs / GAL

∴ 1000 lbs STM = 9.4 GALS #6 @ .64 = \$6.02 / 1000 lbs

9.97 / 1000 lbs

- 6.02 #6 COST

3.95 LEFT FOR PLANT & DIST. SYSTEM MAINTENANCE

332 HEATING PLANT OPERATION & MAINTENANCE / YR

\$211,020. CONTRACT + 15,720. = 226,740 / 95,907 K lbs = \$2.36 / 1000 lbs

3.95

- 2.36 / 1000 lbs

\$1.59 / 1000 lbs FOR DISTRIBUTION SYSTEM MAINTENANCE

BRADL STEAM DISTRIBUTION SYSTEM MAINTENANCE:

\$1.59 / 1000 lbs X 95,907 K lbs = 152,492 / YR = 12,708 / Mo.

CENTRAL HEATING PLANT #332

PLANT EFFICIENCY

OVERALL - 12 MONTHS OCT 1989 → SEPT 1990

95,907 K lbs STM. PRODUCED w/901,940 GALS #6 OIL

$$\frac{95,907,000}{901,940} = 106.33 \text{ lbs / GAL}$$

$$\frac{106,330 \text{ BTU}}{149,700 \text{ BTU/GAL \#6}} = 71.02 \% \text{ EFF.}$$

CLIENT:	EAC/ ENGINEERING APPLICATIONS CONSULTANTS			
#332 SUMMER STEAM ALTERNATIVES	MADE	CHK.	REV	JOB
PROJECT: ENERGY SAVINGS	REF	VP		
OPPORTUNITY SURVEY				SHT M-
SUBJECT: #332 PLANT EFFICIENCY				

(\$18.05 / MET)

BOILER #1 (1965) ELECTRICAL CONSUMPTION
30000 LBS / HR @ 130 PSI (DESIGN)

HIGH TEMP. INDUCED DRAFT FAN (89) 16,900 CFM @ 600°F 10 HP
8.54 KW

FORCED DRAFT FAN (89) 8000 CFM 7½ HP
6.48

FEED WATER PUMP (90) 30 HP
20.52

BOOSTER PUMP (88) 7½ HP
6.48

OIL PUMP SET (84) 500 GPH 3 HP
2.71

CHEMICAL FEED PUMP (34) ¼ HP
.22

PROPELLER FAN (84) 26200 CFM 3 HP
2.71

ELECTRICAL CONSUMPTION

			<u>\$</u>	<u>MBTU</u>
8.54	x 4044 = 34,535	x .0616/kwh	= 2127	117.83
6.48	x 4044 = 26,205	x	= 1614	89.41
20.52	x 4044 = 82982	x	= 5111	283.15
6.48	x 4044 = 26205	x	= 1614	89.41
2.71	x 4044 = 10,959	x	= 675	37.39
.22	x 4044 = 889	x	= 54	2.99
2.71	x 4044 = 10,959	x	= <u>675</u>	<u>37.39</u>
			\$ 11,870	657.6

CONSTRUCTION COST ESTIMATE

DATE PREPARED
APRIL 1991

SHEET OF

PROJECT
ENERGY SAVINGS OPPORTUNITY SURVEY

LOCATION
FT. BELVOIR, VIRGINIA

ARCHITECT ENGINEER
ENGINEERING APPLICATIONS CONSULTANTS

BASIS FOR ESTIMATE

- CODE A (No design completed)
- CODE B (Preliminary design)
- CODE C (Final design)
- OTHER (Specify) _____

DRAWING NO.

ESTIMATOR
REF

CHECKED BY
VP

SUMMARY	QUANTITY		LABOR		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	PER UNIT	TOTAL	
INTERCONNECT STEAM SUPPLY FROM #1422 w/ 300 AREA DISTRIBUTION SYSTEM - SUMMER							
PIPE/CONDUIT SYSTEM							
8" STM / 12 3/4" φ	7700	LF	12.60	97020.	24.77	190729.	287,749.
4" COND / 8 5/8" φ	7700	LF	11.10	85470.	19.56	150612	236,082.
TRENCHING	7700	LF	4.81	37037	3.36	25872	62,909.
BEDDING	7700	LF	1.93	14861	1.41	10857	25,718.
LOOPS	26	EA	913.	23738	1473.	38,298	62,036.
ANCHORS 8"	27	EA	85.	2295	315.	8,505	10,800.
4"	27	EA	74.	1998	225.	6,075	8,073.
TRAP ASSEMBLIES	8	EA	150	1200	165	1320	2,520.
MANHOLES	4	EA	4000	16000	6000	24000	40,000.
MISC. CUTTING, PATCHING, REMOVAL & REELEMENENT	7700	LF	12.	92,400	18.	138,600	231,000.
SUB-TOTAL				372,019.		594,868.	966,887.
LABOR MARKUP 21%				78,124.			78,124.
TAXES 4.5%						26,769.	26,769.
SUB-TOTAL							1,071,780.
OVERHEAD 10%							107,178.
SUB-TOTAL							1,178,958
PROFIT 10%							117,896.
SUB-TOTAL							1,296,854
TOTAL							1,296,850.

FUEL CONSUMPTION

EXTRA #6 OIL EXPENDED AT CENTRAL PLANT #1422
DURING NON-HEATING MONTHS

#1422 IS 3% MORE EFFICIENT (74%) THAN #332

$$\therefore 351,180 \text{ GALS \#6 BY \#332} = 340,645 \text{ AT \#1422}$$

$$\begin{aligned} & 340,645 \text{ GALS FOR 300 AREA LOAD} \\ & + 21,986 \text{ GALS FOR CONNECTION} \\ & \underline{362,631 \text{ GALS \#6}} \\ & - 351,180 \text{ GALS \#6 (ACTUALLY USED)} \\ & \underline{11,451 \text{ GALS MORE FUEL EXPENDED}} \end{aligned}$$

$$11,451 \text{ GALS} / 6.68 = 1714.221557 \text{ MBTU ADDITIONAL ENERGY}$$

$$\begin{aligned} \text{SAVINGS IN} \\ \text{OTHER 7 BLDGS} &= 799 \text{ GALS \#6} \\ &= 119.6 \text{ MBTU ADDITIONAL} \end{aligned}$$

$$\begin{aligned} \text{TOTAL EXTRA FUEL EXPENDED} &= 10,652 \text{ GALS \#6} \\ 10,652 / 6.68 &= 1,594.6 \text{ MBTU} \end{aligned}$$

CLIENT:	EAC/			ENGINEERING APPLICATIONS CONSULTANTS
#332 SUMMER STEAM ALTERNATIVES	MADE	CHK.	REV	JCB
PROJECT: ENERGY SAVINGS OPPORTUNITY SURVEY	REF	VP		SHT M-
SUBJECT: #1422 → #332 SUMMER				

(ASSOCIATED MAINTENANCE COST)

-REPAIR AND MAINTENANCE OF EXISTING DISTRIBUTION SYSTEM BECAUSE OF 26 WEEKS OF NON-USE AND A COLD START-UP.

$$LS = \$6,000.$$

- REPACK	15 VALVES	25		
- REPLACE	20 LF OF 6" PIPING	15.35	13.54	
- REPLACE	20 LF OF 2" PIPING	5.55	2.99	
- REPLACE	(2) 90° ELS - 6"	110.	37.	
- REPLACE	(2) 90° ELS - 2"	19.75	10.30	
- REPLACE	15 GASKET SETS	150.	25.	
		<u>3366</u>	<u>799</u>	4165
		707	36	<u>743</u>
				4908
				+ 0.8 P =
				→ # 5940.
				SAY # 6000.

PROJECT: ENERGY SAVINGS OPPORTUNITY SURVEY
300 AREA SUMMER STEAM USE EVALUATION

LOCATION: FT BELVOIR, VA.

PREPARED BY: Engineering Applications Consultants

Additional 300 Area buildings that use summer steam

BLDG. #	LBS/HR
314	45
315	45
316	70
318	115
324	115
325	70
326	20

 $480 \text{ lbs/HR} \times 24 = 11,520 \text{ lbs/DAY}$

$\times 183.5 \text{ days} = 2,114,400 \text{ lbs/summer}$

ENERGY EXPENDED FROM CENTRAL PLANT #332

w/ 332 @ 71 percent efficiency = 106.33 lbs/GAL #6 oil

$2,114,400 / 106.33 = 19,886 \text{ gals \#6} \times 149,700 \text{ BTU/GAL}$

= -2976.8 MBTU by 332 for other 7 bldgs

ENERGY EXPENDED FROM CENTRAL PLANT #1422

w/ 1422 @ 74 percent efficiency = 110.78 lbs/GAL #6 oil

$2,114,400 / 110.78 = 19,087 \text{ gals \#6} \times 149,700 \text{ BTU/GAL}$

= -2857.2 MBTU by 1422 for other 7 bldgs

PROJECT: ENERGY SAVINGS OPPORTUNITY SURVEY
300 AREA SUMMER STEAM USE EVALUATION

LOCATION: FT BELVOIR, VA.

PREPARED BY: Engineering Applications Consultants

ESTIMATE OF DISTRIBUTION SYSTEM ENERGY LOSSES

Central Heating Plant #332

Mid-April through Mid-October

Total steam produced = 39,434,000 lbs stm

Total #6 fuel oil expended = 351,180 gals

39,434,000 lbs stm	(actual steam produced as per log)
-20,030,000 lbs stm	(E20 estimated energy use for 10 bldgs)
<hr/>	
19,404,000 lbs stm	
- 2,114,400 lbs stm	(estimated energy for other 7 bldgs)
<hr/>	
17,289,600 lbs stm	(distribution system losses = 43.8 percent of total production)

MAKEUP WATER RATE

The actual average rate from April '89 thru Sept '90 =
46.3 percent of feedwater which seems to enforce a poor
distribution system theory.

300 SERIES BUILDINGS

Connect 300 Area to Central Boiler Plant in #1422

Description - Buildings 307, 309, 317, 327, 331, 334, 357, 362, 363, and 365 in the Belvoir Research, Development, and Engineering Center require steam during the summer for air-conditioning re-heat, and domestic hot water generation. This evaluation addresses the feasibility of connecting 300 area to central boiler plant in building 1422 and shutting down #322 boiler plant.

Energy Saved	= -3625	MBTU/year
Cost	= \$1,465,057	(incl. SIOH)
SIR	= 1.2	

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: FORT BELVOIR REGION NO. 3 PROJECT NUMBER DACA-31-89-C-0198
 PROJECT TITLE: ENERGY SAVINGS OPPORTUNITY SURVEY FISCAL YR. 199
 DISCRETE PORTION NAME #300 AREA - CONNECT #1422 TO 300 AREA - YEAR ROUND
 ANALYSIS DATE August '91 ECONOMIC LIFE 25 YEARS PREPARED BY EAC

1. INVESTMENT
 A. CONSTRUCTION COST \$ 1,388,680
 B. SIOH \$ 76,377
 C. DESIGN COST \$ 83,321
 D. SALVAGE VALUE - \$ _____
 E. TOTAL INVESTMENT (1A + 1B + 1C - 1D) \$ 1,548,378

2. ENERGY SAVINGS (+) / COST (-)
 ANALYSIS DATE ANNUAL SAVINGS, UNIT COST AND DISCOUNTED SAVINGS

FUEL	COST \$/MBTU/YR(1)	SAVINGS MBTU/YR(2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELEC	\$ <u>18.05</u>	<u>1052</u>	\$ <u>18989</u>	<u>15.61</u>	\$ <u>296,418</u>
B. DIST	\$ <u>7.43</u>		\$ _____		\$ _____
C. RESID	\$ <u>6.62</u>	<u>-4677</u>	\$ <u>-30962</u>	<u>26.51</u>	\$ <u>-820,803</u>
D. NG	\$ <u>5.33</u>		\$ _____		\$ _____
E. COAL	\$ _____		\$ _____		\$ _____
TOTAL		<u>-3625</u>	\$ <u>-11,973</u>		\$ <u>-524,385</u>

NONENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-) #332 0 E M \$ 161,020
 (1) DISCOUNT FACTOR (TABLE A) 14.53
 (2) DISCOUNTED SAVING/COST (3A X 3A1) \$ 2,339,621

B. NONRECURRING SAVINGS (+) / COST (-)

ITEM	SAVINGS (+) COST (-) (1)	YEAR OF OCCUR. (2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST (-) (4)
(1)	\$ _____	_____	_____	\$ _____
(2)	\$ _____	_____	_____	\$ _____
(3)	\$ _____	_____	_____	\$ _____
(4) TOTAL	\$ _____			\$ _____

C. TOTAL NONENERGY DISCOUNTED SAVINGS(+)/COST(-) (3A2+3Bd4) \$ 2,339,621

D. PROJECT NONENERGY QUALIFICATION TEST
 (1) 25% MAX NONENERGY CALC (2F5 x .33) \$ -173,047
 a. IF 3D1 IS = OR > 3C GO TO ITEM 4
 b. IF 3D1 IS < 3C CALC S1R = (2F5+3D1) ÷ 1E = -0.45
 c. IF 3D1 IS = > 1 GO TO ITEM 4
 d. IF 3D1 IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3 + 3A + (3B1d - YEARS ECONOMIC LIFE) \$ 149,047

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) \$ 1,815,236

DISCOUNTED SAVINGS RATION (IF < 1 PROJECT DOES NOT QUALIFY) (S1R) = (5-1E) = 1.2

SIMPLE PAYBACK PERIOD (YEARS) = 10.4

CONSTRUCTION COST ESTIMATE

DATE PREPARED

SHEET OF

PROJECT
ENERGY SAVINGS OPPORTUNITY SURVEY

BASIS FOR ESTIMATE

LOCATION
FT. BELVOIR, VIRGINIA

- CODE A (No design completed)
- CODE B (Preliminary design)
- CODE C (Final design)
- OTHER (Specify) _____

ARCHITECT ENGINEER
ENGINEERING APPLICATIONS CONSULTANTS

DRAWING NO.

ESTIMATOR
REF

CHECKED BY
VP

SUMMARY	QUANTITY		LABOR		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	PER UNIT	TOTAL	
INTERCONNECT STEAM SUPPLY FROM #1422 w/ 300 AREA DISTRIBUTION SYSTEM - YEAR ROUND							
PIPE / CONDUIT SYSTEM							
10" STM / 14" φ	7700	LF	14.20	109,340	30.08	231,616	340,956
6" COND / 10 3/4" φ	7700	LF	11.80	90,860	22.61	174,097	264,957
TRENCHING	7700	LF	4.81	37,037	3.36	25,872	62,909
BEDDING	7100	LF	1.93	14,861	1.41	10,857	25,718
LOOPS	26	EA	32.74	982	57.46	1,724	2,706
ANCHORS 10"	27	EA	92	2484	377	10,179	12,663
6"	27	EA	79	2133	301	8,127	10,260
TRAP ASSEMBLIES	8	EA	150	1200	165	1320	2,520
MANHOLES	4	EA	4000	16,000	6000	24,000	40,000
MISC. CUTTING, PATCHING							
REMOVAL & REPLACEMENT	7700	LF	14	107,800	21	161,700	269,500
MOTHBALL #332		LS		4,000		1,000	5,000
SUB-TOTAL				386,697		650,492	1,037,189
LABOR MARKUP 21%				81,206			81,206
TAXES 4.5%						29,272	29,272
SUB-TOTAL							1,147,667
OVERHEAD 10%							114,768
SUB-TOTAL							1,262,435
PROFIT 10%							126,244
SUB-TOTAL							1,388,680
TOTAL							1,388,680

PROJECT: ENERGY SAVINGS OPPORTUNITY SURVEY
300 AREA SUMMER STEAM USE EVALUATION

LOCATION: Fort Belvoir, Virginia

PREPARED BY: Engineering Applications Consultants, P.C.

300 AREA CENTRAL STEAM SYSTEM OPERATING COSTS

CENTRAL HEATING PLANT BUILDING 332

OPERATION and MAINTENANCE	/YEAR
Current O & M Contract = \$211,020/Yr \$ 17,585/Mo	\$211,020
Job Orders Based on 7 months in 1990 = \$15,720/Yr	\$ 15,720
MAKE-UP WATER & TREATMENT =	\$ 12,028
FUEL COST No. 6 Oil, 901,940 GALS X .99 = \$892,921	\$892,921
ELECTRIC COSTS =	\$ 23,740

BRDEC STEAM DISTRIBUTION SYSTEM MAINTENANCE

Based on Ft. Belvoir user charge of \$9.97/1000 lbs of steam - fuel and plant costs = \$1.59/1000 lbs X 95,907 k lbs = \$152,492	\$152,492
-------------------------------------------------------------------------------------------------------------------------------------------	-----------

SUB-TOTALS \$1,307,921

PROJECT: ENERGY SAVINGS OPPORTUNITY SURVEY
 300 AREA SUMMER STEAM ALTERNATIVES

LOCATION: FT BELVOIR, VA.

PREPARED BY: Engineering Applications Consultants

CENTRAL HEATING PLANT BUILDING 332 STEAM PRODUCTION
 (Actual - Based on Facilities Engineering Log)
 (October 1989 thru September 1990)

Year	Month	Steam 1000 lbs	Low	24 Hours Avg	High	Gallons No. 6	
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12 Month Total = 95,907,000 lbs 901,940 gals x \$.99 = \$892,920.
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 Summer Total = 39,434,000 lbs 351,180 gals x \$.99 = \$347,668.

PROJECT: ENERGY SAVINGS OPPORTUNITY SURVEY
 300 AREA SUMMER STEAM USE EVALUATION

LOCATION: FT BELVOIR, VA.

PREPARED BY: Engineering Applications Consultants

CENTRAL HEATING PLANT BUILDING 332 MAKE-UP WATER USAGE
 (Actual - Based on Facilities Engineering Log)
 (October 1989 thru September 1990)

Year	Month	Feedwater 1000 lb	Gallons	Make-up Gallons	%
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	Aug	5,880	705,882	354,130	50.1
	Sep	6,382	766,146	319,721	45.29
		95,686 lbs		5,322,537 gals	46.3%
			11,486,915 gals		

WATER COST

Mid-April thru Mid-October = 2,318,116 gals
 2,318,116 gals x \$ 1.28 / 1000 gals = \$ 2,967.

WATER TREATMENT

2,318,116 GALS X \$.98 / 1000 gals = \$ 2,273.

\$ 5,240.

BLDG. # 332 HEATING PLANT AND CENTRAL STEAM
DISTRIBUTION SYSTEM MAINTENANCE ESTIMATE,

BASED ON FT. BELVOIR CHARGE OF \$9.97 / 1000 lbs STM.
TO USERS.

FUEL COST

901,940 GAL. #6 EXPENDED TO PRODUCE 95,907,000 lbs of STM
= 106.33 lbs / GAL

∴ 1000 lbs STM = 9.4 GALS #6 @ .64 = \$6.02 / 1000 lbs

9.97 / 1000 lbs

- 6.02 #6 COST

3.95 LEFT FOR PLANT & DIST. SYSTEM MAINTENANCE

332 HEATING PLANT OPERATION & MAINTENANCE / YR

\$211,020. CONTRACT + 15,720. = 226,740 / 95,907 Klbs = \$2.36 / 1000 lbs

3.95

- 2.36 / 1000 lbs

\$1.59 / 1000 lbs FOR DISTRIBUTION SYSTEM MAINTENANCE

BRADL STEAM DISTRIBUTION SYSTEM MAINTENANCE:

\$1.59 / 1000 lbs X 95,907 Klbs = 152,492 / YR = 12,708 / Mo.

CENTRAL HEATING PLANT #332

PLANT EFFICIENCY

OVERALL - 12 MONTHS OCT 1989 → SEPT 1990

95,907 K lbs STM. PRODUCED w/901,940 GALS #6 OIL

$$\frac{95,907,000}{901,940} = 106.33 \text{ lbs / GAL}$$

$$\frac{106,330 \text{ BTU}}{149,700 \text{ BTU/GAL \#6}} = 71.02 \% \text{ EFF.}$$

CLIENT:	EAC/ ENGINEERING APPLICATIONS CONSULTANTS			
#332 SUMMER STEAM ALTERNATIVES	MADE	CHK.	REV	JOB
PROJECT: ENERGY SAVINGS OPPORTUNITY SURVEY	REF	VP		
SUBJECT: #332 PLANT EFFICIENCY				SHT M-

(\$18.05 / MBTU)

BOILER #1 (1965) ELECTRICAL CONSUMPTION
30000 KGS / HR @ 130 PSI (DESIGN)

HIGH TEMP. INDUCED DRAFT FAN	(89)	16,900 CFM @ 600°F	10 HP
		8.54 KW	
FORCED DRAFT FAN	(88)	8000 CFM	7½ HP
		6.48	
FEED WATER PUMP	(90)		30 HP
		20.52	
ECOASTER PUMP	(85)		7½ HP
		6.48	
OIL PUMP SET	(84)	500 GPH	3 HP
		2.71	
CHEMICAL FEED PUMP	(84)		¼ HP
		.22	
PROPELLER FAN	(84)	26200 CFM	3 HP
		2.71	

ELECTRICAL CONSUMPTION

	<u>\$</u>	<u>MBTU</u>
8.54 x 4044 = 34,535 x .0616 /KWH	= 2127	117.83
6.48 x 4044 = 26,205 x	= 1614	89.41
20.52 x 4044 = 82982 x	= 5111	283.15
6.48 x 4044 = 26205 x	= 1614	89.41
2.71 x 4044 = 10,959 x	= 675	37.39
.22 x 4044 = 889 x	= 54	2.99
2.71 x 4044 = 10959 x	= 675	37.39
	<u>\$ 11,870</u>	<u>657.6</u>
	<u>x 2</u>	<u>x 2</u>
TOTAL YEARLY ELECTRIC CONSUMPTION =	\$ 23,740.	1315.2 MBTU
ASSUME 80% OF ELECTRICAL LOAD WILL BE REDUNDANT W/1422 ∴ IS SAVINGS	<u>x .8</u> 18,992.	<u>x .8</u> 1052.1 MBTU

PROJECT: ENERGY SAVINGS OPPORTUNITY SURVEY
300 AREA SUMMER STEAM USE EVALUATION

LOCATION: FT BELVOIR, VA.

PREPARED BY: Engineering Applications Consultants

Additional 300 Area buildings that use summer steam

BLDG. #	LBS/HR
314	45
315	45
316	70
318	115
324	115
325	70
326	20

 $480 \text{ lbs/HR} \times 24 = 11,520 \text{ lbs/DAY}$

$\times 183.5 \text{ days} = 2,114,400 \text{ lbs/summer}$

ENERGY EXPENDED FROM CENTRAL PLANT #332

w/ 332 @ 71 percent efficiency = 106.33 lbs/GAL #6 oil

$2,114,400 / 106.33 = 19,886 \text{ gals \#6} \times 149,700 \text{ BTU/GAL}$

= -2976.8 MBTU by 332 for other 7 bldgs

ENERGY EXPENDED FROM CENTRAL PLANT #1422

w/ 1422 @ 74 percent efficiency = 110.78 lbs/GAL #6 oil

$2,114,400 / 110.78 = 19,087 \text{ gals \#6} \times 149,700 \text{ BTU/GAL}$

= -2857.2 MBTU by 1422 for other 7 bldgs

PROJECT: ENERGY SAVINGS OPPORTUNITY SURVEY
300 AREA SUMMER STEAM USE EVALUATION

LOCATION: FT BELVOIR, VA.

PREPARED BY: Engineering Applications Consultants

ESTIMATE OF DISTRIBUTION SYSTEM ENERGY LOSSES

Central Heating Plant #332

Mid-April through Mid-October

Total steam produced = 39,434,000 lbs stm

Total #6 fuel oil expended = 351,180 gals

39,434,000 lbs stm (actual steam produced as per log)
-20,030,000 lbs stm (E20 estimated energy use for 10 bldgs)

19,404,000 lbs stm
- 2,114,400 lbs stm (estimated energy for other 7 bldgs)

17,289,600 lbs stm (distribution system losses =
43.8 percent of total production)

MAKEUP WATER RATE

The actual average rate from April '89 thru Sept '90 =
46.3 percent of feedwater which seems to enforce a poor
distribution system theory.

BUILDING 307

DESIGN PARAMETERS, SHGs

Location : FT. BELVOIR, VIRGINIA
 Prepared By : ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

10-16-90
 6022890201
 Page 1 of 1

DESIGN WEATHER PARAMETERS

City Name.....: FT. BELVOIR
 Location.....: VIRGINIA
 Latitude.....: 38.4 deg
 Elevation.....: 69.0 ft
 Summer Design Dry Bulb Temp.....: 90.0 F
 Summer Design Wet Bulb Temp.....: 75.0 F
 Daily Temperature Range.....: 23.0 F
 Winter Design Dry Bulb Temp.....: 12.0 F
 Atmospheric Clearness Number.....: 1.00

TABLE 1. MAXIMUM SOLAR HEAT GAINS - AVERAGE DAYS
 (BTU/hr/sqft)

Month	NE	E	SE	S	SW	W	NW	N	Hor
Jan	24.2	61.1	97.3	110.1	97.3	61.1	24.2	24.2	80.0
Feb	31.8	74.8	105.7	113.8	105.7	74.8	31.8	31.8	107.2
Mar	40.8	87.0	106.9	108.0	106.9	87.0	40.8	40.8	136.8
Apr	60.0	97.4	104.4	97.2	104.4	97.4	60.0	49.3	164.3
May	74.9	103.0	98.4	84.0	98.4	103.0	74.9	54.9	181.8
Jun	85.1	109.3	97.5	79.2	97.5	109.3	85.1	57.9	195.2
Jul	80.6	106.7	98.1	81.4	98.1	106.7	80.6	56.4	189.3
Aug	69.1	104.1	105.7	94.4	105.7	104.1	69.1	52.2	177.6
Sep	52.3	99.3	114.8	111.6	114.8	99.3	52.3	45.4	158.1
Oct	36.4	88.3	117.7	122.9	117.7	88.3	36.4	36.4	128.2
Nov	26.7	66.5	101.8	113.3	101.8	66.5	26.7	26.7	89.4
Dec	21.4	53.0	87.6	100.9	87.6	53.0	21.4	21.4	68.4

TABLE 2. MAXIMUM SOLAR HEAT GAINS - DESIGN DAYS
 (BTU/hr/sqft)

Month	NE	E	SE	S	SW	W	NW	N	Hor
Jan	20.4	158.9	243.9	253.8	243.9	158.9	20.4	20.4	142.0
Feb	53.0	189.1	246.5	237.5	246.5	189.1	53.0	24.7	187.7
Mar	95.9	219.8	234.5	200.7	234.5	219.8	95.9	29.4	229.0
Apr	141.6	224.4	200.1	146.7	200.1	224.4	141.6	34.1	256.0
May	166.1	220.1	170.7	104.6	170.7	220.1	166.1	37.4	268.0
Jun	173.2	215.4	156.7	87.8	156.7	215.4	173.2	47.4	269.7
Jul	163.7	215.7	166.5	101.4	166.5	215.7	163.7	38.3	264.7
Aug	136.4	216.6	193.1	141.7	193.1	216.6	136.4	35.8	251.3
Sep	90.3	207.2	224.7	194.9	224.7	207.2	90.3	30.6	221.4
Oct	52.0	182.7	238.2	230.6	238.2	182.7	52.0	25.5	184.4
Nov	20.7	156.1	239.8	249.9	239.8	156.1	20.7	20.7	141.3
Dec	18.5	141.9	236.4	254.2	236.4	141.9	18.5	18.5	122.2

MASTER SCHEDULE SUMMARY

Prepared By : ENGG APPLICATIONS CONSUL
Carrier Hourly Analysis Program

MASTER SCHEDULE 1. OCCUPANCY Hourly Percentages

Hour ---->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	0	0	0	0	0	0	10	50	100	100	100	100
Saturday	0	0	0	0	0	0	5	5	5	10	10	10
Sunday	0	0	0	0	0	0	0	5	5	5	5	5
DESIGN	0	0	0	0	0	10	20	100	100	100	100	100

Hour ---->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	100	100	100	100	80	50	10	10	5	5	0	0
Saturday	10	10	10	5	5	5	5	5	0	0	0	0
Sunday	5	5	5	5	5	5	0	0	0	0	0	0
DESIGN	100	100	100	100	100	100	100	20	10	0	0	0

MASTER SCHEDULE 2. LIGHTING Hourly Percentages

Hour ---->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	5	5	5	5	5	5	20	80	100	100	100	100
Saturday	5	5	5	5	5	5	15	15	20	40	50	50
Sunday	5	5	5	5	5	5	5	15	20	30	30	30
DESIGN	10	10	10	10	10	20	50	100	100	100	100	100

Hour ---->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	100	100	100	100	90	70	40	30	20	20	5	5
Saturday	50	50	50	50	50	40	30	20	5	5	5	5
Sunday	30	30	30	20	20	20	20	5	5	5	5	5
DESIGN	100	100	100	100	100	100	100	50	20	10	10	10

MASTER SCHEDULE 3. EQUIPMENT Hourly Percentages

Hour ---->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	5	5	5	5	5	5	20	50	100	100	100	100
Saturday	5	5	5	5	5	5	10	10	15	20	20	20
Sunday	5	5	5	5	5	5	5	10	10	10	10	20
DESIGN	10	10	10	10	10	20	40	100	100	100	100	100

Hour ---->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	100	100	100	100	80	50	20	10	5	5	5	5
Saturday	20	20	20	10	10	10	10	10	5	5	5	5
Sunday	20	15	15	10	10	10	10	5	5	5	5	5
DESIGN	100	100	100	100	100	100	100	40	20	10	10	10

MASTER SCHEDULE SUMMARY

Prepared By : ENGG APPLICATIONS CONSUL
Carrier Hourly Analysis Program

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MASTER SCHEDULE 4. DOMESTIC HOT WATER Hourly Percentages

Hour ----->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	0	0	0	0	0	5	10	10	20	20	20	80
Saturday	0	0	0	0	0	2	2	2	5	5	5	5
Sunday	0	0	0	0	0	0	0	2	2	2	2	2
DESIGN	0	0	0	0	0	5	5	20	20	20	20	80

Hour ----->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	80	20	20	20	10	10	5	5	5	2	0	0
Saturday	5	5	5	2	2	2	2	2	0	0	0	0
Sunday	2	2	2	2	2	2	0	0	0	0	0	0
DESIGN	80	20	20	20	10	10	5	5	5	2	0	0

DAY TYPE DATA

Prepared By : ENGG APPLICATIONS CONSUL
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10-02-90
 6022890201

Month	DAY TYPE 1 Weekday	DAY TYPE 2 Saturday	DAY TYPE 3 Sunday	Total Days/Month
January	21	4	6	31
February	19	4	5	28
March	22	5	4	31
April	21	4	5	30
May	22	4	5	31
June	21	5	4	30
July	21	4	6	31
August	23	4	4	31
September	19	5	6	30
October	23	4	4	31
November	21	4	5	30
December	20	5	6	31

ENGINEERING ANALYSIS

Sheet 1 of 1

By: REF

Calculations for Infiltration

Building 307

Project: ESOS, Fort BELVOIR Date: SEPT. 1990

Contract No: DACA-31-89-C=0189 EAC Project No.: 89034.01

Calculations based on ASHRAE 1989 Page F 2.3.14.

Building Leakage Area

	Effective Leakage Area, in ²	Building Component Parameter	Building Leakage Area D _L , in ²
	L _i	D _i	L
Sill foundation	0.19/ft. of perimeter	400 ft.	76.0
Joints, ceiling/wall	0.12/ft. of wall	400 ft.	48.0
Windows	0.063/ft ² . of window	2421 ft ² .	152.6
Doors	0.215/ft ² . of doors	168 ft ² .	36.2
Wall - Window frames	0.15/ft ² . of window	1154 ft ² .	173.1
- Door frames	0.072/ft ² . of door	104 ft ² .	7.5
Elec. outlet/switch	0.16/fixture	100 ft.	16.0
Recessed lights	1.6/fixture	402 ft.	643.2
Pipe penetration	1.55/in ² . of pipe,	10 ft.	15.5
Exhaust fans	6.0/fan	14 ft.	84.0
Duct penetration	2.2/SF	75SF	165.0
FCU openings	0 x 1/3(SF/unit) x 2.2/SF		<u>1417.1</u> in ² .

Infiltration Q(cfm) = L x (A At + Bv²)^{1/2}

(ASHRAE 1989, P. 23.17, EQ.33)

Winter

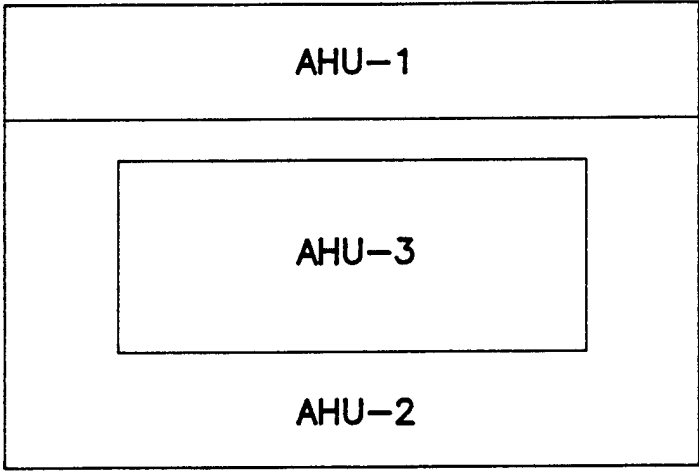
Summer

Q(cfm) =
= L(0.01313 x 51 + 0.0157 x 14²)^{1/2}
= L x 2.2
= 1417.1 x 2.2 = 3118 CFM

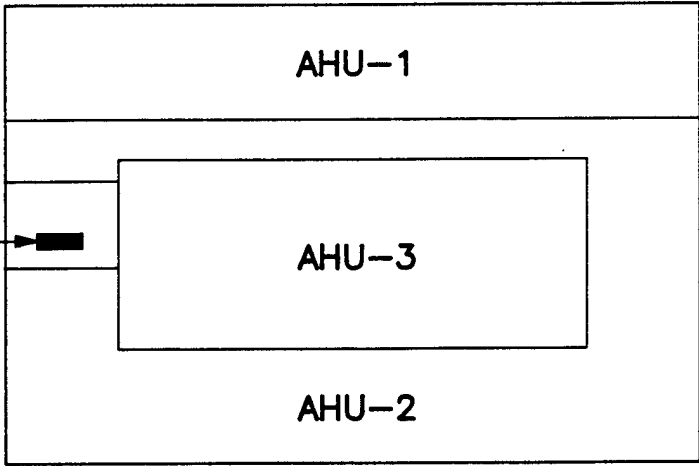
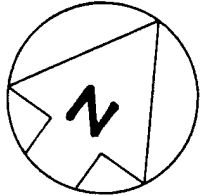
= L(0.0313 x 15 + 0.0157 x 10²)^{1/2}
= L x 1.45
= 1417.1 x 1.45 = 2055 CFM

Rate = $\frac{3118}{19,200} = 0.162$ CFM/SF

Rate = $\frac{2055}{19,200} = 0.11$ CFM/SF



SECOND FLOOR PLAN



FIRST FLOOR PLAN

BUILDING 307 KEY PLAN

SIMPLE SPACE DESCRIPTION

Space Name : 119 RC-1 1 1 10-02-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.310 Roof 0.090 Glass 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 580.0 Schedule = 1 Activity Level = 2
Lights : W/sqft = 4.14 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 119 RC-1 1 1

Exposure : NW E Floor Area : 580.0 sqft
Wall Area : 374.0 0.0 Roof Area : 0.0 sqft
Glass Area : 0.0 0.0 Current Elements : El,Pt,Pt,In,Gr

ADDITIONAL ELEMENT - Other Electric

W/sqft = 4.40
Total Watts = 2,552
Schedule No. = 3

ADDITIONAL ELEMENT - Partition

Area = 580.0 sqft Uncond. Space Temp:Cooling = 85.0 F
U-Value = 0.240 BTU/hr/sqft/F Uncond. Space Temp:Heating = 40.0 F

ADDITIONAL ELEMENT - Partition

Area = 258.0 sqft Uncond. Space Temp:Cooling = 85.0 F
U-Value = 0.330 BTU/hr/sqft/F Uncond. Space Temp:Heating = 40.0 F

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.11 CFM/sqft = 64 CFM
Heating : 0.16 CFM/sqft = 93 CFM
Typical : 0.16 CFM/sqft = 93 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 580.0 sqft
Perimeter = 29.0 ft
Depth = 0.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : 120 RC-1 1 1 (TYP 121 10-02-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.310 Roof 0.090 Glass 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 400.0 Schedule = 1 Activity Level = 2
Lights : W/sqft = 4.08 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 120 RC-1 1 1 (TYP 121

Floor Area : 400.0 sqft
Exposure : NW E Roof Area : 0.0 sqft
Wall Area : 155.0 0.0 Current
Glass Area : 103.0 0.0 Elements : El,Pt,In,Gr

ADDITIONAL ELEMENT - Other Electric

W/sqft = 4.40
Total Watts = 1,760
Schedule No. = 3

ADDITIONAL ELEMENT - Partition

Area = 400.0 sqft Uncond. Space Temp:Cooling = 85.0 F
U-Value = 0.240 BTU/hr/sqft/F Uncond. Space Temp:Heating = 40.0 F

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.11 CFM/sqft = 44 CFM
Heating : 0.16 CFM/sqft = 64 CFM
Typical : 0.16 CFM/sqft = 64 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 400.0 sqft
Perimeter = 20.0 ft
Depth = 0.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : 122 RC-4 1 1 10-02-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.310 Roof 0.090 Glass 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 400.0 Schedule = 1 Activity Level = 2
Lights : W/sqft = 4.80 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 122 RC-4 1 1

Floor Area : 400.0 sqft
Exposure : NW NE Roof Area : 0.0 sqft
Wall Area : 155.0 258.0 Current
Glass Area : 103.0 0.0 Elements : El,Pt,In,Gr

ADDITIONAL ELEMENT - Other Electric

W/sqft = 4.40
Total Watts = 1,760
Schedule No. = 3

ADDITIONAL ELEMENT - Partition

Area = 400.0 sqft Uncond. Space Temp:Cooling = 85.0 F
U-Value = 0.240 BTU/hr/sqft/F Uncond. Space Temp:Heating = 40.0 F

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.11 CFM/sqft = 44 CFM
Heating : 0.16 CFM/sqft = 64 CFM
Typical : 0.16 CFM/sqft = 64 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 400.0 sqft
Perimeter = 20.0 ft
Depth = 0.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : 218 RC-5 1 2 10-02-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.310 Roof 0.090 Glass 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 400.0 Schedule = 1 Activity Level = 2
Lights : W/sqft = 3.20 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 218 RC-5 1 2

Exposure : NW SW Floor Area : 400.0 sqft
Wall Area : 155.0 258.0 Roof Area : 400.0 sqft
Glass Area : 103.0 0.0 Current Elements : El,Pt,Pt,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 4.40
Total Watts = 1,760
Schedule No. = 3

ADDITIONAL ELEMENT - Partition

Area = 167.0 sqft Uncond. Space Temp:Cooling = 85.0 F
U-Value = 0.330 BTU/hr/sqft/F Uncond. Space Temp:Heating = 65.0 F

ADDITIONAL ELEMENT - Partition

Area = 400.0 sqft Uncond. Space Temp:Cooling = 85.0 F
U-Value = 0.540 BTU/hr/sqft/F Uncond. Space Temp:Heating = 40.0 F

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.11 CFM/sqft = 44 CFM
Heating : 0.16 CFM/sqft = 64 CFM
Typical : 0.16 CFM/sqft = 64 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 219 RC-6 1 2 10-02-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

Walls Roof Glass
U-Value : 0.310 0.090 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 2
Lights : W/sqft = 3.80 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 219 RC-6 1 2

Exposure : NW SW Floor Area : 252.0 sqft
Wall Area : 100.0 0.0 Roof Area : 252.0 sqft
Glass Area : 62.3 0.0 Current Elements : El,Pt,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 4.40
Total Watts = 1,109
Schedule No. = 3

ADDITIONAL ELEMENT - Partition

Area = 252.0 sqft Uncond. Space Temp:Cooling = 85.0 F
U-Value = 0.540 BTU/hr/sqft/F Uncond. Space Temp:Heating = 65.0 F

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.11 CFM/sqft = 28 CFM
Heating : 0.16 CFM/sqft = 40 CFM
Typical : 0.16 CFM/sqft = 40 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 220 RC-7 1 2 10-02-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

Walls Roof Glass
U-Value : 0.310 0.090 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 330.0 Schedule = 1 Activity Level = 2
Lights : W/sqft = 4.36 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 220 RC-7 1 2

Floor Area : 330.0 sqft
Exposure : NW SW Roof Area : 330.0 sqft
Wall Area : 178.4 0.0 Current
Glass Area : 40.6 0.0 Elements : El,Pt,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 4.40
Total Watts = 1,452
Schedule No. = 3

ADDITIONAL ELEMENT - Partition

Area = 330.0 sqft Uncond. Space Temp:Cooling = 85.0 F
U-Value = 0.540 BTU/hr/sqft/F Uncond. Space Temp:Heating = 65.0 F

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.11 CFM/sqft = 36 CFM
Heating : 0.16 CFM/sqft = 53 CFM
Typical : 0.16 CFM/sqft = 53 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 221 1 2

10-02-90

Prepared By : ENGG APPLICATIONS CONSUL

6022890201

Carrier Hourly Analysis Program

Page 1 of 1

	Walls	Roof	Glass		
U-Value :	0.310	0.090	1.060	Building Weight	: M
Weight :	100	L		Glass Factor	: 1.00
Color :	D	D		Internal Shades	? N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 2
 Lights : W/sqft = 1.95 Schedule = 2 Wattage Mult. = 1.20
 : Fixture Type = 1 Recessed, not vented

SPACE NAME = 221 1 2

		Floor Area	:	154.0 sqft
Exposure	:	NW	SW	Roof Area : 154.0 sqft
Wall Area	:	99.0	0.0	Current
Glass Area	:	0.0	0.0	Elements : Pt,In

ADDITIONAL ELEMENT - Partition

 Area = 154.0 sqft Uncond. Space Temp:Cooling = 85.0 F
 U-Value = 0.540 BTU/hr/sqft/F Uncond. Space Temp:Heating = 40.0 F

ADDITIONAL ELEMENT - Infiltration

 Cooling : 0.11 CFM/sqft = 17 CFM
 Heating : 0.16 CFM/sqft = 25 CFM
 Typical : 0.16 CFM/sqft = 25 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 222 RC-8 1 2 10-02-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.310 Roof 0.090 Glass 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 240.0 Schedule = 1 Activity Level = 2
Lights : W/sqft = 4.00 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 222 RC-8 1 2

Exposure : NW SW Floor Area : 240.0 sqft
Wall Area : 114.4 0.0 Roof Area : 240.0 sqft
Glass Area : 40.0 0.0 Current Elements : El,Pt,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 4.40
Total Watts = 1,056
Schedule No. = 3

ADDITIONAL ELEMENT - Partition

Area = 240.0 sqft Uncond. Space Temp:Cooling = 85.0 F
U-Value = 0.540 BTU/hr/sqft/F Uncond. Space Temp:Heating = 40.0 F

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.11 CFM/sqft = 26 CFM
Heating : 0.16 CFM/sqft = 38 CFM
Typical : 0.16 CFM/sqft = 38 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 223 RC-9 1 2 10-02-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.310 Roof 0.090 Glass 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 640.0 Schedule = 1 Activity Level = 2
Lights : W/sqft = 3.75 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 223 RC-9 1 2

Floor Area : 640.0 sqft
Exposure : NW SW Roof Area : 640.0 sqft
Wall Area : 247.0 0.0 Current
Glass Area : 165.2 0.0 Elements : El,Pt,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 4.40
Total Watts = 2,816
Schedule No. = 3

ADDITIONAL ELEMENT - Partition

Area = 640.0 sqft Uncond. Space Temp:Cooling = 85.0 F
U-Value = 0.540 BTU/hr/sqft/F Uncond. Space Temp:Heating = 40.0 F

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.11 CFM/sqft = 70 CFM
Heating : 0.16 CFM/sqft = 102 CFM
Typical : 0.16 CFM/sqft = 102 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 224 RC-10 1 2 10-02-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.310 Roof 0.090 Glass 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 400.0 Schedule = 1 Activity Level = 2
Lights : W/sqft = 4.80 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 224 RC-10 1 2

Floor Area : 400.0 sqft
Exposure : NW NE Roof Area : 400.0 sqft
Wall Area : 155.0 258.0 Current
Glass Area : 103.0 0.0 Elements : El,Pt,Pt,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 4.40
Total Watts = 1,760
Schedule No. = 3

ADDITIONAL ELEMENT - Partition

Area = 400.0 sqft Uncond. Space Temp:Cooling = 85.0 F
U-Value = 0.540 BTU/hr/sqft/F Uncond. Space Temp:Heating = 40.0 F

ADDITIONAL ELEMENT - Partition

Area = 167.0 sqft Uncond. Space Temp:Cooling = 85.0 F
U-Value = 0.330 BTU/hr/sqft/F Uncond. Space Temp:Heating = 40.0 F

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.11 CFM/sqft = 44 CFM
Heating : 0.16 CFM/sqft = 64 CFM
Typical : 0.16 CFM/sqft = 64 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 102 RC-11 2 1 10-02-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.310 Roof 0.090 Glass 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 156.0 Schedule = 1 Activity Level = 2
Lights : W/sqft = 2.05 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 102 RC-11 2 1

Exposure : NE NE Floor Area : 156.0 sqft
Wall Area : 91.8 0.0 Roof Area : 0.0 sqft
Glass Area : 62.8 0.0 Current
Elements : El,Pt,Pt,In,Gr

ADDITIONAL ELEMENT - Other Electric

W/sqft = 5.32
Total Watts = 830
Schedule No. = 3

ADDITIONAL ELEMENT - Partition

Area = 156.0 sqft Uncond. Space Temp:Cooling = 85.0 F
U-Value = 0.240 BTU/hr/sqft/F Uncond. Space Temp:Heating = 40.0 F

ADDITIONAL ELEMENT - Partition

Area = 154.6 sqft Uncond. Space Temp:Cooling = 85.0 F
U-Value = 0.330 BTU/hr/sqft/F Uncond. Space Temp:Heating = 65.0 F

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.11 CFM/sqft = 17 CFM
Heating : 0.16 CFM/sqft = 25 CFM
Typical : 0.16 CFM/sqft = 25 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 156.0 sqft
Perimeter = 12.0 ft
Depth = 0.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : 103 RC-11 2 1 10-02-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.310 Roof 0.090 Glass 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 156.0 Schedule = 1 Activity Level = 2
Lights : W/sqft = 2.05 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 103 RC-11 2 1

Floor Area : 156.0 sqft
Exposure : NE NE Roof Area : 0.0 sqft
Wall Area : 91.8 0.0 Current
Glass Area : 62.8 0.0 Elements : El,Pt,In,Gr

ADDITIONAL ELEMENT - Other Electric

W/sqft = 5.32
Total Watts = 830
Schedule No. = 3

ADDITIONAL ELEMENT - Partition

Area = 156.0 sqft Uncond. Space Temp:Cooling = 85.0 F
U-Value = 0.240 BTU/hr/sqft/F Uncond. Space Temp:Heating = 40.0 F

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.11 CFM/sqft = 17 CFM
Heating : 0.16 CFM/sqft = 25 CFM
Typical : 0.16 CFM/sqft = 25 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 156.0 sqft
Perimeter = 12.0 ft
Depth = 0.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : 104 RC-11 2 1 10-02-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.310 Roof 0.090 Glass 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 156.0 Schedule = 1 Activity Level = 2
Lights : W/sqft = 1.88 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 104 RC-11 2 1

Floor Area : 156.0 sqft
Exposure : NE SE Roof Area : 0.0 sqft
Wall Area : 130.4 130.4 Current
Glass Area : 75.8 75.8 Elements : El,Pt,In,Gr

ADDITIONAL ELEMENT - Other Electric

W/sqft = 5.32
Total Watts = 830
Schedule No. = 3

ADDITIONAL ELEMENT - Partition

Area = 156.0 sqft Uncond. Space Temp:Cooling = 85.0 F
U-Value = 0.240 BTU/hr/sqft/F Uncond. Space Temp:Heating = 40.0 F

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.11 CFM/sqft = 17 CFM
Heating : 0.16 CFM/sqft = 25 CFM
Typical : 0.16 CFM/sqft = 25 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 156.0 sqft
Perimeter = 32.0 ft
Depth = 0.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : 105 RC-11 2 1 10-02-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.310 Roof 0.090 Glass 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 144.0 Schedule = 1 Activity Level = 2
Lights : W/sqft = 4.44 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 105 RC-11 2 1

Floor Area : 144.0 sqft
Exposure : SE SE Roof Area : 0.0 sqft
Wall Area : 95.1 0.0 Current
Glass Area : 59.5 0.0 Elements : El,Pt,In,Gr

ADDITIONAL ELEMENT - Other Electric

W/sqft = 5.76
Total Watts = 830
Schedule No. = 3

ADDITIONAL ELEMENT - Partition

Area = 144.0 sqft Uncond. Space Temp:Cooling = 85.0 F
U-Value = 0.240 BTU/hr/sqft/F Uncond. Space Temp:Heating = 40.0 F

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.11 CFM/sqft = 16 CFM
Heating : 0.16 CFM/sqft = 23 CFM
Typical : 0.16 CFM/sqft = 23 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 144.0 sqft
Perimeter = 12.0 ft
Depth = 0.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : 106 RC-11 2 1 (107,9,10) 10-02-90
 Prepared By : ENGG APPLICATIONS CONSUL 6022890201
 Carrier Hourly Analysis Program Page 1 of 1

 Walls Roof Glass
 U-Value : 0.310 0.090 1.060 Building Weight : M
 Weight : 100 L Glass Factor : 1.00
 Color : D D Internal Shades ? N

People : sqft/person = 144.0 Schedule = 1 Activity Level = 2
 Lights : W/sqft = 4.44 Schedule = 2 Wattage Mult. = 1.20
 : Fixture Type = 1 Recessed, not vented

 SPACE NAME = 106 RC-11 2 1 (107,9,10)

Floor Area : 144.0 sqft
 Exposure : SE SE Roof Area : 0.0 sqft
 Wall Area : 86.0 0.0 Current
 Glass Area : 62.2 0.0 Elements : El,Pt,In,Gr

 ADDITIONAL ELEMENT - Other Electric

 W/sqft = 5.76
 Total Watts = 830
 Schedule No. = 3

 ADDITIONAL ELEMENT - Partition

 Area = 144.0 sqft Uncond. Space Temp:Cooling = 85.0 F
 U-Value = 0.240 BTU/hr/sqft/F Uncond. Space Temp:Heating = 40.0 F

 ADDITIONAL ELEMENT - Infiltration

 Cooling : 0.11 CFM/sqft = 16 CFM
 Heating : 0.16 CFM/sqft = 23 CFM
 Typical : 0.16 CFM/sqft = 23 CFM

 ADDITIONAL ELEMENT - Ground

 Slab Floor Area = 144.0 sqft
 Perimeter = 12.0 ft
 Depth = 0.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : 108 RC-11 2 1 10-02-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.310 Roof 0.090 Glass 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 198.0 Schedule = 1 Activity Level = 2
Lights : W/sqft = 4.85 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 108 RC-11 2 1

Exposure : SE SE Floor Area : 198.0 sqft
Wall Area : 131.4 0.0 Roof Area : 0.0 sqft
Glass Area : 81.2 0.0 Current Elements : El,Pt,In,Gr

ADDITIONAL ELEMENT - Other Electric

W/sqft = 4.40
Total Watts = 871
Schedule No. = 3

ADDITIONAL ELEMENT - Partition

Area = 198.0 sqft Uncond. Space Temp:Cooling = 85.0 F
U-Value = 0.240 BTU/hr/sqft/F Uncond. Space Temp:Heating = 40.0 F

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.11 CFM/sqft = 22 CFM
Heating : 0.16 CFM/sqft = 32 CFM
Typical : 0.16 CFM/sqft = 32 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 198.0 sqft
Perimeter = 16.5 ft
Depth = 0.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : 112 RC-11 2 1 10-02-90
 Prepared By : ENGG APPLICATIONS CONSUL 6022890201
 Carrier Hourly Analysis Program Page 1 of 1

	Walls	Roof	Glass		
U-Value :	0.310	0.090	1.060	Building Weight :	M
Weight :	100	L		Glass Factor :	1.00
Color :	D	D		Internal Shades :	N

People : sqft/person = 208.0 Schedule = 1 Activity Level = 2
 Lights : W/sqft = 3.85 Schedule = 2 Wattage Mult. = 1.20
 : Fixture Type = 1 Recessed, not vented

 SPACE NAME = 112 RC-11 2 1

		Floor Area :	208.0 sqft
Exposure :	SE	SW Roof Area :	0.0 sqft
Wall Area :	130.4	Current	
Glass Area :	75.8	Elements :	El,Pt,Pt,In,Gr

ADDITIONAL ELEMENT - Other Electric

 W/sqft = 4.40
 Total Watts = 915
 Schedule No. = 3

ADDITIONAL ELEMENT - Partition

 Area = 208.0 sqft Uncond. Space Temp:Cooling = 85.0 F
 U-Value = 0.240 BTU/hr/sqft/F Uncond. Space Temp:Heating = 40.0 F

ADDITIONAL ELEMENT - Partition

 Area = 208.0 sqft Uncond. Space Temp:Cooling = 83.0 F
 U-Value = 0.360 BTU/hr/sqft/F Uncond. Space Temp:Heating = 72.0 F

ADDITIONAL ELEMENT - Infiltration

 Cooling : 0.11 CFM/sqft = 23 CFM
 Heating : 0.16 CFM/sqft = 33 CFM
 Typical : 0.16 CFM/sqft = 33 CFM

ADDITIONAL ELEMENT - Ground

 Slab Floor Area = 208.0 sqft
 Perimeter = 29.0 ft
 Depth = 0.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : 100 CORR RET 2 1 10-02-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.310 Roof 0.090 Glass 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 2
Lights : W/sqft = 1.65 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 100 CORR RET 2 1

Exposure : SE SW Floor Area : 1,548.0 sqft
Wall Area : 0.0 0.0 Roof Area : 0.0 sqft
Glass Area : 0.0 0.0 Current Elements : Pt,Pt,In,Gr

ADDITIONAL ELEMENT - Partition

Area = 258.0 sqft Uncond. Space Temp:Cooling = 85.0 F
U-Value = 0.330 BTU/hr/sqft/F Uncond. Space Temp:Heating = 40.0 F

ADDITIONAL ELEMENT - Partition

Area = 1,548.0 sqft Uncond. Space Temp:Cooling = 85.0 F
U-Value = 0.240 BTU/hr/sqft/F Uncond. Space Temp:Heating = 40.0 F

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.11 CFM/sqft = 170 CFM
Heating : 0.16 CFM/sqft = 248 CFM
Typical : 0.16 CFM/sqft = 248 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 1,548.0 sqft
Perimeter = 0.0 ft
Depth = 0.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : 203 RC-11 2 2 10-02-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.310 Roof 0.090 Glass 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 156.0 Schedule = 1 Activity Level = 2
Lights : W/sqft = 2.05 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 203 RC-11 2 2

Exposure : NE SW Floor Area : 156.0 sqft
Wall Area : 91.8 0.0 Roof Area : 156.0 sqft
Glass Area : 62.8 0.0 Current Elements : El,Pt,Pt,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 5.32
Total Watts = 830
Schedule No. = 3

ADDITIONAL ELEMENT - Partition

Area = 156.0 sqft Uncond. Space Temp:Cooling = 85.0 F
U-Value = 0.330 BTU/hr/sqft/F Uncond. Space Temp:Heating = 68.0 F

ADDITIONAL ELEMENT - Partition

Area = 156.0 sqft Uncond. Space Temp:Cooling = 85.0 F
U-Value = 0.540 BTU/hr/sqft/F Uncond. Space Temp:Heating = 40.0 F

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.11 CFM/sqft = 17 CFM
Heating : 0.16 CFM/sqft = 25 CFM
Typical : 0.16 CFM/sqft = 25 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 204 RC-11 2 2 10-02-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.310 Roof 0.090 Glass 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 412.0 Schedule = 1 Activity Level = 2
Lights : W/sqft = 2.33 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 204 RC-11 2 2

Exposure : NE SE Floor Area : 412.0 sqft
Wall Area : 222.7 134.1 Roof Area : 412.0 sqft
Glass Area : 138.1 78.5 Current
Elements : El,Pt,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 4.40
Total Watts = 1,813
Schedule No. = 3

ADDITIONAL ELEMENT - Partition

Area = 412.0 sqft Uncond. Space Temp:Cooling = 85.0 F
U-Value = 0.540 BTU/hr/sqft/F Uncond. Space Temp:Heating = 40.0 F

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.11 CFM/sqft = 45 CFM
Heating : 0.16 CFM/sqft = 66 CFM
Typical : 0.16 CFM/sqft = 66 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 205 RC-11 2 2 (211,208) 10-02-90
 Prepared By : ENGG APPLICATIONS CONSUL 6022890201
 Carrier Hourly Analysis Program Page 1 of 1

	Walls	Roof	Glass		
U-Value :	0.310	0.090	1.060	Building Weight :	M
Weight :	100	L		Glass Factor :	1.00
Color :	D	D		Internal Shades :	N

People : sqft/person = 144.0 Schedule = 1 Activity Level = 2
 Lights : W/sqft = 4.44 Schedule = 2 Wattage Mult. = 1.20
 : Fixture Type = 1 Recessed, not vented

 SPACE NAME = 205 RC-11 2 2 (211,208)

		Floor Area :	144.0 sqft
Exposure :	SE	SE Roof Area :	144.0 sqft
Wall Area :	95.1	0.0 Current	
Glass Area :	59.5	0.0 Elements :	El,Pt,In

ADDITIONAL ELEMENT - Other Electric

 W/sqft = 5.76
 Total Watts = 830
 Schedule No. = 3

ADDITIONAL ELEMENT - Partition

 Area = 144.0 sqft Uncond. Space Temp:Cooling = 85.0 F
 U-Value = 0.540 BTU/hr/sqft/F Uncond. Space Temp:Heating = 40.0 F

ADDITIONAL ELEMENT - Infiltration

 Cooling : 0.11 CFM/sqft = 16 CFM
 Heating : 0.16 CFM/sqft = 23 CFM
 Typical : 0.16 CFM/sqft = 23 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 206 RC-11 2 2 (TYP. 210)
Prepared By : ENGG APPLICATIONS CONSUL
Carrier Hourly Analysis Program

10-02-90
6022890201
Page 1 of 1

	Walls	Roof	Glass		
U-Value :	0.310	0.090	1.060	Building Weight :	M
Weight :	100	L		Glass Factor :	1.00
Color :	D	D		Internal Shades :	? N

People : sqft/person = 144.0 Schedule = 1 Activity Level = 2
 Lights : W/sqft = 4.44 Schedule = 2 Wattage Mult. = 1.20
 : Fixture Type = 1 Recessed, not vented

SPACE NAME = 206 RC-11 2 2 (TYP. 210)

		Floor Area :	144.0 sqft
Exposure :	SE	SE Roof Area :	144.0 sqft
Wall Area :	86.0	0.0 Current	
Glass Area :	62.2	0.0 Elements :	El,Pt,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 5.76
 Total Watts = 830
 Schedule No. = 3

ADDITIONAL ELEMENT - Partition

Area = 144.0 sqft Uncond. Space Temp:Cooling = 85.0 F
 U-Value = 0.540 BTU/hr/sqft/F Uncond. Space Temp:Heating = 40.0 F

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.11 CFM/sqft = 16 CFM
 Heating : 0.16 CFM/sqft = 23 CFM
 Typical : 0.16 CFM/sqft = 23 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 207 RC-11 2 2
Prepared By : ENGG APPLICATIONS CONSUL
Carrier Hourly Analysis Program

10-02-90
6022890201
Page 1 of 1

U-Value : Walls 0.310 Roof 0.090 Glass 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 192.0 Schedule = 1 Activity Level = 2
Lights : W/sqft = 5.00 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 207 RC-11 2 2

Exposure : SE SE Floor Area : 192.0 sqft
Wall Area : 128.7 0.0 Roof Area : 192.0 sqft
Glass Area : 83.9 0.0 Current
Elements : El,Pt,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 4.40
Total Watts = 845
Schedule No. = 3

ADDITIONAL ELEMENT - Partition

Area = 192.0 sqft Uncond. Space Temp:Cooling = 85.0 F
U-Value = 0.540 BTU/hr/sqft/F Uncond. Space Temp:Heating = 40.0 F

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.11 CFM/sqft = 21 CFM
Heating : 0.16 CFM/sqft = 31 CFM
Typical : 0.16 CFM/sqft = 31 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 209 RC-11 2 2 10-02-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.310 Roof 0.090 Glass 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 204.0 Schedule = 1 Activity Level = 2
Lights : W/sqft = 4.70 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 209 RC-11 2 2

Floor Area : 204.0 sqft
Exposure : SE SE Roof Area : 204.0 sqft
Wall Area : 125.0 0.0 Current
Glass Area : 81.2 0.0 Elements : El,Pt,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 4.40
Total Watts = 898
Schedule No. = 3

ADDITIONAL ELEMENT - Partition

Area = 204.0 sqft Uncond. Space Temp:Cooling = 85.0 F
U-Value = 0.540 BTU/hr/sqft/F Uncond. Space Temp:Heating = 40.0 F

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.11 CFM/sqft = 22 CFM
Heating : 0.16 CFM/sqft = 33 CFM
Typical : 0.16 CFM/sqft = 33 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 212 RC-11 2 2 10-02-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.310 Roof 0.090 Glass 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 144.0 Schedule = 1 Activity Level = 2
Lights : W/sqft = 4.44 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 212 RC-11 2 2

Floor Area : 144.0 sqft
Exposure : SE SW Roof Area : 144.0 sqft
Wall Area : 97.1 167.5 Current
Glass Area : 59.5 0.0 Elements : El,Pt,Pt,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 5.76
Total Watts = 830
Schedule No. = 3

ADDITIONAL ELEMENT - Partition

Area = 144.0 sqft Uncond. Space Temp:Cooling = 85.0 F
U-Value = 0.540 BTU/hr/sqft/F Uncond. Space Temp:Heating = 40.0 F

ADDITIONAL ELEMENT - Partition

Area = 167.5 sqft Uncond. Space Temp:Cooling = 83.0 F
U-Value = 0.360 BTU/hr/sqft/F Uncond. Space Temp:Heating = 72.0 F

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.11 CFM/sqft = 16 CFM
Heating : 0.16 CFM/sqft = 23 CFM
Typical : 0.16 CFM/sqft = 23 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 200 CORR RET 2 2 10-02-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.310 Roof 0.090 Glass 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 2
Lights : W/sqft = 1.65 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 200 CORR RET 2 2

Exposure : SE SW Floor Area : 1,548.0 sqft
Wall Area : 0.0 0.0 Roof Area : 1,548.0 sqft
Glass Area : 0.0 0.0 Current Elements : Pt,Pt,In

ADDITIONAL ELEMENT - Partition

Area = 1,548.0 sqft Uncond. Space Temp:Cooling = 85.0 F
U-Value = 0.540 BTU/hr/sqft/F Uncond. Space Temp:Heating = 40.0 F

ADDITIONAL ELEMENT - Partition

Area = 400.0 sqft Uncond. Space Temp:Cooling = 85.0 F
U-Value = 0.330 BTU/hr/sqft/F Uncond. Space Temp:Heating = 65.0 F

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.11 CFM/sqft = 170 CFM
Heating : 0.16 CFM/sqft = 248 CFM
Typical : 0.16 CFM/sqft = 248 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 123 RC-17 3 1 (124-126) 10-02-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.310 Roof 0.090 Glass 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 210.0 Schedule = 1 Activity Level = 2
Lights : W/sqft = 4.57 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 123 RC-17 3 1 (124-126)

Exposure : SE SW Floor Area : 210.0 sqft
Wall Area : 0.0 0.0 Roof Area : 0.0 sqft
Glass Area : 0.0 0.0 Current Elements : El,Pt,In,Gr

ADDITIONAL ELEMENT - Other Electric

W/sqft = 4.40
Total Watts = 924
Schedule No. = 3

ADDITIONAL ELEMENT - Partition

Area = 210.0 sqft Uncond. Space Temp:Cooling = 85.0 F
U-Value = 0.240 BTU/hr/sqft/F Uncond. Space Temp:Heating = 40.0 F

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.11 CFM/sqft = 23 CFM
Heating : 0.16 CFM/sqft = 34 CFM
Typical : 0.16 CFM/sqft = 34 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 210.0 sqft
Perimeter = 0.0 ft
Depth = 0.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : 127 RC-13 3 1 (128) 10-02-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

Walls Roof Glass
U-Value : 0.310 0.090 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 420.0 Schedule = 1 Activity Level = 2
Lights : W/sqft = 4.57 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 127 RC-13 3 1 (128)

Floor Area : 420.0 sqft
Exposure : SE SW Roof Area : 0.0 sqft
Wall Area : 0.0 0.0 Current
Glass Area : 0.0 0.0 Elements : El,Pt,In,Gr

ADDITIONAL ELEMENT - Other Electric

W/sqft = 4.40
Total Watts = 1,848
Schedule No. = 3

ADDITIONAL ELEMENT - Partition

Area = 420.0 sqft Uncond. Space Temp:Cooling = 85.0 F
U-Value = 0.240 BTU/hr/sqft/F Uncond. Space Temp:Heating = 40.0 F

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.11 CFM/sqft = 46 CFM
Heating : 0.16 CFM/sqft = 67 CFM
Typical : 0.16 CFM/sqft = 67 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 420.0 sqft
Perimeter = 0.0 ft
Depth = 0.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : 129 RC-18 3 1 10-02-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.310 Roof 0.090 Glass 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 1066.0 Schedule = 1 Activity Level = 2
Lights : W/sqft = 2.40 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 129 RC-18 3 1

Exposure : SE SW Floor Area : 1,066.0 sqft
Wall Area : 0.0 0.0 Roof Area : 0.0 sqft
Glass Area : 0.0 0.0 Current
Glass Area : 0.0 0.0 Elements : El,Pt,In,Gr

ADDITIONAL ELEMENT - Other Electric

W/sqft = 4.40
Total Watts = 4,690
Schedule No. = 3

ADDITIONAL ELEMENT - Partition

Area = 1,066.0 sqft Uncond. Space Temp:Cooling = 85.0 F
U-Value = 0.240 BTU/hr/sqft/F Uncond. Space Temp:Heating = 40.0 F

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.11 CFM/sqft = 117 CFM
Heating : 0.16 CFM/sqft = 171 CFM
Typical : 0.16 CFM/sqft = 171 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 1,066.0 sqft
Perimeter = 0.0 ft
Depth = 0.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : 225 RC-23 3 2 (TYP 227) 10-02-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.310 Roof 0.090 Glass 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 410.0 Schedule = 1 Activity Level = 2
Lights : W/sqft = 4.70 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 225 RC-23 3 2 (TYP 227)

Exposure : SE SW Floor Area : 410.0 sqft
Wall Area : 0.0 0.0 Roof Area : 410.0 sqft
Glass Area : 0.0 0.0 Current
Elements : El,Pt,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 4.40
Total Watts = 1,804
Schedule No. = 3

ADDITIONAL ELEMENT - Partition

Area = 410.0 sqft Uncond. Space Temp:Cooling = 85.0 F
U-Value = 0.240 BTU/hr/sqft/F Uncond. Space Temp:Heating = 40.0 F

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.11 CFM/sqft = 45 CFM
Heating : 0.16 CFM/sqft = 66 CFM
Typical : 0.16 CFM/sqft = 66 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 226 RC-24 3 2

10-02-90

Prepared By : ENGG APPLICATIONS CONSUL

6022890201

Carrier Hourly Analysis Program

Page 1 of 1

	Walls	Roof	Glass		
U-Value :	0.310	0.090	1.060	Building Weight :	M
Weight :	100	L		Glass Factor :	1.00
Color :	D	D		Internal Shades :	N

People : sqft/person = 410.0 Schedule = 1 Activity Level = 2
 Lights : W/sqft = 4.70 Schedule = 2 Wattage Mult. = 1.20
 : Fixture Type = 1 Recessed, not vented

SPACE NAME = 226 RC-24 3 2

			Floor Area :	410.0 sqft
Exposure :	SE	SW	Roof Area :	410.0 sqft
Wall Area :	0.0	0.0	Current	
Glass Area :	0.0	0.0	Elements :	El,Pt,In

ADDITIONAL ELEMENT - Other Electric

 W/sqft = 4.40
 Total Watts = 1,804
 Schedule No. = 3

ADDITIONAL ELEMENT - Partition

 Area = 410.0 sqft Uncond. Space Temp:Cooling = 85.0 F
 U-Value = 0.240 BTU/hr/sqft/F Uncond. Space Temp:Heating = 40.0 F

ADDITIONAL ELEMENT - Infiltration

 Cooling : 0.11 CFM/sqft = 45 CFM
 Heating : 0.16 CFM/sqft = 66 CFM
 Typical : 0.16 CFM/sqft = 66 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 228 RC-26 3 2 10-02-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.310 Roof 0.090 Glass 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 410.0 Schedule = 1 Activity Level = 2
Lights : W/sqft = 4.70 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 228 RC-26 3 2

Exposure : SE SW Floor Area : 410.0 sqft
Wall Area : 0.0 0.0 Roof Area : 410.0 sqft
Glass Area : 0.0 0.0 Current
Elements : El,Pt,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 4.40
Total Watts = 1,804
Schedule No. = 3

ADDITIONAL ELEMENT - Partition

Area = 410.0 sqft Uncond. Space Temp:Cooling = 85.0 F
U-Value = 0.240 BTU/hr/sqft/F Uncond. Space Temp:Heating = 40.0 F

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.11 CFM/sqft = 45 CFM
Heating : 0.16 CFM/sqft = 66 CFM
Typical : 0.16 CFM/sqft = 66 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 229 RC-19 3 2

10-02-90

Prepared By : ENGG APPLICATIONS CONSUL

6022890201

Carrier Hourly Analysis Program

Page 1 of 1

	Walls	Roof	Glass		
U-Value :	0.310	0.090	1.060	Building Weight :	M
Weight :	100	L		Glass Factor :	1.00
Color :	D	D		Internal Shades :	? N

People : sqft/person = 512.0 Schedule = 1 Activity Level = 2
 Lights : W/sqft = 4.38 Schedule = 2 Wattage Mult. = 1.20
 : Fixture Type = 1 Recessed, not vented

SPACE NAME = 229 RC-19 3 2

			Floor Area :	512.0 sqft
Exposure :	SE	SW	Roof Area :	512.0 sqft
Wall Area :	0.0	0.0	Current	
Glass Area :	0.0	0.0	Elements :	El,Pt,In

ADDITIONAL ELEMENT - Other Electric

 W/sqft = 4.40
 Total Watts = 2,253
 Schedule No. = 3

ADDITIONAL ELEMENT - Partition

 Area = 512.0 sqft Uncond. Space Temp:Cooling = 85.0 F
 U-Value = 0.540 BTU/hr/sqft/F Uncond. Space Temp:Heating = 40.0 F

ADDITIONAL ELEMENT - Infiltration

 Cooling : 0.11 CFM/sqft = 56 CFM
 Heating : 0.16 CFM/sqft = 82 CFM
 Typical : 0.16 CFM/sqft = 82 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 230 RC-20 3 2

10-02-90

Prepared By : ENGG APPLICATIONS CONSUL

6022890201

Carrier Hourly Analysis Program

Page 1 of 1

	Walls	Roof	Glass		
U-Value :	0.310	0.090	1.060	Building Weight :	M
Weight :	100	L		Glass Factor :	1.00
Color :	D	D		Internal Shades ?	N

People : sqft/person = 144.0 Schedule = 1 Activity Level = 2
 Lights : W/sqft = 4.44 Schedule = 2 Wattage Mult. = 1.20
 : Fixture Type = 1 Recessed, not vented

SPACE NAME = 230 RC-20 3 2

		Floor Area :	144.0 sqft
Exposure :	SE	SW Roof Area :	144.0 sqft
Wall Area :	0.0	Current	
Glass Area :	0.0	0.0 Elements :	El,Pt,In

ADDITIONAL ELEMENT - Other Electric

 W/sqft = 5.76
 Total Watts = 830
 Schedule No. = 3

ADDITIONAL ELEMENT - Partition

 Area = 144.0 sqft Uncond. Space Temp:Cooling = 85.0 F
 U-Value = 0.540 BTU/hr/sqft/F Uncond. Space Temp:Heating = 40.0 F

ADDITIONAL ELEMENT - Infiltration

 Cooling : 0.11 CFM/sqft = 16 CFM
 Heating : 0.16 CFM/sqft = 23 CFM
 Typical : 0.16 CFM/sqft = 23 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 231, 232 RC-21 3 2 10-02-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.310 Roof 0.090 Glass 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 228.0 Schedule = 1 Activity Level = 2
Lights : W/sqft = 2.80 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 231, 232 RC-21 3 2

Exposure : SE SW Floor Area : 228.0 sqft
Wall Area : 0.0 0.0 Roof Area : 228.0 sqft
Glass Area : 0.0 0.0 Current Elements : El,Pt,Li,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 4.40
Total Watts = 1,003
Schedule No. = 3

ADDITIONAL ELEMENT - Partition

Area = 228.0 sqft Uncond. Space Temp: Cooling = 85.0 F
U-Value = 0.540 BTU/hr/sqft/F Uncond. Space Temp: Heating = 40.0 F

ADDITIONAL ELEMENT - Lights

W/sqft = 0.88 Schedule No. = 1
Total Watts = 201 Wattage Multiplier = 1.00
Fixture Type = 1 (Recessed, not vented)

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.11 CFM/sqft = 25 CFM
Heating : 0.16 CFM/sqft = 36 CFM
Typical : 0.16 CFM/sqft = 36 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 233 RC-22 3 2

10-02-90

Prepared By : ENGG APPLICATIONS CONSUL

6022890201

Carrier Hourly Analysis Program

Page 1 of 1

	Walls	Roof	Glass		
U-Value :	0.310	0.090	1.060	Building Weight :	M
Weight :	100	L		Glass Factor :	1.00
Color :	D	D		Internal Shades ?	N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 2
 Lights : W/sqft = 5.33 Schedule = 2 Wattage Mult. = 1.20
 : Fixture Type = 1 Recessed, not vented

SPACE NAME = 233 RC-22 3 2

		Floor Area :	120.0 sqft
Exposure :	SE	SW Roof Area :	120.0 sqft
Wall Area :	0.0	0.0 Current	
Glass Area :	0.0	0.0 Elements :	E1,Pt,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 4.40
 Total Watts = 528
 Schedule No. = 3

ADDITIONAL ELEMENT - Partition

Area = 120.0 sqft Uncond. Space Temp:Cooling = 85.0 F
 U-Value = 0.540 BTU/hr/sqft/F Uncond. Space Temp:Heating = 40.0 F

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.11 CFM/sqft = 13 CFM
 Heating : 0.16 CFM/sqft = 19 CFM
 Typical : 0.16 CFM/sqft = 19 CFM

AIR SYSTEM DESCRIPTION

Name : AHU-1 BLDG. 307 07-25-91
 Carrier Hourly Analysis Program 6100190202
 Prepared By : E A C, PC BURKE, VA. Page 1 of 2

1. SYSTEM NAME AND TYPE

System Name = AHU-1 BLDG. 307
 System Class = Constant Volume
 System Type = (CV/RH) Constant Volume w/ Terminal Reheat
 Number of Zones = 10

2. SPACE SELECTION (see separate printout)

3. THERMOSTAT & EQUIPMENT SCHEDULING DATA

Operation Period	Thermostat Setpoints		Ventilation Dampers
	Cooling	Heating	
Occupied	75.0 F	68.0 F	OPEN
Unoccupied	75.0 F	68.0 F	OPEN

Weekday : Occupied Period Begins at 0 ; Duration = 24 hrs
 Saturday : Occupied Period Begins at 0 ; Duration = 24 hrs
 Sunday : Occupied Period Begins at 0 ; Duration = 24 hrs
 Design Day : Occupied Period Begins at 0 ; Duration = 24 hrs

4. SUPPLY, VENTILATION, RETURN AIR DATA

SUPPLY AIR

Supply air flow rate = 9780.00 CFM
 Supply temperature control = 1 Constant

VENTILATION AIR

Nominal ventilation flow rate = 5500.00 CFM
 Minimum ventilation flow rate = 5500.00 CFM
 Damper leak rate = 5 % of vent air

RETURN AIR

Zone exhaust air flow rate = 5500.00 CFM
 Zone exhaust fan power = 0.0 kW
 Is a return plenum used ? N

AIR SYSTEM DESCRIPTION

Name : AHU-1 BLDG. 307

07-25-91

Carrier Hourly Analysis Program

6100190202

Prepared By : E A C, PC BURKE, VA.

Page 2 of 2

5. FAN DATA

SUPPLY FAN

Type = 2:Forward curved
Static = 2.25 in wg
Efficiency = 65 %
Configuration = 1 Draw-thru

RETURN FAN

Type = 2:Forward curved
Static = 0.63 in wg
Efficiency = 65 %

6. ACCESSORY DEVICES AND SYSTEMS

PREHEAT COIL

Setpoint temperature = 68.0 F

OUTDOOR AIR ECONOMIZER CONTROL

(Not used)

VENTILATION AIR RECLAIM

(Not used)

HUMIDITY CONTROL

Upper RH setpoint = 100 %
Lower RH setpoint = 40 %

7. MISCELLANEOUS SYSTEM DATA

Cooling coil bypass factor = 0.050
Type of supplemental heating = 2 Skin Heating Units

SKIN HEATING UNITS

Heat source = 1 Baseboard Heaters
Skin heating trip temperature = 65.0 F

AIR SYSTEM DESCRIPTION

Name : AHU-2 BLDG. 307 10-16-90
 Carrier Hourly Analysis Program 6022890201
 Prepared By : ENGG APPLICATIONS CONSUL Page 1 of 2

1. SYSTEM NAME AND TYPE

System Name = AHU-2 BLDG. 307
 System Class = Constant Volume
 System Type = (CV/RH) Constant Volume w/ Terminal Reheat
 Number of Zones = 1

2. SPACE SELECTION (see separate printout)

3. THERMOSTAT & EQUIPMENT SCHEDULING DATA

Operation Period	Thermostat Setpoints		Ventilation Dampers
	Cooling	Heating	
Occupied	75.0 F	68.0 F	OPEN
Unoccupied	75.0 F	68.0 F	OPEN

Weekday : Occupied Period Begins at 0 ; Duration = 24 hrs
 Saturday : Occupied Period Begins at 0 ; Duration = 24 hrs
 Sunday : Occupied Period Begins at 0 ; Duration = 24 hrs
 Design Day : Occupied Period Begins at 0 ; Duration = 24 hrs

4. SUPPLY, VENTILATION, RETURN AIR DATA

SUPPLY AIR

Supply air flow rate = 8490.00 CFM
 Supply temperature control = 1 Constant

VENTILATION AIR

Nominal ventilation flow rate = 770.00 CFM
 Minimum ventilation flow rate = 770.00 CFM
 Damper leak rate = 5 % of vent air

RETURN AIR

Zone exhaust air flow rate = 770.00 CFM
 Zone exhaust fan power = 0.0 kW
 Is a return plenum used ? N

AIR SYSTEM DESCRIPTION

Name : AHU-2 BLDG. 307

10-16-90

Carrier Hourly Analysis Program

6022890201

Prepared By : ENGG APPLICATIONS CONSUL

Page 2 of 2

5. FAN DATA

SUPPLY FAN

Type = 2:Forward curved
Static = 2.50 in wg
Efficiency = 65 %
Configuration = 1 Draw-thru

RETURN FAN

Type = 2:Forward curved
Static = 0.75 in wg
Efficiency = 65 %

6. ACCESSORY DEVICES AND SYSTEMS

PREHEAT COIL

(Not used)

OUTDOOR AIR ECONOMIZER CONTROL

(Not used)

VENTILATION AIR RECLAIM

(Not used)

HUMIDITY CONTROL

Upper RH setpoint = 100 %
Lower RH setpoint = 40 %

7. MISCELLANEOUS SYSTEM DATA

Cooling coil bypass factor = 0.050
Type of supplemental heating = 2 Skin Heating Units

SKIN HEATING UNITS

Heat source = 1 Baseboard Heaters
Skin heating trip temperature = 65.0 F

AIR SYSTEM DESCRIPTION

Name : AHU-3 BLDG. 307 10-16-90
 Carrier Hourly Analysis Program 6022890201
 Prepared By : ENGG APPLICATIONS CONSUL Page 1 of 2

1. SYSTEM NAME AND TYPE

System Name = AHU-3 BLDG. 307
 System Class = Constant Volume
 System Type = (CV/RH) Constant Volume w/ Terminal Reheat
 Number of Zones = 10

2. SPACE SELECTION (see separate printout)

3. THERMOSTAT & EQUIPMENT SCHEDULING DATA

Operation Period	Thermostat Setpoints		Ventilation Dampers
	Cooling	Heating	
Occupied	75.0 F	68.0 F	OPEN
Unoccupied	75.0 F	68.0 F	OPEN

 Weekday : Occupied Period Begins at 0 ; Duration = 24 hrs
 Saturday : Occupied Period Begins at 0 ; Duration = 24 hrs
 Sunday : Occupied Period Begins at 0 ; Duration = 24 hrs
 Design Day : Occupied Period Begins at 0 ; Duration = 24 hrs

4. SUPPLY, VENTILATION, RETURN AIR DATA

SUPPLY AIR

Supply air flow rate = 9420.00 CFM
 Supply temperature control = 1 Constant

VENTILATION AIR

Nominal ventilation flow rate = 2160.00 CFM
 Minimum ventilation flow rate = 2160.00 CFM
 Damper leak rate = 5 % of vent air

RETURN AIR

Zone exhaust air flow rate = 2160.00 CFM
 Zone exhaust fan power = 0.0 kW
 Is a return plenum used ? N

AIR SYSTEM DESCRIPTION

Name : AHU-3 BLDG. 307

10-16-90

Carrier Hourly Analysis Program

6022890201

Prepared By : ENGG APPLICATIONS CONSUL

Page 2 of 2

5. FAN DATA

SUPPLY FAN

Type = 2:Forward curved
Static = 2.50 in wg
Efficiency = 65 %
Configuration = 1 Draw-thru

RETURN FAN

Type = 2:Forward curved
Static = 1.00 in wg
Efficiency = 65 %

6. ACCESSORY DEVICES AND SYSTEMS

PREHEAT COIL

(Not used)

OUTDOOR AIR ECONOMIZER CONTROL

(Not used)

VENTILATION AIR RECLAIM

(Not used)

HUMIDITY CONTROL

Upper RH setpoint = 100 %
Lower RH setpoint = 40 %

7. MISCELLANEOUS SYSTEM DATA

Cooling coil bypass factor = 0.050
Type of supplemental heating = 1 Not Used

PLANT DESCRIPTIONS

Plant : #2 OIL FIRED BOILER 07-25-91
 Prepared By : E A C, PC BURKE, VA. 6100190202
 Carrier Hourly Analysis Program Page 1 of 1

 1 PLANT NAME AND TYPES

Class = Individual Plants
 Name = #2 OIL FIRED BOILER
 Cooling Plant Type = Air Cooled Reciprocating
 Heating Plant Type = Combustion

 2 AIR SYSTEM SELECTION

Air System Name	Mult	Air System Name	Mult
AHU-1 BLDG. 307	1	AHU-2 BLDG. 307	1
AHU-3 BLDG. 307	1		

 3a COOLING PLANT DATA (Air Cooled Reciprocating)

Estimated maximum cooling coil load = 101.12 Ton
 Is an electronic expansion valve used ? Y
 Capacity at 95.0 F outdoor air = 103.00 Ton
 Input power rate at 95.0 F outdoor air = 1.200 kW/Ton
 Is chilled water reset used ? N
 Design leaving water temperature = 42.0 F
 Is hot gas bypass used ? Y
 Part load % for minimum unloading step = 20 %

 3b HEATING PLANT DATA (Combustion)

Estimated maximum heating coil load = 1579.55 MBH
 Fuel type = Fuel Oil
 Rated plant output = 1864.0 MBH
 Type of heating = Hydronic
 Is plant efficiency computer generated ? N
 Seasonal plant efficiency = 64 %

 4 PUMP SYSTEM DATA

Chilled water pumping system head = 57.00 ft wg
 Chilled water pumping system delta T = 10.00 F
 Hot water pumping system head = 40.00 ft wg
 Hot water pumping system delta T = 20.00 F

FUEL RATE DATA

Fuel Rate : DOMESTIC FUEL OIL #2 (GENERIC)

01-29-91

Prepared By : ENGG APPLICATIONS CONSUL

6100190202

Carrier Hourly Analysis Program

Page 1 of 1

1. FUEL RATE DATA

NAME
Name of rate schedule = DOMESTIC FUEL OIL #2 (GENERIC)
CURRENCY
Currency name = MBTU
Currency symbol = MBTU
BASIC INFORMATION
Units of measurement = Gallon
Conversion factor = 138.70000 kBTU/Gallon
Type of rate schedule = 1 Simple
Flat rate charge = 0.13870 MBTU/Gallon

BUILDING DESCRIPTION

Building : BUILDING #307 01-29-91
 Prepared By: ENGG APPLICATIONS CONSUL 6100190202
 Carrier Hourly Analysis Program Page 1 of 1

1. BUILDING INPUTS

BUILDING NAME = BUILDING #307

MISCELLANEOUS ELECTRIC

Maximum power = 0.0 kW
 Power schedule = 1

DOMESTIC WATER HEATING

Is a domestic hot water system used ? Y
 Maximum hourly hot water use = 140.0 gal
 Hot water schedule = 4
 Average entering water temperature = 65.0 F
 Average hot water supply temperature = 140.0 F
 Heating plant type = 2 : Combustion
 Fuel type = 2 : Fuel Oil
 Plant capacity = 1864.0 MBH
 Is plant efficiency computer generated ? N
 Annual plant efficiency = 64 %

OTHER INPUTS

Additional building floor area = 10970.0 sqft
 Electrical generating efficiency = 100.00 %

2. PLANT SELECTION

Plant Name	Mult	Plant Name	Mult
#2 OIL FIRED BOILER	1		

3. FUEL & ELECTRIC RATE SELECTION

Fuel or Energy	No.	Name of Rate Schedule	Currency
Electric	10	GENERIC	MBTU
Natural Gas	7	NATURAL GAS (GENERIC)	MBTU
Fuel Oil	6	DOMESTIC FUEL OIL #2 (GENERIC)	MBTU
Propane	9	Empty...	MBTU
Remote Source Heating	8	HEAVY FUEL OIL #6 (GENERIC)	MBTU
Remote Source Cooling	9	Empty...	MBTU

MONTHLY ENERGY COSTS

Building : BUILDING #307
 Site : FT. BELVOIR, VIRGINIA
 Prepared By : E A C, PC BURKE, VA.
 Carrier Hourly Analysis Program

07-25-91
 6100190202

 TABLE 1. HVAC COSTS (MBTU)

Month	Electric	Natural Gas	Fuel Oil	Propane	Remote Heating	Remote Cooling
Jan	89	0	875	0	0	0
Feb	82	0	737	0	0	0
Mar	95	0	598	0	0	0
Apr	99	0	331	0	0	0
May	128	0	215	0	0	0
June	172	0	124	0	0	0
July	220	0	107	0	0	0
Aug	209	0	116	0	0	0
Sept	149	0	177	0	0	0
Oct	108	0	315	0	0	0
Nov	93	0	521	0	0	0
Dec	91	0	791	0	0	0
Tot.	1,535	0	4,907	0	0	0

 TABLE 2. NON-HVAC COSTS (MBTU)

Month	Electric	Natural Gas	Fuel Oil	Propane	Remote Heating
Jan	112	0	10	0	0
Feb	101	0	9	0	0
Mar	116	0	11	0	0
Apr	110	0	10	0	0
May	115	0	11	0	0
June	111	0	10	0	0
July	112	0	10	0	0
Aug	119	0	11	0	0
Sept	104	0	10	0	0
Oct	119	0	11	0	0
Nov	110	0	10	0	0
Dec	109	0	10	0	0
Tot.	1,337	0	126	0	0

FUEL OIL COSTS

Building : BUILDING #307

07-25-91

Site : FT. BELVOIR, VIRGINIA

6100190202

Prepared By : E A C, PC BURKE, VA.

Page 1 of 1

Carrier Hourly Analysis Program

TABLE 1. MONTHLY COMPONENT CHARGES (MBTU)

Month	Energy Charges	Fixed Charges	Taxes	Total Charges
Jan	885	0	0	885
Feb	747	0	0	747
Mar	609	0	0	609
Apr	342	0	0	342
May	225	0	0	225
June	134	0	0	134
July	118	0	0	118
Aug	127	0	0	127
Sept	186	0	0	186
Oct	326	0	0	326
Nov	531	0	0	531
Dec	801	0	0	801
Tot.	5,033	0	0	5,033

TABLE 2. MONTHLY TOTALS

Month	Charges (MBTU)	Energy (Gallon)	Effective Rate (MBTU/Gallon)
Jan	885	6,384	0.13870
Feb	747	5,385	0.13870
Mar	609	4,389	0.13870
Apr	342	2,463	0.13870
May	225	1,625	0.13870
June	134	968	0.13870
July	118	849	0.13870
Aug	127	917	0.13870
Sept	186	1,344	0.13870
Oct	326	2,353	0.13870
Nov	531	3,829	0.13870
Dec	801	5,777	0.13870
Tot.	5,033	36,283	0.13870

THE SIMULATIONS ESTIMATED HEATING LOAD (1601.96 MBH) IS WORST CASE CONDITION AND PROBABLY OCCURES DURING JANUARY. THIS LOAD ONLY REPRESENTS THE SYSTEMS SIMULATED WHICH REQUIRE SUMMER STEAM,

SINCE THE NEW LOCAL BOILER WILL ONLY BE NEEDED FROM MID APRIL THRU MID OCTOBER WE WILL NOT NEED AS LARGE A BOILER LOAD AS INDICATED BY THE COMPUTER SIMULATION.

IF WE TAKE THE AVERAGE MBTU FOR DAYS IN APRIL (WORST CASE) AND ADD 20% AS A SAFETY FACTOR THE RESULTANT LOAD WILL BE SUFFICIENT TO SELECT A LOCAL STEAM BOILER TO ACCOMMODATE THE BUILDINGS STEAM REQUIREMENTS DURING THE SUMMER.

SUMMER STEAM

AVG. MBTU/DAY

↓

APR	11.63 ←
MAY	7.36
JUNE	4.81
JULY	4.20
AUG.	4.52
SEPT.	6.44
OCT.	10.58

$$11.63/24 = 484.58 \times 1.2 = 581.5 \text{ MBH LOAD}$$

SELECT: PEERLESS SERIES 7 FDA INDUSTRIAL/COMMERCIAL
 CAST IRON BOILER/BURNER UNIT
 MODEL 707 FDA SU, 25 BHP, 10" Ø VENT, 7 SECTIONS
 OVERALL EFFICIENCY w/ PIPING LOSSES & PICKUP = 64%
 INPUT @ 7.4 GPH #2 = 1026.3 MBH (CORRECTED)
 CORRECTED NET OUTPUT = 622.1 MBH
 48" L x 35" W x 60" H (2) 4" SUP TAPS & (1) 3" RET.

COMPUTER SIMULATED MAX. EST. HTG LOAD
 = 1601.96 MBH (OCCURS IN JAN)

JAN MBTU = 910 EXPENDED
 APR = 349 "

$$349/910 = .3835 \times 1601.96 = 614.37 \text{ MBH}$$

JAN EXPENDED MBTU = $910/31 = 29.354 \text{ MBTU/DAY}$

$$29.354/24 = 1.223 \text{ MBTU/HR}$$

IS LESS THAN EST MAX LOAD
 BY 76.3%

∴ MAYBE BEST TO INCREASE
 APR HOURLY EST BY SAME %

$$581.5/76.3 \times 100 = 762.12 \text{ MBH MAX}$$

MONTHLY MBTU EXPENDED FOR SUMMER REHEAT AND DOMESTIC HOT WATER GENERATION AS SIMULATED BY CARRIER E-20 HOURLY ANALYSIS COMPUTER PROGRAM.

APR	349/2	=	175 MBTU	1260 GALS
MAY		=	228	1640
JUNE		=	144	1036
JULY		=	130	937
AUG		=	140	1007
SEPT		=	193	1394
OCT	328/2	=	164	1182

1174 MBTU 8,456 GALS

SELECT : 1500 GAL OIL STORAGE TANK
5'-4" ϕ x 9' L , 1607 lbs , 7 GA.

OIL STORAGE

REQD. 1500 GAL. UNDERGROUND, DOUBLE WALL, STEEL
UL LISTED, w/STI-P3 CORROSION PROTECTION
& 30 YR WARRANTY

		L	M	T	
182	TANK	220	3700	3920	5'-4" x 9' L
	HOLD DNS.	47	270	317	
	1" PIPING (50')	3.82	1.47	5.70	
	INCASED PIPING (60')	7.15	10.15	18.06	
158	FOOT VALVE	12.40	34.50	46.90	
	PUMP (2)	59	395	454	
	TANK GAGE SYS	79.	715.	794.	
	VALVES (2)	8.25	7.75	16.	
	SHUT OFFS (4)	19.80	11.75	31.55	
	PAD CY (5)	25.	94.	119	
	EXCAVATION CY (115)	27	-	-	
		<u>4422</u>	<u>6791</u>	<u>11,213</u>	

LEAK DETECTION SYSTEM

CONTROL MASTER w/ALARM	725.
PROBES 4" WELL	760.
" TANK DOUBLE WALL	650.
CABLE	<u>195</u>

OPTIONAL LEAK DETECTION = 2330

<u>4422</u>	<u>9121</u>	<u>13,543</u>
-------------	-------------	---------------

STEAM VALVES, PIPING, FITTINGS, VALVES ETC.

		L	M	T
132	4" STM. VALVES OS&Y (2)	120	215	335
	BOILER DRAIN	5.80	11.90	17.70
87	PIPING (45')	9.60	6.77	1.03
	PIPING ()			17.40
	PIPING ()			
110	4" WN/FLANGE (5)	36	14.80	3.82
	90° ELL (10)	71	14.90	7.65
	TEE (2)	120	27	12.75
	WELD. JOINTS (20)	39.82		
		<u>2605</u>	<u>1166</u>	<u>3771</u>

CONDENSATE PIPING, TRAPS

		L	M	T
	2" PIPING (40')	6.25	3.30	.67
203	TRAP ASSEMBLY (2)	90	320	410
	MISC 10%	43		
	WELDING LABOR	22	2.39	24.39
		<u>649</u>	<u>898</u>	<u>1547</u>

RETURN FEEDWATER

		L	M	T
	PIPING ()			
	VALVE			
	MISC FITTINGS			
		880	574	1454

ALL FUEL CHIMNEY, UL LISTED, DOUBLE WALL, 304 INNER - STL OUTER

	L	M	T
(30') STR 10" ϕ	7.30	58.30	65.60
(2) 45° EL	14.60	195	209.60
90° TEE	16.70	214	230.70
PLT. SUPPORT (3)	17.55	123	140.55
ROOF THIMBLE	17.55	310	327.55
ROOF SUP. ASSEM.	18.45	405	423.45
STACK CAP	8.75	245	253.75
	<u>144</u>	<u>1933</u>	<u>2077.</u>

OIL HOOK-UP

	L	M	T
FILTER (1)	9.90	9.95	19.95
VALVE	8.25	4.25	12.50
VALVE	16.50	8.60	25.00
2" VENT CAP	6.20	7.50	13.70
TUBE (20')	2.53	1.28	3.81
2" STL V.P. (30')	6.25	4.08 .67	11.00
LOUVERS (2)	7.20	24.00	31.20
DAMPERS (2)	17.70	58.30	76
FILL CAP	6.20	7.50	13.70
	<u>335</u>	<u>370</u>	<u>705</u>

$1,026,300 / 4000 = 257 \text{ sq in.}$
 $\times 1.5 = 385 / 144 = 2.67 \phi$

BUILDING 309

DESIGN PARAMETERS, SHGs

Location : FORT BELVOIR, VIRGINIA
 Prepared By : ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

02-07-91
 6100190202
 Page 1 of 1

DESIGN WEATHER PARAMETERS

City Name.....: FORT BELVOIR
 Location.....: VIRGINIA
 Latitude.....: 38.7 deg
 Elevation.....: 69.0 ft
 Summer Design Dry Bulb Temp.....: 90.0 F
 Summer Design Wet Bulb Temp.....: 75.0 F
 Daily Temperature Range.....: 23.0 F
 Winter Design Dry Bulb Temp.....: 12.0 F
 Atmospheric Clearness Number.....: 1.00

TABLE 1. MAXIMUM SOLAR HEAT GAINS - AVERAGE DAYS
 (BTU/hr/sqft)

Month	NE	E	SE	S	SW	W	NW	N	Hor
Jan	18.8	36.2	59.9	68.5	59.9	36.2	18.8	18.8	53.9
Feb	25.7	46.8	67.6	74.7	67.6	46.8	25.7	25.7	74.9
Mar	36.0	64.4	80.5	83.2	80.5	64.4	36.0	36.0	107.8
Apr	53.2	86.3	93.6	88.6	93.6	86.3	53.2	47.1	148.6
May	67.2	92.8	90.1	78.8	90.1	92.8	67.2	52.9	166.3
Jun	78.1	100.7	91.5	76.0	91.5	100.7	78.1	56.4	181.9
Jul	77.1	102.4	95.1	79.9	95.1	102.4	77.1	55.6	182.6
Aug	63.0	95.0	97.7	88.6	97.7	95.0	63.0	50.5	164.5
Sep	44.1	83.2	97.4	96.3	97.4	83.2	44.1	42.5	137.0
Oct	31.8	63.2	85.6	91.3	85.6	63.2	31.8	31.8	98.9
Nov	19.5	34.8	55.6	62.9	55.6	34.8	19.5	19.5	54.7
Dec	14.9	27.2	46.9	54.1	46.9	27.2	14.9	14.9	40.7

TABLE 2. MAXIMUM SOLAR HEAT GAINS - DESIGN DAYS
 (BTU/hr/sqft)

Month	NE	E	SE	S	SW	W	NW	N	Hor
Jan	20.2	157.9	243.4	253.9	243.4	157.9	20.2	20.2	140.3
Feb	52.5	188.6	246.3	238.2	246.3	188.6	52.5	24.6	186.3
Mar	95.5	219.4	234.8	201.8	234.8	219.4	95.5	29.3	227.8
Apr	141.3	224.3	200.7	148.1	200.7	224.3	141.3	34.1	255.2
May	165.9	220.1	171.5	106.1	171.5	220.1	165.9	37.3	267.4
Jun	173.0	215.4	157.5	89.2	157.5	215.4	173.0	47.4	269.3
Jul	163.5	215.7	167.2	102.9	167.2	215.7	163.5	38.2	264.2
Aug	136.2	216.5	193.7	143.1	193.7	216.5	136.2	35.7	250.5
Sep	89.8	206.8	224.9	195.9	224.9	206.8	89.8	30.4	220.2
Oct	51.4	182.2	238.2	231.2	238.2	182.2	51.4	25.4	183.0
Nov	20.6	155.1	239.4	250.0	239.4	155.1	20.6	20.6	139.7
Dec	18.3	140.7	235.7	254.0	235.7	140.7	18.3	18.3	120.5

MASTER SCHEDULE SUMMARY

Prepared By : ENGG APPLICATIONS CONSUL

02-07-91

Carrier Hourly Analysis Program

6100190202

MASTER SCHEDULE 1. OCCUPANCY Hourly Percentages

Hour ---->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	0	0	0	0	0	0	10	50	100	100	100	100
Saturday	0	0	0	0	0	0	10	10	10	20	20	20
Sunday	0	0	0	0	0	0	10	10	10	10	10	10
DESIGN	0	0	0	0	0	0	10	50	100	100	100	100

Hour ---->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	80	80	100	100	100	50	50	25	0	0	0	0
Saturday	20	20	20	20	10	10	10	0	0	0	0	0
Sunday	10	10	10	10	10	10	10	0	0	0	0	0
DESIGN	100	100	100	100	100	50	50	25	0	0	0	0

MASTER SCHEDULE 2. LIGHTING Hourly Percentages

Hour ---->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	5	5	5	5	5	5	50	50	100	100	100	100
Saturday	5	5	5	5	5	5	5	10	20	20	20	20
Sunday	5	5	5	5	5	5	10	10	10	10	10	10
DESIGN	5	5	5	5	5	5	50	50	100	100	100	100

Hour ---->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	100	100	100	100	100	100	100	50	50	5	5	5
Saturday	20	20	20	20	20	20	20	5	5	5	5	5
Sunday	10	10	10	10	10	10	5	5	5	5	5	5
DESIGN	100	100	100	100	100	100	100	50	50	5	5	5

MASTER SCHEDULE 3. APPLIANCES Hourly Percentages

Hour ---->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	0	0	0	0	0	0	10	20	20	50	50	50
Saturday	0	0	0	0	0	0	10	10	10	10	10	10
Sunday	0	0	0	0	0	0	10	10	10	10	10	10
DESIGN	0	0	0	0	0	0	10	20	20	50	50	50

Hour ---->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	50	50	50	50	20	20	20	0	0	0	0	0
Saturday	10	10	10	10	10	10	10	0	0	0	0	0
Sunday	10	10	10	10	10	10	10	0	0	0	0	0
DESIGN	50	50	50	50	20	20	20	0	0	0	0	0

MASTER SCHEDULE SUMMARY

Prepared By : ENGG APPLICATIONS CONSUL

02-07-91

Carrier Hourly Analysis Program

6100190202

MASTER SCHEDULE 4. PC's Hourly Percentages

Hour ---->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	0	0	0	0	0	0	10	50	100	100	100	100
Saturday	0	0	0	0	0	0	10	10	10	20	20	20
Sunday	0	0	0	0	0	0	10	10	10	10	10	10
DESIGN	0	0	0	0	0	0	10	50	100	100	100	100

Hour ---->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	80	80	100	100	100	50	50	20	0	0	0	0
Saturday	20	20	20	20	10	10	10	0	0	0	0	0
Sunday	10	10	10	10	10	10	10	0	0	0	0	0
DESIGN	100	100	100	100	100	50	50	20	0	0	0	0

MASTER SCHEDULE 5. SIMULATOR LIGHTS Hourly Percentages

Hour ---->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	5	5	5	5	5	5	5	25	25	25	25	25
Saturday	5	5	5	5	5	5	5	5	5	5	5	5
Sunday	5	5	5	5	5	5	5	5	5	5	5	5
DESIGN	5	5	5	5	5	5	5	25	25	25	25	25

Hour ---->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	25	25	25	25	25	25	25	25	5	5	5	5
Saturday	5	5	5	5	5	5	5	5	5	5	5	5
Sunday	5	5	5	5	5	5	5	5	5	5	5	5
DESIGN	25	25	25	25	25	25	25	25	5	5	5	5

MASTER SCHEDULE 6. DOMESTIC HOT WATER Hourly Percentages

Hour ---->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	0	0	0	0	0	5	10	10	20	20	20	80
Saturday	0	0	0	0	0	2	2	2	5	5	5	5
Sunday	0	0	0	0	0	0	0	2	2	2	2	2
DESIGN	0	0	0	0	0	5	5	20	20	20	20	80

Hour ---->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	80	20	20	20	10	10	5	5	5	2	0	0
Saturday	5	5	5	2	2	2	2	2	0	0	0	0
Sunday	2	2	2	2	2	2	0	0	0	0	0	0
DESIGN	80	20	20	20	10	10	5	5	2	2	0	0

DAY TYPE DATA

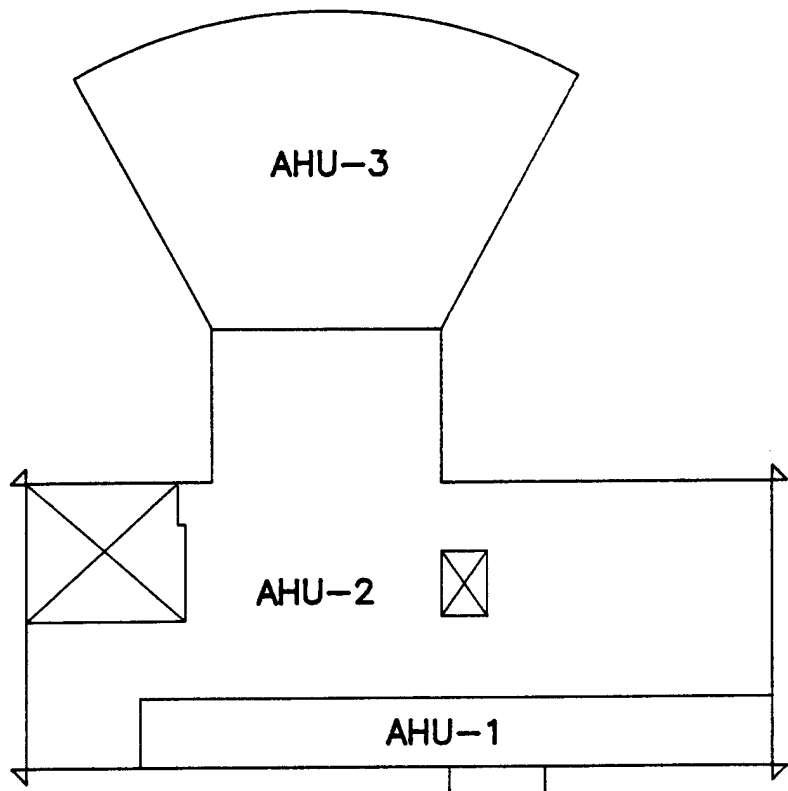
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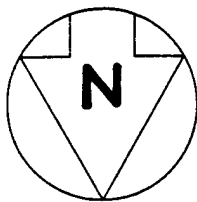
Carrier Hourly Analysis Program

6100190202

Month	DAY TYPE 1 Weekday	DAY TYPE 2 Saturday	DAY TYPE 3 Sunday	Total Days/Month
January	21	4	6	31
February	19	4	5	28
March	22	5	4	31
April	21	4	5	30
May	22	4	5	31
June	21	4	5	30
July	21	4	6	31
August	23	4	4	31
September	19	5	6	30
October	23	4	4	31
November	21	4	5	30
December	20	5	6	31

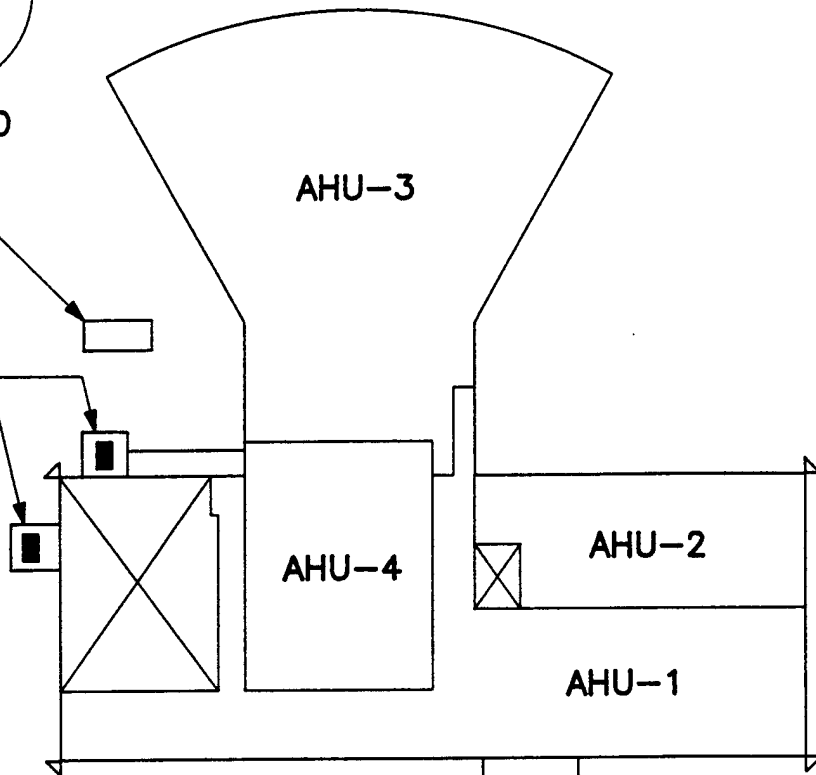


SECOND FLOOR PLAN



UNDERGROUND
OIL STORAGE
TANK

PROPOSED
POSSIBLE
BOILER ROOM
LOCATIONS



FIRST FLOOR PLAN

BUILDING 309 KEY PLAN

COMPLEX SPACE DESCRIPTION

Space Name : #309 SIMULATION CHAMBER
 Prepared By : ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

02-07-91
 6100190202
 Page 1 of 2

1. SPACE NAME = #309 SIMULATION CHAMBER

2. WALL INFORMATION (Number of Wall Types = 2)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)
Wall Type 1	M	M	0.240
Wall Type 2	M	M	0.250

Exposure	<----- Net Wall Areas (sqft) ----->		
	Wall Type 1	Wall Type 2	Wall Type 3
NE	2,880.0	0.0	NA
E	0.0	350.0	NA
SE	2,000.0	0.0	NA
S	2,000.0	0.0	NA
SW	2,000.0	0.0	NA
W	0.0	350.0	NA
NW	2,880.0	0.0	NA
N	0.0	0.0	NA

3. ROOF INFORMATION (Number of Roof Types = 1)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)	Area (sqft)
Roof 1	M	M	0.090	7,600.0

4. GLASS INFORMATION (Number of Glass Types = 1)

	U-Value (BTU/hr/sqft/F)	Glass Factor	Internal Shades
Glass Type 1	0.500	1.00	Y

<----- External Shading Information ----->							
	Window Height (ft)	Window Width (ft)	Reveal Depth (in)	Overhang Height (in)	Overhang Extension (in)	Fin Separation (in)	Fin Exten. (in)
Shade 1	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 2	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 3	8.0	4.0	0.0	0.0	0.0	0.0	0.0

COMPLEX SPACE DESCRIPTION

Space Name : #309 SIMULATION CHAMBER
 Prepared By : ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

02-07-91
 6100190202
 Page 2 of 2

4. GLASS INFORMATION (continued)

Exposure	Glass Areas (sqft)					
	Type 1		Type 2		Type 3	
	Area	Shade	Area	Shade	Area	Shade
NE	0.0	0	NA	NA	NA	NA
E	0.0	0	NA	NA	NA	NA
SE	0.0	0	NA	NA	NA	NA
S	0.0	0	NA	NA	NA	NA
SW	0.0	0	NA	NA	NA	NA
W	0.0	0	NA	NA	NA	NA
NW	0.0	0	NA	NA	NA	NA
N	0.0	0	NA	NA	NA	NA
H	0.0	0	NA	NA	NA	NA

5. INTERNAL LOADS

SPACE DATA	: Floor Area	=	7,600 sqft	Building Wt.	=	M lb/sqft
PEOPLE	: sqft/person	=	0.0	Total People	=	0
	Schedule No.	=	1	Activity Level	=	2
LIGHTING	: W/sqft	=	4.74	Total Watts	=	36,000
	Schedule No.	=	5	Wattage Mult.	=	1.00
	Fixture Type	=	1 Recessed, not vented			
OTHER ELECTRIC:	W/sqft	=	0.00	Total Watts	=	0
	Schedule No.	=	1			
MISC. SENSIBLE:	Load	=	0 BTU/hr	Schedule No.	=	1
MISC. LATENT :	Load	=	0 BTU/hr	Schedule No.	=	1

6. PARTITIONS, INFILTRATION, GROUND

PARTITIONS (Next to Unconditioned Spaces)	Area (sqft)	U-Value (BTU/hr/sqft/F)	Unconditioned Space Temp.	
			Cooling (deg F or %)	Heating (deg F or %)
Walls	0.0	0.100	90.0 F	50.0 F
Ceilings	0.0	0.100	90.0 F	50.0 F
Floors	0.0	0.100	90.0 F	50.0 F

INFILTRATION			GROUND ELEMENT		
Cooling	: 0.10 CFM/sqft =	760 CFM	Area	:	7,600.0 sqft
Heating	: 0.20 CFM/sqft =	1,520 CFM	Perimeter	:	300.0 ft
Typical	: 0.20 CFM/sqft =	1,520 CFM	Depth	:	0.0 ft

COMPLEX SPACE DESCRIPTION

Space Name : #309 OFFICE SPACES (FF)
 Prepared By : ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

02-07-91
 6100190202
 Page 1 of 2

1. SPACE NAME = #309 OFFICE SPACES (FF)

2. WALL INFORMATION (Number of Wall Types = 1)

Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)
M	M	0.300

Exposure	Net Wall Areas (sqft)		
	Wall Type 1	Wall Type 2	Wall Type 3
NE	0.0	NA	NA
E	135.0	NA	NA
SE	0.0	NA	NA
S	0.0	NA	NA
SW	0.0	NA	NA
W	315.0	NA	NA
NW	0.0	NA	NA
N	1,620.0	NA	NA

3. ROOF INFORMATION (Number of Roof Types = 1)

Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)	Area (sqft)
M	M	0.090	0.0

4. GLASS INFORMATION (Number of Glass Types = 1)

U-Value (BTU/hr/sqft/F)	Glass Factor	Internal Shades
0.500	1.00	N

External Shading Information							
Window Height (ft)	Window Width (ft)	Reveal Depth (in)	Overhang Height (in)	Overhang Extension (in)	Fin Separation (in)	Fin Exten. (in)	
Shade 1	8.0	4.0	0.0	0.0	0.0	0.0	
Shade 2	8.0	4.0	0.0	0.0	0.0	0.0	
Shade 3	8.0	4.0	0.0	0.0	0.0	0.0	

COMPLEX SPACE DESCRIPTION

Space Name : #309 OFFICE SPACES (FF)
 Prepared By : ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

02-07-91
 610019020
 Page 2 of 2

4. GLASS INFORMATION (continued)

Exposure	Glass Areas (sqft)					
	Type 1		Type 2		Type 3	
	Area	Shade	Area	Shade	Area	Shade
NE	0.0	0	NA	NA	NA	NA
E	77.0	0	NA	NA	NA	NA
SE	0.0	0	NA	NA	NA	NA
S	0.0	0	NA	NA	NA	NA
SW	0.0	0	NA	NA	NA	NA
W	90.0	0	NA	NA	NA	NA
NW	0.0	0	NA	NA	NA	NA
N	924.0	0	NA	NA	NA	NA
H	0.0	0	NA	NA	NA	NA

5. INTERNAL LOADS

SPACE DATA	: Floor Area	=	4,540 sqft	Building Wt.	=	M lb/sqft
PEOPLE	: sqft/person	=	227.0	Total People	=	20
	Schedule No.	=	1	Activity Level	=	2
LIGHTING	: W/sqft	=	2.50	Total Watts	=	11,350
	Schedule No.	=	2	Wattage Mult.	=	1.00
	Fixture Type	=	1 Recessed, not vented			
OTHER ELECTRIC:	W/sqft	=	2.20	Total Watts	=	10,000
	Schedule No.	=	4			
MISC. SENSIBLE:	Load	=	0 BTU/hr	Schedule No.	=	1
MISC. LATENT	: Load	=	0 BTU/hr	Schedule No.	=	1

6. PARTITIONS, INFILTRATION, GROUND

PARTITIONS (Next to Unconditioned Spaces)	Area (sqft)	U-Value (BTU/hr/sqft/F)	Unconditioned Space Temp.	
			Cooling (deg F or %)	Heating (deg F or %)
Walls	0.0	0.100	90.0 F	50.0 F
Ceilings	0.0	0.100	90.0 F	50.0 F
Floors	0.0	0.100	90.0 F	50.0 F

INFILTRATION		GROUND ELEMENT	
Cooling	: 0.06 CFM/sqft =	272 CFM	Area : 4,540.0 sqft
Heating	: 0.10 CFM/sqft =	454 CFM	Perimeter : 240.0 ft
Typical	: 0.10 CFM/sqft =	454 CFM	Depth : 0.0 ft

COMPLEX SPACE DESCRIPTION

Space Name : #309 OFFICE SPACES (SF)
 Prepared By : ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

02-07-91
 6100190202
 Page 1 of 2

 1. SPACE NAME = #309 OFFICE SPACES (SF)

2. WALL INFORMATION (Number of Wall Types = 1)

Wall Type	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)
Wall Type 1	M	M	0.300

Exposure	Net Wall Areas (sqft)		
	Wall Type 1	Wall Type 2	Wall Type 3
NE	0.0	NA	NA
E	0.0	NA	NA
SE	0.0	NA	NA
S	0.0	NA	NA
SW	0.0	NA	NA
W	0.0	NA	NA
NW	0.0	NA	NA
N	1,380.0	NA	NA

 3. ROOF INFORMATION (Number of Roof Types = 1)

Roof	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)	Area (sqft)
Roof 1	M	M	0.090	2,280.0

 4. GLASS INFORMATION (Number of Glass Types = 1)

Glass Type	U-Value (BTU/hr/sqft/F)	Glass Factor	Internal Shades
Glass Type 1	0.500	1.00	N

Shade	External Shading Information						
	Window Height (ft)	Window Width (ft)	Reveal Depth (in)	Overhang Height (in)	Overhang Extension (in)	Fin Separation (in)	Fin Exten. (in)
Shade 1	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 2	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 3	8.0	4.0	0.0	0.0	0.0	0.0	0.0

COMPLEX SPACE DESCRIPTION

Space Name : #309 OFFICE SPACES (SF)
 Prepared By : ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

02-07-91
 6100190202
 Page 2 of 2

 4. GLASS INFORMATION (continued)

Exposure	Glass Areas (sqft)					
	Type 1		Type 2		Type 3	
	Area	Shade	Area	Shade	Area	Shade
NE	0.0	0	NA	NA	NA	NA
E	0.0	0	NA	NA	NA	NA
SE	0.0	0	NA	NA	NA	NA
S	0.0	0	NA	NA	NA	NA
SW	0.0	0	NA	NA	NA	NA
W	0.0	0	NA	NA	NA	NA
NW	0.0	0	NA	NA	NA	NA
N	660.0	0	NA	NA	NA	NA
H	0.0	0	NA	NA	NA	NA

5. INTERNAL LOADS

SPACE DATA	: Floor Area	=	2,280 sqft	Building Wt.	=	M lb/sqft
PEOPLE	: sqft/person	=	190.0	Total People	=	12
	Schedule No.	=	1	Activity Level	=	2
LIGHTING	: W/sqft	=	2.50	Total Watts	=	5,700
	Schedule No.	=	2	Wattage Mult.	=	1.00
	Fixture Type	=	1 Recessed, not vented			
OTHER ELECTRIC:	W/sqft	=	3.00	Total Watts	=	6,840
	Schedule No.	=	4			
MISC. SENSIBLE:	Load	=	0 BTU/hr	Schedule No.	=	1
MISC. LATENT	: Load	=	0 BTU/hr	Schedule No.	=	1

6. PARTITIONS, INFILTRATION, GROUND

PARTITIONS (Next to Unconditioned Spaces)	Area (sqft)	U-Value (BTU/hr/sqft/F)	Unconditioned Space Temp.	
			Cooling (deg F or %)	Heating (deg F or %)
Walls	0.0	0.100	90.0 F	50.0 F
Ceilings	0.0	0.100	90.0 F	50.0 F
Floors	0.0	0.100	90.0 F	50.0 F

INFILTRATION		GROUND ELEMENT	
Cooling	: 0.06 CFM/sqft =	137 CFM	Area : 0.0 sqft
Heating	: 0.10 CFM/sqft =	228 CFM	Perimeter : 0.0 ft
Typical	: 0.10 CFM/sqft =	228 CFM	Depth : 0.0 ft

COMPLEX SPACE DESCRIPTION

Space Name : #309 COMPUTER AREA 02-07-91
 Prepared By : ENGG APPLICATIONS CONSUL 6100190202
 Carrier Hourly Analysis Program Page 1 of 2

 1. SPACE NAME = #309 COMPUTER AREA

2. WALL INFORMATION (Number of Wall Types = 1)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)
Wall Type 1	M	M	0.300

Exposure	----- Net Wall Areas (sqft) ----->		
	Wall Type 1	Wall Type 2	Wall Type 3
NE	0.0	NA	NA
E	0.0	NA	NA
SE	0.0	NA	NA
S	0.0	NA	NA
SW	0.0	NA	NA
W	0.0	NA	NA
NW	0.0	NA	NA
N	0.0	NA	NA

 3. ROOF INFORMATION (Number of Roof Types = 1)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)	Area (sqft)
Roof 1	M	M	0.090	0.0

 4. GLASS INFORMATION (Number of Glass Types = 1)

	U-Value (BTU/hr/sqft/F)	Glass Factor	Internal Shades
Glass Type 1	0.500	1.00	N

	----- External Shading Information ----->						
	Window Height (ft)	Window Width (ft)	Reveal Depth (in)	Overhang Height (in)	Overhang Extension (in)	Fin Separation (in)	Fin Exten. (in)
Shade 1	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 2	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 3	8.0	4.0	0.0	0.0	0.0	0.0	0.0

COMPLEX SPACE DESCRIPTION

Space Name : #309 COMPUTER AREA

02-07-91

Prepared By : ENGG APPLICATIONS CONSUL

6100190202

Carrier Hourly Analysis Program

Page 2 of 2

4. GLASS INFORMATION (continued)

Exposure	Glass Areas (sqft)					
	Type 1		Type 2		Type 3	
	Area	Shade	Area	Shade	Area	Shade
NE	0.0	0	NA	NA	NA	NA
E	0.0	0	NA	NA	NA	NA
SE	0.0	0	NA	NA	NA	NA
S	0.0	0	NA	NA	NA	NA
SW	0.0	0	NA	NA	NA	NA
W	0.0	0	NA	NA	NA	NA
NW	0.0	0	NA	NA	NA	NA
N	0.0	0	NA	NA	NA	NA
H	0.0	0	NA	NA	NA	NA

5. INTERNAL LOADS

SPACE DATA	: Floor Area	=	1,470 sqft	Building Wt.	=	M lb/sqft
PEOPLE	: sqft/person	=	245.0	Total People	=	6
	Schedule No.	=	1	Activity Level	=	2
LIGHTING	: W/sqft	=	2.13	Total Watts	=	3,129
	Schedule No.	=	2	Wattage Mult.	=	1.00
	Fixture Type	=	1 Recessed, not vented			
OTHER ELECTRIC:	W/sqft	=	15.00	Total Watts	=	22,050
	Schedule No.	=	4			
MISC. SENSIBLE:	Load	=	0 BTU/hr	Schedule No.	=	1
MISC. LATENT	: Load	=	0 BTU/hr	Schedule No.	=	1

6. PARTITIONS, INFILTRATION, GROUND

PARTITIONS (Next to Unconditioned Spaces)	Area (sqft)	U-Value (BTU/hr/sqft/F)	Unconditioned Space Temp.	
			Cooling (deg F or %)	Heating (deg F or %)
Walls	0.0	0.100	90.0 F	50.0 F
Ceilings	0.0	0.100	90.0 F	50.0 F
Floors	0.0	0.100	90.0 F	50.0 F

INFILTRATION	GROUND ELEMENT
Cooling : 0.06 CFM/sqft =	88 CFM Area : 0.0 sqft
Heating : 0.10 CFM/sqft =	147 CFM Perimeter : 0.0 ft
Typical : 0.10 CFM/sqft =	147 CFM Depth : 0.0 ft

COMPLEX SPACE DESCRIPTION

Space Name : #309 LAB AREA (FF) 02-07-91
 Prepared By : ENGG APPLICATIONS CONSUL 6100190202
 Carrier Hourly Analysis Program Page 1 of 2

1. SPACE NAME = #309 LAB AREA (FF)

2. WALL INFORMATION (Number of Wall Types = 1)

Wall Type 1	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)
1	M	M	0.300

Exposure	<----- Net Wall Areas (sqft) ----->		
	Wall Type 1	Wall Type 2	Wall Type 3
NE	0.0	NA	NA
E	0.0	NA	NA
SE	0.0	NA	NA
S	648.0	NA	NA
SW	0.0	NA	NA
W	306.0	NA	NA
NW	0.0	NA	NA
N	0.0	NA	NA

3. ROOF INFORMATION (Number of Roof Types = 1)

Roof 1	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)	Area (sqft)
1	M	M	0.090	0.0

4. GLASS INFORMATION (Number of Glass Types = 1)

Glass Type 1	U-Value (BTU/hr/sqft/F)	Glass Factor	Internal Shades
1	0.500	1.00	N

Shade	<----- External Shading Information ----->						
	Window Height (ft)	Window Width (ft)	Reveal Depth (in)	Overhang Height (in)	Overhang Extension (in)	Fin Separation (in)	Fin Exten. (in)
Shade 1	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 2	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 3	8.0	4.0	0.0	0.0	0.0	0.0	0.0

COMPLEX SPACE DESCRIPTION

Space Name : #309 LAB AREA (FF)
 Prepared By : ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

02-07-91
 6100190202
 Page 2 of 2

4. GLASS INFORMATION (continued)

Exposure	Glass Areas (sqft)					
	Type 1		Type 2		Type 3	
	Area	Shade	Area	Shade	Area	Shade
NE	0.0	0	NA	NA	NA	NA
E	0.0	0	NA	NA	NA	NA
SE	0.0	0	NA	NA	NA	NA
S	0.0	0	NA	NA	NA	NA
SW	0.0	0	NA	NA	NA	NA
W	0.0	0	NA	NA	NA	NA
NW	0.0	0	NA	NA	NA	NA
N	0.0	0	NA	NA	NA	NA
H	0.0	0	NA	NA	NA	NA

5. INTERNAL LOADS

SPACE DATA	: Floor Area	=	2,450 sqft	Building Wt. =	M lb/sqft
PEOPLE	: sqft/person	=	204.2	Total People =	12
	Schedule No.	=	1	Activity Level =	2
LIGHTING	: W/sqft	=	2.45	Total Watts =	6,000
	Schedule No.	=	1	Wattage Mult. =	1.00
	Fixture Type	=	1 Recessed, not vented		
OTHER ELECTRIC:	W/sqft	=	4.07	Total Watts =	9,960
	Schedule No.	=	4		
MISC. SENSIBLE:	Load	=	0 BTU/hr	Schedule No. =	1
MISC. LATENT	: Load	=	0 BTU/hr	Schedule No. =	1

6. PARTITIONS, INFILTRATION, GROUND

PARTITIONS (Next to Unconditioned Spaces)	Area (sqft)	U-Value (BTU/hr/sqft/F)	Unconditioned Space Temp.	
			Cooling (deg F or %)	Heating (deg F or %)
Walls	0.0	0.100	90.0 F	50.0 F
Ceilings	0.0	0.100	90.0 F	50.0 F
Floors	0.0	0.100	90.0 F	50.0 F

INFILTRATION		GROUND ELEMENT	
Cooling	: 0.06 CFM/sqft =	147 CFM	Area : 2,450.0 sqft
Heating	: 0.10 CFM/sqft =	245 CFM	Perimeter : 105.0 ft
Typical	: 0.10 CFM/sqft =	245 CFM	Depth : 0.0 ft

COMPLEX SPACE DESCRIPTION

Space Name : #309 LAB AREA (SF) 02-07-91
 Prepared By : ENGG APPLICATIONS CONSUL 6100190202
 Carrier Hourly Analysis Program Page 1 of 2

1. SPACE NAME = #309 LAB AREA (SF)

2. WALL INFORMATION (Number of Wall Types = 1)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)
Wall Type 1	M	M	0.300

Exposure	<----- Net Wall Areas (sqft) ----->		
	Wall Type 1	Wall Type 2	Wall Type 3
NE	0.0	NA	NA
E	0.0	NA	NA
SE	0.0	NA	NA
S	864.0	NA	NA
SW	0.0	NA	NA
W	783.0	NA	NA
NW	0.0	NA	NA
N	135.0	NA	NA

3. ROOF INFORMATION (Number of Roof Types = 1)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)	Area (sqft)
Roof 1	M	M	0.090	8,650.0

4. GLASS INFORMATION (Number of Glass Types = 1)

	U-Value (BTU/hr/sqft/F)	Glass Factor	Internal Shades
Glass Type 1	0.500	1.00	N

	<----- External Shading Information ----->						
	Window Height (ft)	Window Width (ft)	Reveal Depth (in)	Overhang Height (in)	Overhang Extension (in)	Fin Separation (in)	Fin Exten. (in)
Shade 1	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 2	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 3	8.0	4.0	0.0	0.0	0.0	0.0	0.0

COMPLEX SPACE DESCRIPTION

Space Name : #309 LAB AREA (SF) 02-07-91
 Prepared By : ENGG APPLICATIONS CONSUL 6100190202
 Carrier Hourly Analysis Program Page 2 of 2

 4. GLASS INFORMATION (continued)

Exposure	----- Glass Areas (sqft) ----->					
	Type 1		Type 2		Type 3	
	Area	Shade	Area	Shade	Area	Shade
NE	0.0	0	NA	NA	NA	NA
E	0.0	0	NA	NA	NA	NA
SE	0.0	0	NA	NA	NA	NA
S	390.0	0	NA	NA	NA	NA
SW	0.0	0	NA	NA	NA	NA
W	0.0	0	NA	NA	NA	NA
NW	0.0	0	NA	NA	NA	NA
N	75.0	0	NA	NA	NA	NA
H	0.0	0	NA	NA	NA	NA

 5. INTERNAL LOADS

SPACE DATA : Floor Area = 8,650 sqft Building Wt. = M lb/sqft

PEOPLE : sqft/person = 240.3 Total People = 36
 Schedule No. = 1 Activity Level = 2

LIGHTING : W/sqft = 3.78 Total Watts = 32,720
 Schedule No. = 2 Wattage Mult. = 1.00
 Fixture Type = 1 Recessed, not vented

OTHER ELECTRIC: W/sqft = 3.07 Total Watts = 26,560
 Schedule No. = 4

MISC. SENSIBLE: Load = 0 BTU/hr Schedule No. = 1
 MISC. LATENT : Load = 0 BTU/hr Schedule No. = 1

 6. PARTITIONS, INFILTRATION, GROUND

PARTITIONS (Next to Unconditioned Spaces)	Area (sqft)	U-Value (BTU/hr/sqft/F)	Unconditioned Space Temp.	
			Cooling (deg F or %)	Heating (deg F or %)
Walls	0.0	0.100	90.0 F	50.0 F
Ceilings	0.0	0.100	90.0 F	50.0 F
Floors	0.0	0.100	90.0 F	50.0 F

INFILTRATION

INFILTRATION		GROUND ELEMENT	
Cooling	: 0.06 CFM/sqft = 519 CFM	Area	: 0.0 sqft
Heating	: 0.10 CFM/sqft = 865 CFM	Perimeter	: 0.0 ft
Typical	: 0.10 CFM/sqft = 865 CFM	Depth	: 0.0 ft

ZONE DESCRIPTION

Zone Name : Office AREA (FF) 02-07-91
Prepared By : ENGG APPLICATIONS CONSUL 6100190202
Carrier Hourly Analysis Program Page 1 of 1

1. ZONE NAME AND TYPE

Zone Name = Office AREA (FF)
Job Name = Default Job
Zone Type = 1 (Normal Zone)

2. THERMOSTAT AND EQUIPMENT SCHEDULE

COOLING EQUIPMENT

Occupied cooling thermostat setpoint = 75.0 F
Unoccupied cooling thermostat setpoint = 75.0 F
Starting hour of occupied period = 0
Number of hours in occupied period = 24

HEATING EQUIPMENT

Heating thermostat setpoint = 68.0 F

3. COOLING SYSTEM PARAMETERS

SUPPLY AIR

Type of input = 3 (Supply Temperature)
Supply temperature = 57.3 F

VENTILATION AIR

Type of input = 2 (CFM)
Ventilation air = 2,650 CFM

SAFETY FACTOR

Cooling safety factor = 0 %

4. HEATING SYSTEM PARAMETERS

HEATING SOURCE

Type of system = 1 (Warm Air)
Supply temperature = 102.8 F

VENTILATION AIR

Type of input = 2 (CFM)
Ventilation air = 2,650 CFM

SAFETY FACTOR

Heating safety factor = 0 %

5. OTHER SYSTEM PARAMETERS

SUPPLY FAN

Total static pressure = 2.50 in wg
Total efficiency = 54 %
Fan configuration = 2 (Blow-Thru)

EXHAUST AIR

Direct exhaust air flow rate = 0 % of vent. air

RETURN AIR

Is a return plenum used = N

COIL DATA

Cooling coil bypass factor = 0.050

6. SPACES INCLUDED IN ZONE

Table with 4 columns: Space Name, Qty., Space Name, Qty. Row 1: 2 #309 OFFICE SPACES (FF) x 1

ZONE DESCRIPTION

Zone Name : OFFICE AREA (SF)
Prepared By : ENGG APPLICATIONS CONSUL
Carrier Hourly Analysis Program

02-07-91
6100190202
Page 1 of 1

1. ZONE NAME AND TYPE

Zone Name = OFFICE AREA (SF)
Job Name = Default Job
Zone Type = 1 (Normal Zone)

2. THERMOSTAT AND EQUIPMENT SCHEDULE

COOLING EQUIPMENT

Occupied cooling thermostat setpoint = 75.0 F
Unoccupied cooling thermostat setpoint = 75.0 F
Starting hour of occupied period = 0
Number of hours in occupied period = 24

HEATING EQUIPMENT

Heating thermostat setpoint = 68.0 F

3. COOLING SYSTEM PARAMETERS

SUPPLY AIR

Type of input = 3 (Supply Temperature)
Supply temperature = 57.3 F

VENTILATION AIR

Type of input = 2 (CFM)
Ventilation air = 2,650 CFM

SAFETY FACTOR

Cooling safety factor = 0 %

4. HEATING SYSTEM PARAMETERS

HEATING SOURCE

Type of system = 1 (Warm Air)
Supply temperature = 102.8 F

VENTILATION AIR

Type of input = 2 (CFM)
Ventilation air = 2,650 CFM

SAFETY FACTOR

Heating safety factor = 0 %

5. OTHER SYSTEM PARAMETERS

SUPPLY FAN

Total static pressure = 2.50 in wg
Total efficiency = 54 %
Fan configuration = 2 (Blow-Thru)

EXHAUST AIR

Direct exhaust air flow rate = 0 % of vent. air

RETURN AIR

Is a return plenum used = N

COIL DATA

Cooling coil bypass factor = 0.050

6. SPACES INCLUDED IN ZONE

Table with 4 columns: Space Name, Qty., Space Name, Qty. Row 1: 3 #309 OFFICE SPACES (SF) x 1

AIR SYSTEM DESCRIPTION

Name : #309 OFFICES AHU 02-07-91
 Carrier Hourly Analysis Program 6100190202
 Prepared By : ENGG APPLICATIONS CONSUL Page 1 of 2

1. SYSTEM NAME AND TYPE

System Name = #309 OFFICES AHU
 System Class = Constant Volume
 System Type = (MZ) Multizone
 Number of Zones = 2

2. SPACE SELECTION (see separate printout)

3. THERMOSTAT & EQUIPMENT SCHEDULING DATA

Operation Period	Thermostat Setpoints		Ventilation Dampers
	Cooling	Heating	
Occupied	75.0 F	68.0 F	OPEN
Unoccupied	75.0 F	68.0 F	OPEN

Weekday	: Occupied Period Begins at	0	; Duration = 24 hrs
Saturday	: Occupied Period Begins at	0	; Duration = 24 hrs
Sunday	: Occupied Period Begins at	0	; Duration = 24 hrs
Design Day	: Occupied Period Begins at	0	; Duration = 24 hrs

4. SUPPLY, VENTILATION, RETURN AIR DATA

SUPPLY AIR

Supply air flow rate = 7200.00 CFM
 Hot deck supply temperature = 102.8 F
 First month hot deck is on = Jan
 Last month hot deck is on = Dec

VENTILATION AIR

Nominal ventilation flow rate = 2650.00 CFM
 Minimum ventilation flow rate = 1750.00 CFM
 Damper leak rate = 5 % of vent air

RETURN AIR

Zone exhaust air flow rate = 0.00 CFM
 Zone exhaust fan power = 0.0 kW
 Is a return plenum used ? N

AIR SYSTEM DESCRIPTION

Name : #309 OFFICES AHU

02-07-91

Carrier Hourly Analysis Program

6100190202

Prepared By : ENGG APPLICATIONS CONSUL

Page 2 of 2

5. FAN DATA

SUPPLY FAN

Type = 2:Forward curved

Static = 2.25 in wg

Efficiency = 60 %

Configuration = 2 Blow-thru

RETURN FAN

Type = 2:Forward curved

Static = 0.75 in wg

Efficiency = 60 %

6. ACCESSORY DEVICES AND SYSTEMS

PREHEAT COIL

(Not used)

OUTDOOR AIR ECONOMIZER CONTROL

(Not used)

VENTILATION AIR RECLAIM

(Not used)

HUMIDITY CONTROL

(Not available)

7. MISCELLANEOUS SYSTEM DATA

Cooling coil bypass factor = 0.050

Type of supplemental heating = 1 Not Used

AIR SYSTEM DESCRIPTION

Name : #309 LAB AREAS AHU 02-07-91
 Carrier Hourly Analysis Program 6100190202
 Prepared By : ENGG APPLICATIONS CONSUL Page 1 of 2

 1. SYSTEM NAME AND TYPE

System Name = #309 LAB AREAS AHU
 System Class = Constant Volume
 System Type = (CV/RH) Constant Volume w/ Terminal Reheat
 Number of Zones = 2

 2. SPACE SELECTION (see separate printout)

 3. THERMOSTAT & EQUIPMENT SCHEDULING DATA

Operation Period	Thermostat Setpoints		Ventilation Dampers
	Cooling	Heating	
Occupied	75.0 F	68.0 F	OPEN
Unoccupied	75.0 F	68.0 F	OPEN

 Weekday : Occupied Period Begins at 0 ; Duration = 24 hrs
 Saturday : Occupied Period Begins at 0 ; Duration = 24 hrs
 Sunday : Occupied Period Begins at 0 ; Duration = 24 hrs
 Design Day : Occupied Period Begins at 0 ; Duration = 24 hrs

 4. SUPPLY, VENTILATION, RETURN AIR DATA

SUPPLY AIR

Supply air flow rate = 15200.00 CFM
 Supply temperature control = 1 Constant

VENTILATION AIR

Nominal ventilation flow rate = 6200.00 CFM
 Minimum ventilation flow rate = 6200.00 CFM
 Damper leak rate = 5 % of vent air

RETURN AIR

Zone exhaust air flow rate = 6200.00 CFM
 Zone exhaust fan power = 8.5 kW
 Is a return plenum used ? N

AIR SYSTEM DESCRIPTION

Name : #309 LAB AREAS AHU

02-07-91

Carrier Hourly Analysis Program

6100190202

Prepared By : ENGG APPLICATIONS CONSUL

Page 2 of 2

5. FAN DATA

SUPPLY FAN

Type = 2:Forward curved

Static = 2.75 in wg

Efficiency = 60 %

Configuration = 1 Draw-thru

RETURN FAN

Type = 2:Forward curved

Static = 1.00 in wg

Efficiency = 54 %

6. ACCESSORY DEVICES AND SYSTEMS

PREHEAT COIL

(Not used)

OUTDOOR AIR ECONOMIZER CONTROL

(Not used)

VENTILATION AIR RECLAIM

(Not used)

HUMIDITY CONTROL

(Not used)

7. MISCELLANEOUS SYSTEM DATA

Cooling coil bypass factor = 0.050

Type of supplemental heating = 1 Not Used

AIR SYSTEM DESCRIPTION

Name : #309 SIMULATOR CHAMB AHU 02-07-91
 Carrier Hourly Analysis Program 6100190202
 Prepared By : ENGG APPLICATIONS CONSUL Page 1 of 2

1. SYSTEM NAME AND TYPE

System Name = #309 SIMULATOR CHAMB AHU
 System Class = Constant Volume
 System Type = (CV/RH) Constant Volume w/ Terminal Reheat
 Number of Zones = 1

2. SPACE SELECTION (see separate printout)

3. THERMOSTAT & EQUIPMENT SCHEDULING DATA

Operation Period	Thermostat Setpoints		Ventilation Dampers
	Cooling	Heating	
Occupied	75.0 F	68.0 F	OPEN
Unoccupied	75.0 F	68.0 F	OPEN

Weekday : Occupied Period Begins at 0 ; Duration = 24 hrs
 Saturday : Occupied Period Begins at 0 ; Duration = 24 hrs
 Sunday : Occupied Period Begins at 0 ; Duration = 24 hrs
 Design Day : Occupied Period Begins at 0 ; Duration = 24 hrs

4. SUPPLY, VENTILATION, RETURN AIR DATA

SUPPLY AIR

Supply air flow rate = 20000.00 CFM
 Supply temperature control = 1 Constant

VENTILATION AIR

Nominal ventilation flow rate = 3000.00 CFM
 Minimum ventilation flow rate = 3000.00 CFM
 Damper leak rate = 5 % of vent air

RETURN AIR

Zone exhaust air flow rate = 0.00 CFM
 Zone exhaust fan power = 0.0 kW
 Is a return plenum used ? N

AIR SYSTEM DESCRIPTION

Name : #309 SIMULATOR CHAMB AHU

02-07-91

Carrier Hourly Analysis Program

6100190202

Prepared By : ENGG APPLICATIONS CONSUL

Page 2 of 2

5. FAN DATA

SUPPLY FAN

Type = 2:Forward curved
Static = 2.50 in wg
Efficiency = 60 %
Configuration = 1 Draw-thru

RETURN FAN

Type = 1:(Fan does not exist)

6. ACCESSORY DEVICES AND SYSTEMS

PREHEAT COIL

(Not used)

OUTDOOR AIR ECONOMIZER CONTROL

(Not used)

VENTILATION AIR RECLAIM

(Not used)

HUMIDITY CONTROL

(Not used)

7. MISCELLANEOUS SYSTEM DATA

Cooling coil bypass factor = 0.050

Type of supplemental heating = 1 Not Used

AIR SYSTEM DESCRIPTION

Name : #309 COMPUTER ROOM AHU 02-07-91
 Carrier Hourly Analysis Program 6100190202
 Prepared By : ENGG APPLICATIONS CONSUL Page 1 of 2

1. SYSTEM NAME AND TYPE

System Name = #309 COMPUTER ROOM AHU
 System Class = Constant Volume
 System Type = (SZCV) Single Zone Constant Volume
 Operation Type = 3 Cooling & Heating
 Type of Heating = 1 Central Heating

2. SPACE SELECTION (see separate printout)

3. THERMOSTAT & EQUIPMENT SCHEDULING DATA

Operation Period	Thermostat Setpoints		Ventilation Dampers
	Cooling	Heating	
Occupied	75.0 F	68.0 F	OPEN
Unoccupied	75.0 F	68.0 F	OPEN

Weekday	: Occupied Period Begins at	0	; Duration = 24 hrs
Saturday	: Occupied Period Begins at	0	; Duration = 24 hrs
Sunday	: Occupied Period Begins at	0	; Duration = 24 hrs
Design Day	: Occupied Period Begins at	0	; Duration = 24 hrs

4. SUPPLY, VENTILATION, RETURN AIR DATA

SUPPLY AIR

Supply air flow rate = 10000.00 CFM
 Heating supply temperature = 73.0 F
 Fan operation for heating = 1 Continuous

VENTILATION AIR

Nominal ventilation flow rate = 360.00 CFM
 Minimum ventilation flow rate = 360.00 CFM
 Damper leak rate = 5 % of vent air

RETURN AIR

Zone exhaust air flow rate = 0.00 CFM
 Zone exhaust fan power = 0.0 kW
 Is a return plenum used ? N

AIR SYSTEM DESCRIPTION

Name : #309 COMPUTER ROOM AHU

02-07-91

Carrier Hourly Analysis Program

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Page 2 of 2

5. FAN DATA

SUPPLY FAN

Type = 2:Forward curved

Static = 1.50 in wg

Efficiency = 54 %

Configuration = 1 Draw-thru

RETURN FAN

Type = 1:(Fan does not exist)

6. ACCESSORY DEVICES AND SYSTEMS

PREHEAT COIL

(Not used)

OUTDOOR AIR ECONOMIZER CONTROL

(Not used)

VENTILATION AIR RECLAIM

(Not used)

HUMIDITY CONTROL

(Not used)

7. MISCELLANEOUS SYSTEM DATA

Cooling coil bypass factor = 0.050

Type of supplemental heating = 1 Not Used

PLANT DESCRIPTIONS

Plant : #309 CHILLER

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6100190202

Carrier Hourly Analysis Program

Page 1 of 1

1 PLANT NAME AND TYPES

Class = Individual Plants
 Name = #309 CHILLER
 Cooling Plant Type = Air Cooled Reciprocating
 Heating Plant Type = Combustion

2 AIR SYSTEM SELECTION

Air System Name	Mult	Air System Name	Mult
#309 OFFICES AHU	1	#309 LAB AREAS AHU	1
#309 SIMULATOR CHAMB AHU	1	#309 COMPUTER ROOM AHU	1

3a COOLING PLANT DATA (Air Cooled Reciprocating)

Estimated maximum cooling coil load = 145.66 Ton
 Is an electronic expansion valve used ? N
 Capacity at 95.0 F outdoor air = 140.00 Ton
 Input power rate at 95.0 F outdoor air = 0.900 kW/Ton
 Type of cooling = Hydronic
 Is chilled water reset used ? N
 Is hot gas bypass used ? Y
 Part load % for minimum unloading step = 20 %
 One compressor per condenser circuit ? Y
 Are compressors cycled ? N

3b HEATING PLANT DATA (Combustion)

Estimated maximum heating coil load = 1525.80 MBH
 Fuel type = Fuel Oil
 Rated plant output = 1525.8 MBH
 Type of heating = Hydronic
 Is plant efficiency computer generated ? N
 Seasonal plant efficiency = 64 %

4 PUMP SYSTEM DATA

Chilled water pumping system head = 65.00 ft wg
 Chilled water pumping system delta T = 8.00 F
 Hot water pumping system head = 0.00 ft wg
 Hot water pumping system delta T = 0.00 F

BUILDING DESCRIPTION

Building : BUILDING #309
 Prepared By: ENGG APPLICATIONS CONSUL
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02-07-91
 6100190202
 Page 1 of 1

1. BUILDING INPUTS

BUILDING NAME = BUILDING #309

MISCELLANEOUS ELECTRIC

Maximum power = 0.0 kW
 Power schedule = 1

DOMESTIC WATER HEATING

Is a domestic hot water system used ? Y
 Maximum hourly hot water use = 90.0 gal
 Hot water schedule = 6
 Average entering water temperature = 65.0 F
 Average hot water supply temperature = 140.0 F
 Heating plant type = 2 : Combustion
 Fuel type = 2 : Fuel Oil
 Plant capacity = 1444.5 MBH
 Is plant efficiency computer generated ? N
 Annual plant efficiency = 64 %

OTHER INPUTS

Additional building floor area = 2085.0 sqft
 Electrical generating efficiency = 100.00 %

2. PLANT SELECTION

Plant Name	Mult	Plant Name	Mult
#309 CHILLER	1		

3. FUEL & ELECTRIC RATE SELECTION

Fuel or Energy	No.	Name of Rate Schedule	Currency
Electric	10	ELECTRIC RATE (GENERIC)	MBTU
Natural Gas	6	NATURAL GAS (GENERIC)	MBTU
Fuel Oil	5	DOMESTIC FUEL OIL #2 (GENERIC)	MBTU
Propane	9	Empty...	MBTU
Remote Source Heating	7	HEAVY FUEL OIL #6 (GENERIC)	MBTU
Remote Source Cooling	9	Empty...	MBTU

MONTHLY ENERGY COSTS

Building : BUILDING #309
 Site : FORT BELVOIR, VIRGINIA
 Prepared By : ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

02-07-91
 6100190202

 TABLE 1. HVAC COSTS (MBTU)

Month	Electric	Natural Gas	Fuel Oil	Propane	Remote Heating	Remote Cooling
Jan	160	0	1,229	0	0	0
Feb	145	0	1,081	0	0	0
Mar	171	0	1,038	0	0	0
Apr	196	0	830	0	0	0
May	234	0	731	0	0	0
June	260	0	603	0	0	0
July	301	0	579	0	0	0
Aug	289	0	599	0	0	0
Sept	246	0	686	0	0	0
Oct	215	0	820	0	0	0
Nov	182	0	947	0	0	0
Dec	163	0	1,158	0	0	0
Tot.	2,562	0	10,301	0	0	0

 TABLE 2. NON-HVAC COSTS (MBTU)

Month	Electric	Natural Gas	Fuel Oil	Propane	Remote Heating
Jan	131	0	7	0	0
Feb	119	0	6	0	0
Mar	137	0	7	0	0
Apr	130	0	7	0	0
May	136	0	7	0	0
June	130	0	7	0	0
July	131	0	7	0	0
Aug	141	0	7	0	0
Sept	121	0	6	0	0
Oct	141	0	7	0	0
Nov	130	0	7	0	0
Dec	127	0	6	0	0
Tot.	1,576	0	81	0	0

FUEL OIL COSTS

Building : BUILDING #309

02-07-91

Site : FORT BELVOIR, VIRGINIA

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Carrier Hourly Analysis Program

Page 1 of 1

TABLE 1. MONTHLY COMPONENT CHARGES (MBTU)

Month	Energy Charges	Fixed Charges	Taxes	Total Charges
Jan	1,236	0	0	1,236
Feb	1,087	0	0	1,087
Mar	1,046	0	0	1,046
Apr	837	0	0	837
May	738	0	0	738
June	610	0	0	610
July	585	0	0	585
Aug	607	0	0	607
Sept	692	0	0	692
Oct	827	0	0	827
Nov	954	0	0	954
Dec	1,164	0	0	1,164
Tot.	10,382	0	0	10,382

TABLE 2. MONTHLY TOTALS

Month	Charges (MBTU)	Energy (Gallon)	Effective Rate (MBTU/Gallon)
Jan	1,236	8,908	0.13870
Feb	1,087	7,838	0.13870
Mar	1,046	7,538	0.13870
Apr	837	6,032	0.13870
May	738	5,319	0.13870
June	610	4,399	0.13870
July	585	4,221	0.13870
Aug	607	4,373	0.13870
Sept	692	4,990	0.13870
Oct	827	5,962	0.13870
Nov	954	6,878	0.13870
Dec	1,164	8,395	0.13870
Tot.	10,382	74,855	0.13870

THE SIMULATIONS ESTIMATED HEATING LOAD (1525.8 MBH) IS WORST CASE CONDITION AND PROBABLY OCCURES DURING JANUARY. THIS LOAD ONLY REPRESENTS THE SYSTEMS SIMULATED WHICH REQUIRE SUMMER STEAM,

SINCE THE NEW LOCAL BOILER WILL ONLY BE NEEDED FROM MID APRIL THRU MID OCTOBER WE WILL NOT NEED AS LARGE A BOILER LOAD AS INDICATED BY THE COMPUTER SIMULATION.

IF WE TAKE THE AVERAGE MBTU FOR DAYS IN APRIL (WORST CASE) AND ADD 20% AS A SAFETY FACTOR THE RESULTANT LOAD WILL BE SUFFICIENT TO SELECT A LOCAL STEAM BOILER TO ACCOMMODATE THE BUILDINGS STEAM REQUIREMENTS DURING THE SUMMER.

SUMMER STEAM

AVG. MBTU/DAY



APR	27.9 ←
MAY	23.8
JUNE	20.33
JULY	18.87
AUG.	19.58
SEPT.	23.06
OCT.	26.67

$$27.9/24 = 1.1625 \text{ MBTU} \times 1.2 =$$

1395 MBH MAX EST LOAD

SELECT: PEERLESS SERIES 7 FDA INDUSTRIAL/COMMERCIAL

CAST IRON BOILER/BURNER UNIT

MODEL 715 FDA SU, 56 BHP, 14" Ø VENT, 15 SECTIONS

OVERALL EFFICIENCY w/PIPING LOSSES & PICKUP = 64 %

INPUT @ 16.4 GPH #2 = 2274.7 MBH (CORRECTED)

CORRECTED NET OUTPUT = 1444.5 MBH

+ 81" L x 35" W x 60" H (2) 4" & (1) 3" SUP TAPS (2) 3" RET TAPS

MONTHLY MBTU EXPENDED FOR SUMMER REHEAT AND DOMESTIC HOT WATER GENERATION AS SIMULATED BY CARRIER E-20 COMPUTER PROGRAM.

APR.	837/2	=	418.5 MBTU	3016 GALS
MAY.		=	738	5319
JUNE		=	610	4399
JULY		=	585	4221
AUG.		=	607	4373
SEPT.		=	692	4990
OCT.	827/2	=	413.5	2981
			<u>4064 MBTU</u>	<u>29,299 GALS</u>

SELECT : 5000 GAL OIL STORAGE TANK
8'-8" x 13'-4"

COMPUTER SIMULATED MAX. EST. HTG. LOAD
 = 1525.8 MBH

JAN MBTU = 1236

APR MBTU = 837

$$837 / 1236 = .6771 \times 1525.8 = 1033.25 \text{ MBH}$$

JAN EXPENDED MBTU = $1236 / 31 = 39.87$ MBTU/DAY AVG
 $39.87 / 24 = 1.661$ MBTU/HR AVG

$$\frac{1661}{1525.8} = 1.088 \quad \text{AVG MBTU/HR IS 8.8\% ABOVE SIMULATED MAX LOAD?}$$

USE 1395 MBH AS MAX GROSS BLDG & SYS. LOAD FOR A NEW PLANT ECO.

CONSTRUCTION COST ESTIMATE

DATE PREPARED
FEB 1991

SHEET OF

PROJECT
ENERGY SAVINGS OPPORTUNITY SURVEY

LOCATION
FT. BELVOIR, VIRGINIA BLDG 309

ARCHITECT ENGINEER
ENGINEERING APPLICATIONS CONSULTANTS

- BASIS FOR ESTIMATE
- CODE A (No design completed)
 - CODE B (Preliminary design)
 - CODE C (Final design)
 - OTHER (Specify) _____

DRAWING NO.
OIL FIRED LP STEAM BOILER

ESTIMATOR
REF

CHECKED BY
VP

SUMMARY	QUANTITY		LABOR		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	PER UNIT	TOTAL	
BOILER HOUSE ADDITION	144	SF	23.	3312	14.	5328	8640
PREPARE SITE		LS		2000		700	2700
OIL FIRED LP STEAM BOILER	1	EA		2700		11,350	14050
5000 GAL OIL STOR. EQUIP.		LS		8766		15,713	24,479
MISC HOOK-UP COSTS		LS		253		314	567
VENT CHIMNEY 14"φ	EA	LF	8.35	251	75.60	2268	2519
FITTINGS, FLASHING, TOP, ETC		LS		126		2087	2213
AUTO DRAFT REGULATOR	1	EA		20		232	252
STEAM PIPING, FITTINGS, VALVES, ETC.		LS		2776		1321	4097
CONDENSATE PIPING, TRAPS ETC		LS		649		898	1547
RETURN FEEDWATER SYSTEM		LS		880		574	1454
ELECTRICAL LIGHTING & POWER	144	SF	3.70	535	5.50	792	1327
SUB-TOTAL				22,268		41,577	63,845
LABOR MARKUP 21%				4,676		-	4,676
TAXES 4.5%				-		1,871	1,871
SUB-TOTAL				26,944		43,448	70,392
OVERHEAD 10%				2,694		4,345	7,039
SUB-TOTAL				29,638		47,793	77,431
PROFIT 10%				2,964		4,779	7,743
SUB-TOTAL				32,602		52,572	85,174
TOTAL						SAY	85,175

OIL STORAGE

REQD.

GAL. UNDERGROUND, DOUBLE WALL, STEEL
UL LISTED, W/STI-P3 CORROSION PROTECTION
& 30 YR WARRANTY

	L	M	T	
182 5000 GAL TANK	755	8000	8755	8' x 13'-4" L
HOLD DNS.	63	450	513	
1/2 PIPING (25')	4.68	2.11 .50	7.29	
INCREASED PIPING (140')	7.90	12.25 .85	21.00	
158 FOOT VALVE	15.25	52.50	67.75	
PUMP (2)	59	395	454	
TANK GAGE SYS	79.	715.	794.	
VALVES (4)	8.25	7.75	16.	
SHUT OFFS (1)	19.80	11.75	31.55	
PAD CY (10)	25.	94.	119	
EXCAVATION CY (135)	46.	-		
MANWAY	-	400	400	
(5Y) DEMO PAV (10)	-	9.27	93.	
	<u>8,766</u>	<u>13,383</u>	<u>22,149</u>	

LEAK DETECTION SYSTEM

CONTROL MASTER W/ALARM	725
PROBES 4" WELL	760
TANK WALL	650
CABLE & TRENCH	195
	<u>M</u>

OPTIONAL LEAK DETECTION = 2330

8766 15,713 = 24,479

ALL FUEL CHIMNEY, UL LISTED, DOUBLE WALL, 304 INNER - STL OUTER

	L	M	T
(30') STR 14" ϕ	8.35	75.6	83.95
(2) 45° ELL	16.70	250	266.70
90° TEE	19.50	285	304.50
PLT. SUPPORT	21.	152	173.
ROOF THIMBLE	21.	345	366.
ROOF SUP. ASSEM.	22.	480	502.
STACK CAP	9.50	325	334.50
	<u>377.</u>	<u>4355.</u>	<u>4732.</u>

OIL HOOK-UP

	L	M	T
✓ FILTER	9.90	9.95	19.95
VALVE	8.25	4.25	12.50
✓ VALVE	16.50	8.60	25.00
✓ 2" VENT CAP	6.20	7.50	13.70
✓ TUBE (12')	2.53	1.28	3.81
✓ 2" STL V.P. (20')	6.25	4.08 .67	11.00
✓ LOUVERS (2)	7.20	24.	31.20
✓ DAMPERS (2)	17.70	58.30	76.
✓ FILL CAP	6.70	7.50	13.70
	<u>253</u>	<u>314</u>	<u>567</u>

$2,274,700 / 4000 = 568 \times 1.5 = 851 / 144 = 5.9 \#$

STEAM VALVES, PIPING, FITTINGS, VALVES ETC.

		L	M	T
132	(2) 4" STM. VALVES OS&V	120	215	335
	BOILER DRAIN	5.80	11.90	17.70
87	4" PIPING (35')	9.60	6.77	10.03
	3" PIPING (10')	8.25	4.69	6.89
	PIPING ()			
110	4" WN/FLANGE (8)	36.	14.80	3.82
105	4" 90° ELL (8)	71	14.90	7.65
	4" TEE (2)	120	27.	12.75
	3" WN/F (1)	25	14.10	2.73
	3" 90° EL (2)	51	9.	5.45
		<u>1888</u>	<u>1226</u>	<u>3114.</u>
	4" WELDING JOINTS (18)	36	8.82	39.82
	3" " " (8.)	<u>30</u>	<u>3.18</u>	<u>33.18</u>
		2776	1321	4097

CONDENSATE PIPING, TRAPS

		L	M	T
	PIPING ()			
203	TRAP ASSEMBLY (-)			
	WELDING LABOR 8	22	2.39	24.39
		<u>473</u>	<u>879</u>	<u>1352</u>
		649	898	1547

RETURN FEEDWATER

		L	M	T
	PIPING (50')			
	VALVE			
	MISC FITTINGS			
		358	280	638
	WELDING LABOR (10)	22	2.39	24.39
		<u>580</u>	<u>304</u>	<u>884</u>
	CONTROL CHANGE	<u>300</u>	<u>270</u>	<u>570</u>
		880	574	1454

309.39

BUILDING 317

DESIGN PARAMETERS, SHGs

Location : FT. BELVOIR, VIRGINIA

10-17-90

Prepared By : ENGG APPLICATIONS CONSUL

6022890201

Carrier Hourly Analysis Program

Page 1 of 1

DESIGN WEATHER PARAMETERS

City Name.....: FT. BELVOIR
 Location.....: VIRGINIA
 Latitude.....: 38.4 deg
 Elevation.....: 69.0 ft
 Summer Design Dry Bulb Temp.....: 90.0 F
 Summer Design Wet Bulb Temp.....: 75.0 F
 Daily Temperature Range.....: 23.0 F
 Winter Design Dry Bulb Temp.....: 12.0 F
 Atmospheric Clearness Number.....: 1.00

TABLE 1. MAXIMUM SOLAR HEAT GAINS - AVERAGE DAYS
 (BTU/hr/sqft)

Month	NE	E	SE	S	SW	W	NW	N	Hor
Jan	24.2	61.1	97.3	110.1	97.3	61.1	24.2	24.2	80.0
Feb	31.8	74.8	105.7	113.8	105.7	74.8	31.8	31.8	107.2
Mar	40.8	87.0	106.9	108.0	106.9	87.0	40.8	40.8	136.8
Apr	60.0	97.4	104.4	97.2	104.4	97.4	60.0	49.3	164.3
May	74.9	103.0	98.4	84.0	98.4	103.0	74.9	54.9	181.8
Jun	85.1	109.3	97.5	79.2	97.5	109.3	85.1	57.9	195.2
Jul	80.6	106.7	98.1	81.4	98.1	106.7	80.6	56.4	189.3
Aug	69.1	104.1	105.7	94.4	105.7	104.1	69.1	52.2	177.6
Sep	52.3	99.3	114.8	111.6	114.8	99.3	52.3	45.4	158.1
Oct	36.4	88.3	117.7	122.9	117.7	88.3	36.4	36.4	128.2
Nov	26.7	66.5	101.8	113.3	101.8	66.5	26.7	26.7	89.4
Dec	21.4	53.0	87.6	100.9	87.6	53.0	21.4	21.4	68.4

TABLE 2. MAXIMUM SOLAR HEAT GAINS - DESIGN DAYS
 (BTU/hr/sqft)

Month	NE	E	SE	S	SW	W	NW	N	Hor
Jan	20.4	158.9	243.9	253.8	243.9	158.9	20.4	20.4	142.0
Feb	53.0	189.1	246.5	237.5	246.5	189.1	53.0	24.7	187.7
Mar	95.9	219.8	234.5	200.7	234.5	219.8	95.9	29.4	229.0
Apr	141.6	224.4	200.1	146.7	200.1	224.4	141.6	34.1	256.0
May	166.1	220.1	170.7	104.6	170.7	220.1	166.1	37.4	268.0
Jun	173.2	215.4	156.7	87.8	156.7	215.4	173.2	47.4	269.7
Jul	163.7	215.7	166.5	101.4	166.5	215.7	163.7	38.3	264.7
Aug	136.4	216.6	193.1	141.7	193.1	216.6	136.4	35.8	251.3
Sep	90.3	207.2	224.7	194.9	224.7	207.2	90.3	30.6	221.4
Oct	52.0	182.7	238.2	230.6	238.2	182.7	52.0	25.5	184.4
Nov	20.7	156.1	239.8	249.9	239.8	156.1	20.7	20.7	141.3
Dec	18.5	141.9	236.4	254.2	236.4	141.9	18.5	18.5	122.2

MASTER SCHEDULE SUMMARY

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12-14-90

Carrier Hourly Analysis Program

6100190202

MASTER SCHEDULE 1. OCCUPANCY Hourly Percentages

Hour ---->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	0	0	0	0	0	0	10	50	100	100	100	100
Saturday	0	0	0	0	0	0	5	5	5	10	10	10
Sunday	0	0	0	0	0	0	0	5	5	5	5	5
DESIGN	0	0	0	0	0	10	20	100	100	100	100	100

Hour ---->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	80	100	100	100	80	50	10	10	5	5	0	0
Saturday	10	10	10	5	5	5	5	5	0	0	0	0
Sunday	5	5	5	5	5	5	0	0	0	0	0	0
DESIGN	100	100	100	100	100	100	100	20	10	0	0	0

MASTER SCHEDULE 2. LIGHTING Hourly Percentages

Hour ---->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	5	5	5	5	5	5	20	80	100	100	100	100
Saturday	5	5	5	5	5	5	15	15	20	40	50	50
Sunday	5	5	5	5	5	5	5	15	20	30	30	30
DESIGN	10	10	10	10	10	20	50	100	100	100	100	100

Hour ---->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	100	100	100	100	90	70	40	30	20	20	5	5
Saturday	50	50	50	50	50	40	30	20	5	5	5	5
Sunday	30	30	30	20	20	20	20	5	5	5	5	5
DESIGN	100	100	100	100	100	100	100	50	20	10	10	10

MASTER SCHEDULE 3. EQUIPMENT Hourly Percentages

Hour ---->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	5	5	5	5	5	5	20	50	100	100	100	100
Saturday	5	5	5	5	5	5	10	10	15	20	20	20
Sunday	5	5	5	5	5	5	5	10	10	10	10	20
DESIGN	10	10	10	10	10	20	40	100	100	100	100	100

Hour ---->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	100	100	100	100	80	50	20	10	5	5	5	5
Saturday	20	20	20	10	10	10	10	10	5	5	5	5
Sunday	20	15	15	10	10	10	10	5	5	5	5	5
DESIGN	100	100	100	100	100	100	100	40	20	10	10	10

MASTER SCHEDULE SUMMARY

Prepared By : ENGG APPLICATIONS CONSUL

12-14-90

Carrier Hourly Analysis Program

6100190202

MASTER SCHEDULE 4. DOMESTIC HOT WATER Hourly Percentages

Hour ----->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	0	0	0	0	0	5	10	10	20	20	20	80
Saturday	0	0	0	0	0	2	2	2	5	5	5	5
Sunday	0	0	0	0	0	0	0	2	2	2	2	2
DESIGN	0	0	0	0	0	5	5	20	20	20	20	80

Hour ----->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	80	20	20	20	10	10	5	5	5	2	0	0
Saturday	5	5	5	2	2	2	2	2	0	0	0	0
Sunday	2	2	2	2	2	2	0	0	0	0	0	0
DESIGN	80	20	20	20	10	10	5	5	5	2	0	0

DAY TYPE DATA

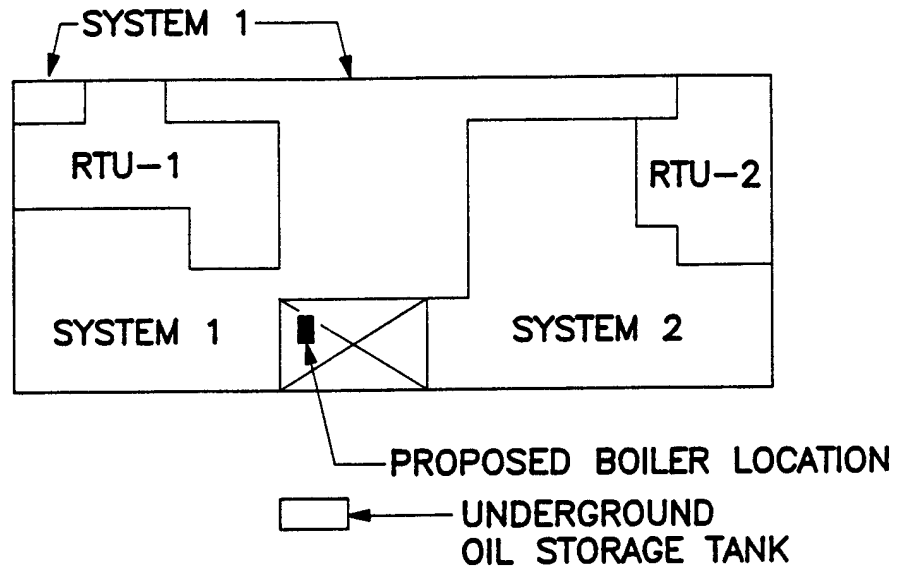
Prepared By : ENGG APPLICATIONS CONSUL

10-01-90

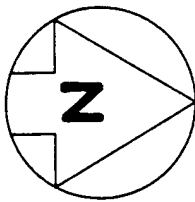
Carrier Hourly Analysis Program

6022890201

Month	DAY TYPE 1 Weekday	DAY TYPE 2 Saturday	DAY TYPE 3 Sunday	Total Days/Month
January	21	4	6	31
February	19	4	5	28
March	22	5	4	31
April	21	4	5	30
May	22	4	5	31
June	21	5	4	30
July	21	4	6	31
August	23	4	4	31
September	19	5	6	30
October	23	4	4	31
November	21	4	5	30
December	20	5	6	31



FLOOR PLAN



BUILDING 317 KEY PLAN

ENGINEERING ANALYSIS

Sheet _____ of _____

By: REF

Calculations for Infiltration

Building 317

Project: ESOS, Fort BELVOIR Date: SEPT 1990

Contract No: DACA-31-89-C=0189 EAC Project No.: 89034.0

Calculations based on ASHRAE 1989 Page F 2.3.14.

Building Leakage Area

	Effective Leakage Area, in ²	Building Component Parameter	Building Leakage Area D _L , in ²
	L _i	D _i	L
Sill foundation	0.19/ft. of perimeter	567 ft.	107.8
Joints, ceiling/wall	0.12/ft. of wall	567 ft.	68.1
Windows	0.063/ft ² . of window	53 ft ² .	3.4
Doors	0.215/ft ² . of doors	105 ft ² .	22.6
Wall - Window frames	0.15/ft ² . of window	53 ft ² .	8.0
- Door frames	0.072/ft ² . of door	105 ft ² .	7.6
Elec. outlet/switch	0.16/fixture	110 ft.	17.6
Recessed lights	1.6/fixture	222 ft.	355.2
Pipe penetration	1.55/in ² . of pipe	4 ft.	892.8
Exhaust fans	6.0/fan	25 ft.	150.0
Duct penetration	2.2/SF	44SF	96.8
FCU openings	60 x 1/3(SF/unit) x 2.2/SF	—	—
			<u>1729.9</u> in ² .

Infiltration Q(cfm) = L x (A Δt + Bv²)^{1/2}

(ASHRAE 1989, P. 23.17, EQ.33)

Winter

Summer

Q(cfm) =
= L(0.01313 x 51 + 0.0157 x 14²)^{1/2}
= L x 2.2
= 1730 x 2.2 = 3806 CFM

= L(0.0313 x 15 + 0.0157 x 10²)^{1/2}
= L x 1.45
= 1730 x 1.45 = 2509 CFM

Rate = $\frac{3806}{16,420} = 0.23$ CFM/SF

Rate = $\frac{2509}{16,420} = 0.15$ CFM/SF

SIMPLE SPACE DESCRIPTION

Space Name : RTU-1 HC-11 L 10-01-90
 Prepared By : ENGG APPLICATIONS CONSUL 6022890201
 Carrier Hourly Analysis Program Page 1 of 1

	Walls	Roof	Glass		
U-Value :	0.063	0.090	1.060	Building Weight :	M
Weight :	H	L		Glass Factor :	1.00
Color :	D	D		Internal Shades :	? N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 2
 Lights : W/sqft = 2.08 Schedule = 4 Wattage Mult. = 1.20
 : Fixture Type = 1 Recessed, not vented

 SPACE NAME = RTU-1 HC-11 L

		Floor Area :	231.0 sqft
Exposure :	W	E Roof Area :	231.0 sqft
Wall Area :	120.0	0.0 Current	
Glass Area :	0.0	0.0 Elements :	Wl,El,In,Gr

ADDITIONAL ELEMENT - Wall

Weight =	H (lb/sqft)	Exposure =	W
Color =	D	Net Area =	180.0 sqft
U-Value =	0.059 BTU/hr/sqft/F		

ADDITIONAL ELEMENT - Other Electric

W/sqft =	4.40
Total Watts =	1,016
Schedule No. =	3

ADDITIONAL ELEMENT - Infiltration

Cooling :	0.15 CFM/sqft =	35 CFM
Heating :	0.23 CFM/sqft =	53 CFM
Typical :	0.19 CFM/sqft =	44 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area =	231.0 sqft
Perimeter =	21.0 ft
Depth =	1.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : RTU-1 HC-3 B 10-01-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.059 Roof 0.090 Glass 1.060 Building Weight : M
Weight : H L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 2
Lights : W/sqft = 3.27 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = RTU-1 HC-3 B

Floor Area : 440.0 sqft
Exposure : S E Roof Area : 440.0 sqft
Wall Area : 330.0 0.0 Current
Glass Area : 0.0 0.0 Elements : El,In,Gr

ADDITIONAL ELEMENT - Other Electric

W/sqft = 5.00
Total Watts = 2,200
Schedule No. = 3

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.15 CFM/sqft = 66 CFM
Heating : 0.23 CFM/sqft = 101 CFM
Typical : 0.19 CFM/sqft = 84 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 440.0 sqft
Perimeter = 22.0 ft
Depth = 1.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : RTU-1 HC-5 D 10-01-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

Walls Roof Glass
U-Value : 0.059 0.090 1.060 Building Weight : M
Weight : H L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 460.0 Schedule = 1 Activity Level = 2
Lights : W/sqft = 3.13 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = RTU-1 HC-5 D

Floor Area : 460.0 sqft
Exposure : S E Roof Area : 460.0 sqft
Wall Area : 0.0 0.0 Current
Glass Area : 0.0 0.0 Elements : El,In,Gr

ADDITIONAL ELEMENT - Other Electric

W/sqft = 3.50
Total Watts = 1,610
Schedule No. = 3

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.15 CFM/sqft = 69 CFM
Heating : 0.23 CFM/sqft = 106 CFM
Typical : 0.19 CFM/sqft = 87 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 460.0 sqft
Perimeter = 0.0 ft
Depth = 1.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : RTU-1 HC-9 H

10-01-90

Prepared By : ENGG APPLICATIONS CONSUL

6022890201

Carrier Hourly Analysis Program

Page 1 of 1

	Walls	Roof	Glass		
U-Value :	0.059	0.090	1.060	Building Weight :	M
Weight :	H	L		Glass Factor :	1.00
Color :	D	D		Internal Shades ?	N

People : sqft/person = 460.0 Schedule = 1 Activity Level = 2
 Lights : W/sqft = 3.13 Schedule = 2 Wattage Mult. = 1.20
 : Fixture Type = 1 Recessed, not vented

SPACE NAME = RTU-1 HC-9 H

			Floor Area :	312.0 sqft
Exposure :	S	E	Roof Area :	312.0 sqft
Wall Area :	0.0	0.0	Current	
Glass Area :	0.0	0.0	Elements :	El, In, Gr

ADDITIONAL ELEMENT - Other Electric

 W/sqft = 5.32
 Total Watts = 1,660
 Schedule No. = 3

ADDITIONAL ELEMENT - Infiltration

 Cooling : 0.15 CFM/sqft = 47 CFM
 Heating : 0.23 CFM/sqft = 72 CFM
 Typical : 0.19 CFM/sqft = 59 CFM

ADDITIONAL ELEMENT - Ground

 Slab Floor Area = 312.0 sqft
 Perimeter = 0.0 ft
 Depth = 1.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : RTU-1 HC-8 G 10-01-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

Walls Roof Glass
U-Value : 0.059 0.090 1.060 Building Weight : M
Weight : H L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 460.0 Schedule = 1 Activity Level = 2
Lights : W/sqft = 3.13 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = RTU-1 HC-8 G

Floor Area : 216.0 sqft
Exposure : S E Roof Area : 216.0 sqft
Wall Area : 0.0 0.0 Current
Glass Area : 0.0 0.0 Elements : El,In,Gr

ADDITIONAL ELEMENT - Other Electric

W/sqft = 6.30
Total Watts = 1,361
Schedule No. = 3

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.15 CFM/sqft = 32 CFM
Heating : 0.23 CFM/sqft = 50 CFM
Typical : 0.19 CFM/sqft = 41 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 216.0 sqft
Perimeter = 0.0 ft
Depth = 1.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : RTU-1 HC-7 F 10-01-90
 Prepared By : ENGG APPLICATIONS CONSUL 6022890201
 Carrier Hourly Analysis Program Page 1 of 1

 Walls Roof Glass
 U-Value : 0.059 0.090 1.060 Building Weight : M
 Weight : H L Glass Factor : 1.00
 Color : D D Internal Shades ? N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 2
 Lights : W/sqft = 2.50 Schedule = 2 Wattage Mult. = 1.20
 : Fixture Type = 1 Recessed, not vented

 SPACE NAME = RTU-1 HC-7 F

Floor Area : 384.0 sqft
 Exposure : S E Roof Area : 384.0 sqft
 Wall Area : 0.0 0.0 Current
 Glass Area : 0.0 0.0 Elements : El,In,Gr

 ADDITIONAL ELEMENT - Other Electric

 W/sqft = 4.40
 Total Watts = 1,690
 Schedule No. = 3

 ADDITIONAL ELEMENT - Infiltration

 Cooling : 0.15 CFM/sqft = 58 CFM
 Heating : 0.23 CFM/sqft = 88 CFM
 Typical : 0.19 CFM/sqft = 73 CFM

 ADDITIONAL ELEMENT - Ground

 Slab Floor Area = 384.0 sqft
 Perimeter = 0.0 ft
 Depth = 1.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : RTU-2 HC-12 M NWCORNER
Prepared By : ENGG APPLICATIONS CONSUL
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10-01-90
6022890201
Page 1 of 1

	Walls	Roof	Glass		
U-Value :	0.059	0.090	1.060	Building Weight	: M
Weight :	H	L		Glass Factor	: 1.00
Color :	D	D		Internal Shades	? N

People : sqft/person = 150.0 Schedule = 1 Activity Level = 2
 Lights : W/sqft = 2.13 Schedule = 2 Wattage Mult. = 1.20
 : Fixture Type = 1 Recessed, not vented

SPACE NAME = RTU-2 HC-12 M NWCORNER

			Floor Area	:	300.0 sqft	
Exposure	:	W	N	Roof Area	:	300.0 sqft
Wall Area	:	375.0	180.0	Current		
Glass Area	:	0.0	0.0	Elements	:	E1, In, Gr

ADDITIONAL ELEMENT - Other Electric

W/sqft	=	3.50
Total Watts	=	1,050
Schedule No.	=	3

ADDITIONAL ELEMENT - Infiltration

Cooling	:	0.15 CFM/sqft	=	45 CFM
Heating	:	0.23 CFM/sqft	=	69 CFM
Typical	:	0.19 CFM/sqft	=	57 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area	=	300.0 sqft
Perimeter	=	37.0 ft
Depth	=	1.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : RTU-2 HC-13 N 10-01-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.059 Roof 0.090 Glass 1.060 Building Weight : M
Weight : H L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 2
Lights : W/sqft = 1.60 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = RTU-2 HC-13 N

Exposure : W N Floor Area : 798.0 sqft
Wall Area : 0.0 570.0 Roof Area : 798.0 sqft
Glass Area : 0.0 0.0 Current
Elements : El,In,Gr

ADDITIONAL ELEMENT - Other Electric

W/sqft = 4.40
Total Watts = 3,510
Schedule No. = 3

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.15 CFM/sqft = 120 CFM
Heating : 0.23 CFM/sqft = 184 CFM
Typical : 0.19 CFM/sqft = 152 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 798.0 sqft
Perimeter = 38.0 ft
Depth = 1.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : RTU-2 HC-15 P 10-01-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.059 Roof 0.090 Glass 1.060 Building Weight : M
Weight : H L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 2
Lights : W/sqft = 3.10 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = RTU-2 HC-15 P

Exposure : W N Floor Area : 415.0 sqft
Wall Area : 0.0 0.0 Roof Area : 415.0 sqft
Glass Area : 0.0 0.0 Current
Glass Area : 0.0 0.0 Elements : El, In, Gr

ADDITIONAL ELEMENT - Other Electric

W/sqft = 5.00
Total Watts = 2,075
Schedule No. = 3

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.15 CFM/sqft = 62 CFM
Heating : 0.23 CFM/sqft = 95 CFM
Typical : 0.19 CFM/sqft = 79 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 415.0 sqft
Perimeter = 0.0 ft
Depth = 1.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : SYS #1 25 SE CORNER 10-01-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.059 Roof 0.090 Glass 1.060 Building Weight : M
Weight : H L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 200.0 Schedule = 1 Activity Level = 2
Lights : W/sqft = 4.00 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = SYS #1 25 SE CORNER

Floor Area : 210.0 sqft
Exposure : S E Roof Area : 210.0 sqft
Wall Area : 285.0 165.0 Current
Glass Area : 0.0 0.0 Elements : El, In, Gr

ADDITIONAL ELEMENT - Other Electric

W/sqft = 11.86
Total Watts = 2,490
Schedule No. = 3

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.15 CFM/sqft = 32 CFM
Heating : 0.23 CFM/sqft = 48 CFM
Typical : 0.19 CFM/sqft = 40 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 210.0 sqft
Perimeter = 30.0 ft
Depth = 1.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : SYS #1 ENTRY AREA 10-01-90
 Prepared By : ENGG APPLICATIONS CONSUL 6022890201
 Carrier Hourly Analysis Program Page 1 of 1

 Walls Roof Glass
 U-Value : 0.059 0.090 1.060 Building Weight : M
 Weight : H L Glass Factor : 1.00
 Color : D D Internal Shades ? N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 2
 Lights : W/sqft = 0.59 Schedule = 2 Wattage Mult. = 1.20
 : Fixture Type = 1 Recessed, not vented

 SPACE NAME = SYS #1 ENTRY AREA

Floor Area : 272.0 sqft
 Exposure : S E Roof Area : 272.0 sqft
 Wall Area : 183.0 0.0 Current
 Glass Area : 0.0 0.0 Elements : Wl,In,Gr

ADDITIONAL ELEMENT - Wall

 Weight = L (lb/sqft) Exposure = S
 Color = D Net Area = 38.0 sqft
 U-Value = 0.590 BTU/hr/sqft/F

 ADDITIONAL ELEMENT - Infiltration

 Cooling : 0.15 CFM/sqft = 41 CFM
 Heating : 0.23 CFM/sqft = 63 CFM
 Typical : 0.19 CFM/sqft = 52 CFM

 ADDITIONAL ELEMENT - Ground

 Slab Floor Area = 272.0 sqft
 Perimeter = 15.0 ft
 Depth = 1.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : SYS #1 23,21A,B,19A,17,C
Prepared By : ENGG APPLICATIONS CONSUL
Carrier Hourly Analysis Program

10-01-90
6022890201
Page 1 of 1

```

*****
Walls      Roof      Glass
U-Value : 0.059  0.090  1.060  Building Weight : M
Weight : H      L      Glass Factor : 1.00
Color : D      D      Internal Shades ? N

```

```

People : sqft/person = 245.0  Schedule = 1  Activity Level = 2
Lights : W/sqft      = 4.25   Schedule = 2  Wattage Mult. = 1.20
       : Fixture Type = 1 Recessed, not vented

```

SPACE NAME = SYS #1 23,21A,B,19A,17,C

```

Exposure : S      E  Floor Area : 980.0 sqft
Wall Area : 0.0   150.0  Roof Area : 980.0 sqft
Glass Area : 0.0   0.0   Current Elements : El,In,Gr

```

ADDITIONAL ELEMENT - Other Electric

```

-----
W/sqft      = 4.11
Total Watts = 4,030
Schedule No. = 3

```

ADDITIONAL ELEMENT - Infiltration

```

-----
Cooling : 0.15 CFM/sqft = 147 CFM
Heating : 0.23 CFM/sqft = 225 CFM
Typical : 0.19 CFM/sqft = 186 CFM

```

ADDITIONAL ELEMENT - Ground

```

-----
Slab Floor Area = 980.0 sqft
Perimeter      = 60.0 ft
Depth          = 1.0 ft

```

SIMPLE SPACE DESCRIPTION

Space Name : SYS #1 SW CORNER 10-01-90
 Prepared By : ENGG APPLICATIONS CONSUL 6022890201
 Carrier Hourly Analysis Program Page 1 of 1

 Walls Roof Glass
 U-Value : 0.059 0.090 1.060 Building Weight : M
 Weight : H L Glass Factor : 1.00
 Color : D D Internal Shades ? N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 2
 Lights : W/sqft = 2.67 Schedule = 2 Wattage Mult. = 1.20
 : Fixture Type = 1 Recessed, not vented

 SPACE NAME = SYS #1 SW CORNER

Floor Area : 240.0 sqft
 Exposure : W S Roof Area : 240.0 sqft
 Wall Area : 300.0 180.0 Current
 Glass Area : 0.0 0.0 Elements : El, In, Gr

 ADDITIONAL ELEMENT - Other Electric

 W/sqft = 4.40
 Total Watts = 1,056
 Schedule No. = 3

 ADDITIONAL ELEMENT - Infiltration

 Cooling : 0.15 CFM/sqft = 36 CFM
 Heating : 0.23 CFM/sqft = 55 CFM
 Typical : 0.19 CFM/sqft = 46 CFM

 ADDITIONAL ELEMENT - Ground

 Slab Floor Area = 240.0 sqft
 Perimeter = 32.0 ft
 Depth = 1.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : SYS #1 TUNNEL 10-01-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.059 Roof 0.090 Glass 1.060 Building Weight : M
Weight : H L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 2
Lights : W/sqft = 1.40 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = SYS #1 TUNNEL

Exposure : W S Floor Area : 1,608.0 sqft
Wall Area : 720.0 0.0 Roof Area : 1,608.0 sqft
Glass Area : 2.0 0.0 Current
Glass Area : 2.0 0.0 Elements : El,Wl,In,Gr,Wl

ADDITIONAL ELEMENT - Other Electric

W/sqft = 4.40
Total Watts = 7,075
Schedule No. = 3

ADDITIONAL ELEMENT - Wall

Weight = M (lb/sqft) Exposure = W
Color = D Net Area = 1,290.0 sqft
U-Value = 0.630 BTU/hr/sqft/F

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.15 CFM/sqft = 241 CFM
Heating : 0.23 CFM/sqft = 370 CFM
Typical : 0.19 CFM/sqft = 306 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 1,608.0 sqft
Perimeter = 134.0 ft
Depth = 1.0 ft

ADDITIONAL ELEMENT - Wall

Weight = L (lb/sqft) Exposure = W
Color = D Net Area = 40.0 sqft
U-Value = 0.590 BTU/hr/sqft/F

SIMPLE SPACE DESCRIPTION

Space Name : SYS #1 21,19,CORRIDOR
Prepared By : ENGG APPLICATIONS CONSUL
Carrier Hourly Analysis Program

10-01-90
6022890201
Page 1 of 1

	Walls	Roof	Glass		
U-Value :	0.059	0.090	1.060	Building Weight	: M
Weight :	H	L		Glass Factor	: 1.00
Color :	D	D		Internal Shades	? N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 2
 Lights : W/sqft = 1.72 Schedule = 2 Wattage Mult. = 1.20
 : Fixture Type = 1 Recessed, not vented

SPACE NAME = SYS #1 21,19,CORRIDOR

			Floor Area	:	700.0 sqft
Exposure	:	W	S	Roof Area	: 700.0 sqft
Wall Area	:	0.0	0.0	Current	
Glass Area	:	0.0	0.0	Elements	: El,In,Gr

ADDITIONAL ELEMENT - Other Electric

W/sqft	=	3.73
Total Watts	=	2,610
Schedule No.	=	3

ADDITIONAL ELEMENT - Infiltration

Cooling	:	0.15 CFM/sqft	=	105 CFM
Heating	:	0.23 CFM/sqft	=	161 CFM
Typical	:	0.19 CFM/sqft	=	133 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area	=	700.0 sqft
Perimeter	=	0.0 ft
Depth	=	1.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : SYS #1 CLEAN AREA W/COR 10-01-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.059 Roof 0.090 Glass 1.060 Building Weight : M
Weight : H L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 2
Lights : W/sqft = 2.06 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = SYS #1 CLEAN AREA W/COR

Exposure : W S Floor Area : 2,244.0 sqft
Wall Area : 0.0 0.0 Roof Area : 2,244.0 sqft
Glass Area : 0.0 0.0 Current Elements : El,In,Gr

ADDITIONAL ELEMENT - Other Electric

W/sqft = 4.40
Total Watts = 9,874
Schedule No. = 3

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.15 CFM/sqft = 337 CFM
Heating : 0.23 CFM/sqft = 516 CFM
Typical : 0.19 CFM/sqft = 426 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 2,244.0 sqft
Perimeter = 0.0 ft
Depth = 1.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : SYS #2 11,9,7A,5,VAULT 10-01-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.059 Roof 0.090 Glass 1.060 Building Weight : M
Weight : H L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 182.7 Schedule = 1 Activity Level = 2
Lights : W/sqft = 3.50 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = SYS #2 11,9,7A,5,VAULT

Exposure : E S Floor Area : 1,279.0 sqft
Wall Area : 315.0 0.0 Roof Area : 1,279.0 sqft
Glass Area : 17.5 0.0 Current
Elements : El,Wl,In,Gr

ADDITIONAL ELEMENT - Other Electric

W/sqft = 2.97
Total Watts = 3,800
Schedule No. = 3

ADDITIONAL ELEMENT - Wall

Weight = M (lb/sqft) Exposure = E
Color = D Net Area = 658.0 sqft
U-Value = 0.063 BTU/hr/sqft/F

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.15 CFM/sqft = 192 CFM
Heating : 0.23 CFM/sqft = 294 CFM
Typical : 0.19 CFM/sqft = 243 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 1,279.0 sqft
Perimeter = 0.0 ft
Depth = 1.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : SYS #2 7,8,8A,10,12,O,C 10-01-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.059 Roof 0.090 Glass 1.060 Building Weight : M
Weight : H L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 1245.0 Schedule = 1 Activity Level = 2
Lights : W/sqft = 0.88 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = SYS #2 7,8,8A,10,12,O,C

Floor Area : 6,225.0 sqft
Exposure : E S Roof Area : 6,225.0 sqft
Wall Area : 0.0 0.0 Current
Glass Area : 0.0 0.0 Elements : El,In,Gr

ADDITIONAL ELEMENT - Other Electric

W/sqft = 0.90
Total Watts = 5,630
Schedule No. = 3

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.15 CFM/sqft = 934 CFM
Heating : 0.23 CFM/sqft = 1,432 CFM
Typical : 0.19 CFM/sqft = 1,183 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 6,225.0 sqft
Perimeter = 0.0 ft
Depth = 1.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : SYS #2 1,EXIT,NW CORNER 10-01-90
 Prepared By : ENGG APPLICATIONS CONSUL 6022890201
 Carrier Hourly Analysis Program Page 1 of 1

	Walls	Roof	Glass		
U-Value :	0.063	0.090	1.060	Building Weight :	M
Weight :	H	L		Glass Factor :	1.00
Color :	D	D		Internal Shades ?	N

People : sqft/person = 327.0 Schedule = 1 Activity Level = 2
 Lights : W/sqft = 1.71 Schedule = 2 Wattage Mult. = 1.20
 : Fixture Type = 1 Recessed, not vented

 SPACE NAME = SYS #2 1,EXIT,NW CORNER

	Floor Area :	435.0 sqft			
Exposure :	E	N	Roof Area :	655.0 sqft	
Wall Area :	340.0	444.0	Current		
Glass Area :	35.0	4.0	Elements :	El,Wl,In,Gr,Pt	

 ADDITIONAL ELEMENT - Other Electric

 W/sqft = 3.82
 Total Watts = 1,660
 Schedule No. = 3

 ADDITIONAL ELEMENT - Wall

Weight =	L (lb/sqft)	Exposure =	N		
Color =	D	Net Area =	17.0 sqft		
U-Value =	0.590 BTU/hr/sqft/F				

 ADDITIONAL ELEMENT - Infiltration

Cooling :	0.15 CFM/sqft =	65 CFM			
Heating :	0.23 CFM/sqft =	100 CFM			
Typical :	0.19 CFM/sqft =	83 CFM			

 ADDITIONAL ELEMENT - Ground

Slab Floor Area =	435.0 sqft				
Perimeter =	56.0 ft				
Depth =	1.0 ft				

 ADDITIONAL ELEMENT - Partition

Area =	220.0 sqft	Uncond. Space Temp:Cooling =	95.0 F		
U-Value =	0.440 BTU/hr/sqft/F	Uncond. Space Temp:Heating =	70.0 F		

AIR SYSTEM DESCRIPTION

Name : RTU-1 10-17-90
 Carrier Hourly Analysis Program 6022890201
 Prepared By : ENGG APPLICATIONS CONSUL Page 1 of 2

1. SYSTEM NAME AND TYPE

System Name = RTU-1
 System Class = Constant Volume
 System Type = (CV/RH) Constant Volume w/ Terminal Reheat
 Number of Zones = 6

2. SPACE SELECTION (see separate printout)

3. THERMOSTAT & EQUIPMENT SCHEDULING DATA

Operation Period	Thermostat Setpoints		Ventilation Dampers
	Cooling	Heating	
Occupied	75.0 F	68.0 F	OPEN
Unoccupied	75.0 F	68.0 F	OPEN

Weekday	: Occupied Period Begins at	0	; Duration = 24 hrs
Saturday	: Occupied Period Begins at	0	; Duration = 24 hrs
Sunday	: Occupied Period Begins at	0	; Duration = 24 hrs
Design Day	: Occupied Period Begins at	0	; Duration = 24 hrs

4. SUPPLY, VENTILATION, RETURN AIR DATA

SUPPLY AIR

Supply air flow rate = 5400.00 CFM
 Supply temperature control = 1 Constant

VENTILATION AIR

Nominal ventilation flow rate = 1680.00 CFM
 Minimum ventilation flow rate = 1680.00 CFM
 Damper leak rate = 5 % of vent air

RETURN AIR

Zone exhaust air flow rate = 100.00 % of vent. air
 Zone exhaust fan power = 0.0 kW
 Is a return plenum used ? N

AIR SYSTEM DESCRIPTION

Name : RTU-1

10-17-90

Carrier Hourly Analysis Program

6022890201

Prepared By : ENGG APPLICATIONS CONSUL

Page 2 of 2

5. FAN DATA

SUPPLY FAN

Type = 2:Forward curved
Static = 2.25 in wg
Efficiency = 65 %
Configuration = 1 Draw-thru

RETURN FAN

Type = 1:(Fan does not exist)

6. ACCESSORY DEVICES AND SYSTEMS

PREHEAT COIL

(Not used)

OUTDOOR AIR ECONOMIZER CONTROL

Type = 3:Integrated dry-bulb
Upper cutoff point = 150.0 F
Lower cutoff point = -60.0 F

VENTILATION AIR RECLAIM

(Not used)

HUMIDITY CONTROL

Upper RH setpoint = 50 %
Lower RH setpoint = 40 %

7. MISCELLANEOUS SYSTEM DATA

Cooling coil bypass factor = 0.050
Type of supplemental heating = 1 Not Used

AIR SYSTEM DESCRIPTION

Name : RTU-2 10-17-90
 Carrier Hourly Analysis Program 6022890201
 Prepared By : ENGG APPLICATIONS CONSUL Page 1 of 2

1. SYSTEM NAME AND TYPE

System Name = RTU-2
 System Class = Constant Volume
 System Type = (CV/RH) Constant Volume w/ Terminal Reheat
 Number of Zones = 3

2. SPACE SELECTION (see separate printout)

3. THERMOSTAT & EQUIPMENT SCHEDULING DATA

Operation Period	Thermostat Setpoints		Ventilation Dampers
	Cooling	Heating	
Occupied	75.0 F	68.0 F	OPEN
Unoccupied	75.0 F	68.0 F	OPEN

Weekday : Occupied Period Begins at 0 ; Duration = 24 hrs
 Saturday : Occupied Period Begins at 0 ; Duration = 24 hrs
 Sunday : Occupied Period Begins at 0 ; Duration = 24 hrs
 Design Day : Occupied Period Begins at 0 ; Duration = 24 hrs

4. SUPPLY, VENTILATION, RETURN AIR DATA

SUPPLY AIR

Supply air flow rate = 5400.00 CFM
 Supply temperature control = 1 Constant

VENTILATION AIR

Nominal ventilation flow rate = 1050.00 CFM
 Minimum ventilation flow rate = 1050.00 CFM
 Damper leak rate = 5 % of vent air

RETURN AIR

Zone exhaust air flow rate = 100.00 % of vent. air
 Zone exhaust fan power = 0.0 kW
 Is a return plenum used ? N

AIR SYSTEM DESCRIPTION

Name : RTU-2

10-17-90

Carrier Hourly Analysis Program

6022890201

Prepared By : ENGG APPLICATIONS CONSUL

Page 2 of 2

5. FAN DATA

SUPPLY FAN

Type = 2:Forward curved
Static = 2.25 in wg
Efficiency = 65 %
Configuration = 1 Draw-thru

RETURN FAN

Type = 1:(Fan does not exist)

6. ACCESSORY DEVICES AND SYSTEMS

PREHEAT COIL

(Not used)

OUTDOOR AIR ECONOMIZER CONTROL

Type = 3:Integrated dry-bulb
Upper cutoff point = 150.0 F
Lower cutoff point = -60.0 F

VENTILATION AIR RECLAIM

(Not used)

HUMIDITY CONTROL

Upper RH setpoint = 50 %
Lower RH setpoint = 40 %

7. MISCELLANEOUS SYSTEM DATA

Cooling coil bypass factor = 0.050
Type of supplemental heating = 1 Not Used

AIR SYSTEM DESCRIPTION

Name : SYSTEM #1 10-17-90
 Carrier Hourly Analysis Program 6022890201
 Prepared By : ENGG APPLICATIONS CONSUL Page 1 of 2

1. SYSTEM NAME AND TYPE

System Name = SYSTEM #1
 System Class = Constant Volume
 System Type = (CV/RH) Constant Volume w/ Terminal Reheat
 Number of Zones = 1

2. SPACE SELECTION (see separate printout)

3. THERMOSTAT & EQUIPMENT SCHEDULING DATA

Operation Period	Thermostat Setpoints		Ventilation Dampers
	Cooling	Heating	
Occupied	75.0 F	68.0 F	OPEN
Unoccupied	75.0 F	68.0 F	OPEN

Weekday : Occupied Period Begins at 0 ; Duration = 24 hrs
 Saturday : Occupied Period Begins at 0 ; Duration = 24 hrs
 Sunday : Occupied Period Begins at 0 ; Duration = 24 hrs
 Design Day : Occupied Period Begins at 0 ; Duration = 24 hrs

4. SUPPLY, VENTILATION, RETURN AIR DATA

SUPPLY AIR

Supply air flow rate = 10500.00 CFM
 Supply temperature control = 1 Constant

VENTILATION AIR

Nominal ventilation flow rate = 5900.00 CFM
 Minimum ventilation flow rate = 5900.00 CFM
 Damper leak rate = 5 % of vent air

RETURN AIR

Zone exhaust air flow rate = 100.00 % of vent. air
 Zone exhaust fan power = 0.0 kW
 Is a return plenum used ? N

AIR SYSTEM DESCRIPTION

Name : SYSTEM #1

10-17-90

Carrier Hourly Analysis Program

6022890201

Prepared By : ENGG APPLICATIONS CONSUL

Page 2 of 2

5. FAN DATA

SUPPLY FAN

Type = 7:Backward inclined or air foil
Static = 2.25 in wg
Efficiency = 54 %
Configuration = 2 Blow-thru

RETURN FAN

Type = 1:(Fan does not exist)

6. ACCESSORY DEVICES AND SYSTEMS

PREHEAT COIL

Setpoint temperature = 72.0 F

OUTDOOR AIR ECONOMIZER CONTROL

(Not used)

VENTILATION AIR RECLAIM

(Not used)

HUMIDITY CONTROL

Upper RH setpoint = 50 %

Lower RH setpoint = 40 %

7. MISCELLANEOUS SYSTEM DATA

Cooling coil bypass factor = 0.050

Type of supplemental heating = 1 Not Used

AIR SYSTEM DESCRIPTION

Name : SYSTEM #2 10-17-90
 Carrier Hourly Analysis Program 6022890201
 Prepared By : ENGG APPLICATIONS CONSUL Page 1 of 2

1. SYSTEM NAME AND TYPE

System Name = SYSTEM #2
 System Class = Constant Volume
 System Type = (CV/RH) Constant Volume w/ Terminal Reheat
 Number of Zones = 1

2. SPACE SELECTION (see separate printout)

3. THERMOSTAT & EQUIPMENT SCHEDULING DATA

Operation Period	Thermostat Setpoints		Ventilation Dampers
	Cooling	Heating	
Occupied	75.0 F	68.0 F	OPEN
Unoccupied	75.0 F	68.0 F	OPEN

Weekday	: Occupied Period Begins at	0	; Duration = 24 hrs
Saturday	: Occupied Period Begins at	0	; Duration = 24 hrs
Sunday	: Occupied Period Begins at	0	; Duration = 24 hrs
Design Day	: Occupied Period Begins at	0	; Duration = 24 hrs

4. SUPPLY, VENTILATION, RETURN AIR DATA

SUPPLY AIR

Supply air flow rate = 10700.00 CFM
 Supply temperature control = 1 Constant

VENTILATION AIR

Nominal ventilation flow rate = 2500.00 CFM
 Minimum ventilation flow rate = 2500.00 CFM
 Damper leak rate = 5 % of vent air

RETURN AIR

Zone exhaust air flow rate = 100.00 % of vent. air
 Zone exhaust fan power = 0.0 kW
 Is a return plenum used ? N

AIR SYSTEM DESCRIPTION

Name : SYSTEM #2

10-17-90

Carrier Hourly Analysis Program

6022890201

Prepared By : ENGG APPLICATIONS CONSUL

Page 2 of 2

5. FAN DATA

SUPPLY FAN

Type = 7:Backward inclined or air foil
Static = 2.25 in wg
Efficiency = 54 %
Configuration = 2 Blow-thru

RETURN FAN

Type = 1:(Fan does not exist)

6. ACCESSORY DEVICES AND SYSTEMS

PREHEAT COIL

Setpoint temperature = 72.0 F

OUTDOOR AIR ECONOMIZER CONTROL

(Not used)

VENTILATION AIR RECLAIM

(Not used)

HUMIDITY CONTROL

Upper RH setpoint = 50 %

Lower RH setpoint = 40 %

7. MISCELLANEOUS SYSTEM DATA

Cooling coil bypass factor = 0.050

Type of supplemental heating = 1 Not Used

PLANT DESCRIPTIONS

Plant : #2 OIL FIRED BOILER 01-25-91
 Prepared By : ENGG APPLICATIONS CONSUL 6100190202
 Carrier Hourly Analysis Program Page 1 of 1

1 PLANT NAME AND TYPES

Class = Individual Plants
 Name = #2 OIL FIRED BOILER
 Cooling Plant Type = User Defined
 Heating Plant Type = Combustion

2 AIR SYSTEM SELECTION

Air System Name	Mult	Air System Name	Mult
RTU-1	1	RTU-2	1
SYSTEM #1	1	SYSTEM #2	1

3a COOLING PLANT DATA (User Defined)

Estimated maximum cooling coil load = 83.65 Ton
 Nominal capacity = 75.30 Ton
 Nominal input power rate = 1.200 kW/Ton
 Type of cooling = DX
 Condenser type = Air Cooled

PART LOAD PERFORMANCE

% Load	% Power	% Load	% Power	% Load	% Power
90	100	60	80	30	50
80	100	50	65	20	40
70	80	40	65	10	25

3b HEATING PLANT DATA (Combustion)

Estimated maximum heating coil load = 1708.70 MBH
 Fuel type = Fuel Oil
 Rated plant output = 1762.0 MBH
 Type of heating = Hydronic
 Is plant efficiency computer generated ? N
 Seasonal plant efficiency = 64 %

4 PUMP SYSTEM DATA

Hot water pumping system head = 0.00 ft wg
 Hot water pumping system delta T = 0.00 F

FUEL RATE DATA

Fuel Rate : DOMESTIC FUEL OIL #2 (GENERIC)

01-25-91

Prepared By : ENGG APPLICATIONS CONSUL

6100190202

Carrier Hourly Analysis Program

Page 1 of 1

1. FUEL RATE DATA

NAME

Name of rate schedule = DOMESTIC FUEL OIL #2 (GENERIC)

CURRENCY

Currency name = MBTU

Currency symbol = MBTU

BASIC INFORMATION

Units of measurement = Gallon

Conversion factor = 138.70000 kBTU/Gallon

Type of rate schedule = 1 Simple

Flat rate charge = 0.13870 MBTU/Gallon

BUILDING DESCRIPTION

Building : BUILDING #317 01-25-91
 Prepared By: ENGG APPLICATIONS CONSUL 6100190202
 Carrier Hourly Analysis Program Page 1 of 1

 1. BUILDING INPUTS

BUILDING NAME = BUILDING #317

MISCELLANEOUS ELECTRIC

Maximum power = 0.0 kW
 Power schedule = 1

DOMESTIC WATER HEATING

Is a domestic hot water system used ? Y
 Maximum hourly hot water use = 100.0 gal
 Hot water schedule = 1
 Average entering water temperature = 65.0 F
 Average hot water supply temperature = 140.0 F
 Heating plant type = 2 : Combustion
 Fuel type = 2 : Fuel Oil
 Plant capacity = 1862.0 MBH
 Is plant efficiency computer generated ? N
 Annual plant efficiency = 64 %

OTHER INPUTS

Additional building floor area = 1130.0 sqft
 Electrical generating efficiency = 100.00 %

2. PLANT SELECTION

Plant Name	Mult	Plant Name	Mult
#2 OIL FIRED BOILER	1		

3. FUEL & ELECTRIC RATE SELECTION

Fuel or Energy	No.	Name of Rate Schedule	Currency
Electric	10	GENERIC	MBTU
Natural Gas	8	NATURAL GAS (GENERIC)	MBTU
Fuel Oil	6	DOMESTIC FUEL OIL #2 (GENERIC)	MBTU
Propane	9	Empty...	MBTU
Remote Source Heating	9	Empty...	MBTU
Remote Source Cooling	9	Empty...	MBTU

MONTHLY ENERGY COSTS

Building : BUILDING #317
 Site : FT. BELVOIR, VIRGINIA
 Prepared By : ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

01-25-91
 6100190202

 TABLE 1. HVAC COSTS (MBTU)

Month	Electric	Natural Gas	Fuel Oil	Propane	Remote Heating	Remote Cooling
Jan	173	0	1,114	0	0	0
Feb	156	0	940	0	0	0
Mar	173	0	759	0	0	0
Apr	170	0	423	0	0	0
May	181	0	266	0	0	0
June	206	0	143	0	0	0
July	244	0	103	0	0	0
Aug	238	0	115	0	0	0
Sept	190	0	199	0	0	0
Oct	177	0	392	0	0	0
Nov	168	0	644	0	0	0
Dec	173	0	996	0	0	0
Tot.	2,249	0	6,095	0	0	0

 TABLE 2. NON-HVAC COSTS (MBTU)

Month	Electric	Natural Gas	Fuel Oil	Propane	Remote Heating
Jan	87	0	22	0	0
Feb	79	0	20	0	0
Mar	90	0	23	0	0
Apr	86	0	22	0	0
May	90	0	23	0	0
June	87	0	22	0	0
July	87	0	22	0	0
Aug	93	0	23	0	0
Sept	81	0	20	0	0
Oct	93	0	23	0	0
Nov	86	0	22	0	0
Dec	85	0	21	0	0
Tot.	1,043	0	260	0	0

FUEL OIL COSTS

Building : BUILDING #317
 Site : FT. BELVOIR, VIRGINIA
 Prepared By : ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

01-25-91
 6100190202

 TABLE 1. MONTHLY COMPONENT CHARGES (MBTU)

Month	Energy Charges	Fixed Charges	Taxes	Total Charges
Jan	1,136	0	0	1,136
Feb	960	0	0	960
Mar	782	0	0	782
Apr	445	0	0	445
May	289	0	0	289
June	165	0	0	165
July	125	0	0	125
Aug	139	0	0	139
Sept	218	0	0	218
Oct	416	0	0	416
Nov	666	0	0	666
Dec	1,017	0	0	1,017

Tot.	6,355	0	0	6,355

 TABLE 2. MONTHLY TOTALS

Month	Charges (MBTU)	Energy (Gallon)	Effective Rate (MBTU/Gallon)
Jan	1,136	8,188	0.13870
Feb	960	6,919	0.13870
Mar	782	5,638	0.13870
Apr	445	3,207	0.13870
May	289	2,080	0.13870
June	165	1,188	0.13870
July	125	898	0.13870
Aug	139	999	0.13870
Sept	218	1,574	0.13870
Oct	416	2,999	0.13870
Nov	666	4,801	0.13870
Dec	1,017	7,329	0.13870

Tot.	6,355	45,819	0.13870

THE SIMULATIONS ESTIMATED HEATING LOAD (1708.70 MBH) IS WORST CASE CONDITION AND PROBABLY OCCURES DURING JANUARY. THIS LOAD ONLY REPRESENTS THE SYSTEMS SIMULATED WHICH REQUIRE SUMMER STEAM,

SINCE THE NEW LOCAL BOILER WILL ONLY BE NEEDED FROM MID APRIL THRU MID OCTOBER WE WILL NOT NEED AS LARGE A BOILER LOAD AS INDICATED BY THE COMPUTER SIMULATION.

IF WE TAKE THE AVERAGE MBTU FOR DAYS IN APRIL (WORST CASE) AND ADD 20% AS A SAFETY FACTOR THE RESULTANT LOAD WILL BE SUFFICIENT TO SELECT A LOCAL STEAM BOILER TO ACCOMMODATE THE BUILDINGS STEAM REQUIREMENTS DURING THE SUMMER.

SUMMER STEAM

AVG. MBTU/DAY



APR	14.84	← WORST CASE	$14.84/24 = 618.33 \times 1.2 =$
MAY	9.33		742 MBH LOAD
JUNE	5.50		
JULY	4.04		
AUG.	4.49		
SEPT.	7.04		
OCT.	13.42		

SELECT: PEERLESS SERIES 7FDA INDUSTRIAL/COMMERCIAL

CAST IRON BOILER/BURNER UNIT

MODEL 709 FDA SU, 33 BHP, 10" Ø VENT, 9 SECTIONS

OVERALL EFFICIENCY W/ PIPING LOSSES & PICK-UP = 61%

INPUT @ 9.6 GPH #2 = 1331.5 MBH (CORRECTED)

CORRECTED NET OUTPUT = 816.3 MBH

50" L x 35" W x 60" H (2) 4" SURTAPS (1) 3" RET.

MONTHLY MBTU EXPENDED FOR SUMMER REHEAT AND DOMESTIC HOT WATER GENERATION AS SIMULATED BY CARRIER E-20 COMPUTER PROGRAM.

APR.	445/2	=	223 MBTU	1603	GALS
MAY.		=	289	2080	
JUNE		=	165	1188	
JULY		=	125	898	
AUG.		=	139	999	
SEPT.		=	218	1574	
OCT.	416/2	=	208	1499	
			<u>1367 MBTU</u>	<u>984</u>	GALS

SELECT: 2000 GAL OIL STORAGE TANK (UNDERGROUND)
5'-4" x 12', (5) 2" TAPS, 1900 lbs, 7 GAGE, BUFFALO

OIL STORAGE

REQD. 2000 GAL. UNDERGROUND, DOUBLE WALL, STEEL
 UL LISTED, W/STI-P3 CORROSION PROTECTION
 & 30 YR WARRANTY

		L	M	T	
182	TANK	200	4200	4450	5'-4" Ø x 12' L
	HOLD DNS.	47	270	317	
	1/4" PIPING (30')	4.23	1.88 AS	6.56	
	INCREASED PIPING (75')	7.60	11.30 BS	19.71	
158	FOOT VALVE	13.20	45.80	59.	
	PUMP (2)	59	395	454.	
	TANK GAGE SYS	79.	715.	794.	
	VALVES (2)	8.25	7.75	16.	
	SHUT OFFS (4)	19.80	11.75	31.55	
	PAD CY (7)	25.	94.	119	
	EXCAVATION CY (60)	46.	-		
	TRENCH (40LF)	1.01	.74	1.75	
		<u>4185.</u>	<u>7750</u>	<u>11,935</u>	

LEAK DETECTION SYSTEM

CONTROL MASTER W/ALARM	725
PROBES: 4" WELL	760
TANK WALL	650
CABLE	<u>195</u>

OPTIONAL LEAK DETECTION = M 2330

4185 10,080 = 14,265

STEAM VALVES, PIPING, FITTINGS, VALVES ETC.

		L	M	T
132	(2) 4" STM. VALVES OS&Y	120	215	335
	(1) BOILER DRAIN	5.80	11.90	17.70
87	4" PIPING (50')	9.60	6.77	1.03
	3" PIPING (10')	8.25	1.69	.89
	PIPING ()			13.83
110	4" WN/FLANGE (6)	36	14.80	3.82
	4" 90° ELL (10)	71	14.90	7.65
	4" TEE (2)	120	27	12.75
	5" TEE (1)	185	50	12.75
	3" WN/F (1)	25	14.10	2.73
	3 90° ELL (2)	51	9	5.45
	4 INS (80)	2.65	5.07	7.72
	3 INS (20)	2.87	5.71	8.58
		<u>2503</u>	<u>1832</u>	<u>4335</u>

CONDENSATE PIPING, TRAPS

		L	M	T
	1" PIPING ()			
203	TRAP ASSEMBLY ()			
	WELDING LABOR			
	LS =	649	898	1547
	(40) INS =	<u>1.57</u>	<u>1.10</u>	<u>2.67</u>
		712	942	1654

RETURN FEEDWATER

		L	M	T
	2" PIPING (175)	5.85	2.68	.63
	VALVE (4)	40	84	124
	MISC FITTINGS 10%	103	60	
	INS. (195)	<u>1.57</u>	<u>1.10</u>	<u>2.67</u>
		<u>1433</u>	<u>854</u>	<u>2287</u>
	MISC INSTALL WORK 10% =	1576	940	2516

ALL FUEL CHIMNEY, UL LISTED, DOUBLE WALL, 304 INNER - STL OUTER

	L	M	T
(17) STR 10" ϕ	7.30	58.30	65.60
(2) 45° EL	14.60	195	209.60
90° TEE	16.70	214	230.70
PLT. SUPPORT	17.55	123	140.55
ROOF THIMBLE	17.55	310	327.55
ROOF SUP. ASSEM.	18.45	405	423.45
STACK CAP	8.75	245	253.75
	<u>109</u>	<u>1687</u>	<u>1796</u>
	233	2678	2911

OIL HOOK-UP

	L	M	T
✓ FILTER	9.90	9.95	19.95
✓ VALVE	8.25	4.25	12.50
✓ VALVE	16.50	8.60	25.00
✓ 2" VENT CAP	6.20	7.50	13.70
✓ TUBE (25')	2.53	1.28	3.81
✓ 2" STL V.P. (25')	6.25	4.08	11.00
✓ LOUVERS (2)	7.20	24	31.20
✓ DAMPERS (2)	17.70	58.30	76
✓ FILL CAP	6.20	7.50	13.70
	<u>428</u>	<u>379</u>	<u>807</u>

+ DEMO L 60 M 15 (2)

BUILDING 327

DESIGN PARAMETERS, SHGs

Location : FT. BELVOIR, VIRGINIA
 Prepared By : ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

10-08-90
 6022890201
 Page 1 of 1

DESIGN WEATHER PARAMETERS

City Name.....: FT. BELVOIR
 Location.....: VIRGINIA
 Latitude.....: 38.4 deg
 Elevation.....: 69.0 ft
 Summer Design Dry Bulb Temp.....: 90.0 F
 Summer Design Wet Bulb Temp.....: 75.0 F
 Daily Temperature Range.....: 23.0 F
 Winter Design Dry Bulb Temp.....: 12.0 F
 Atmospheric Clearness Number.....: 1.00

TABLE 1. MAXIMUM SOLAR HEAT GAINS - AVERAGE DAYS
 (BTU/hr/sqft)

Month	NE	E	SE	S	SW	W	NW	N	Hor
Jan	24.2	61.2	97.5	110.3	97.5	61.2	24.2	24.2	80.0
Feb	31.8	74.8	105.8	113.9	105.8	74.8	31.8	31.8	107.2
Mar	40.8	87.0	107.0	108.1	107.0	87.0	40.8	40.8	136.8
Apr	60.0	97.4	104.4	97.2	104.4	97.4	60.0	49.3	164.3
May	74.9	103.1	98.4	84.1	98.4	103.1	74.9	54.9	181.8
Jun	85.1	109.3	97.6	79.2	97.6	109.3	85.1	57.9	195.2
Jul	80.5	106.7	98.2	81.5	98.2	106.7	80.5	56.4	189.3
Aug	69.1	104.1	105.8	94.5	105.8	104.1	69.1	52.2	177.6
Sep	52.3	99.4	114.8	111.7	114.8	99.4	52.3	45.4	158.1
Oct	36.4	88.4	117.8	123.0	117.8	88.4	36.4	36.4	128.2
Nov	26.7	66.6	101.9	113.4	101.9	66.6	26.7	26.7	89.4
Dec	21.4	53.1	87.8	101.1	87.8	53.1	21.4	21.4	68.4

TABLE 2. MAXIMUM SOLAR HEAT GAINS - DESIGN DAYS
 (BTU/hr/sqft)

Month	NE	E	SE	S	SW	W	NW	N	Hor
Jan	20.4	158.8	243.8	253.8	243.8	158.8	20.4	20.4	141.8
Feb	53.0	189.0	246.5	237.6	246.5	189.0	53.0	24.7	187.6
Mar	95.9	219.8	234.6	200.8	234.6	219.8	95.9	29.4	228.9
Apr	141.6	224.4	200.2	146.8	200.2	224.4	141.6	34.1	255.9
May	166.1	220.1	170.8	104.7	170.8	220.1	166.1	37.4	267.9
Jun	173.2	215.4	156.8	87.9	156.8	215.4	173.2	47.4	269.7
Jul	163.6	215.7	166.5	101.6	166.5	215.7	163.6	38.3	264.6
Aug	136.4	216.6	193.2	141.9	193.2	216.6	136.4	35.8	251.2
Sep	90.3	207.2	224.7	195.0	224.7	207.2	90.3	30.5	221.3
Oct	51.9	182.7	238.2	230.7	238.2	182.7	51.9	25.5	184.2
Nov	20.7	156.0	239.8	249.9	239.8	156.0	20.7	20.7	141.2
Dec	18.5	141.8	236.4	254.2	236.4	141.8	18.5	18.5	122.1

MASTER SCHEDULE SUMMARY

Prepared By : ENGG APPLICATIONS CONSUL
Carrier Hourly Analysis Program

02-05-91
6100190202

MASTER SCHEDULE 1. OCCUPANCY Hourly Percentages

Hour ----->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	0	0	0	0	0	0	10	50	100	100	100	100
Saturday	0	0	0	0	0	0	5	5	5	10	10	10
Sunday	0	0	0	0	0	0	0	5	5	5	5	5
DESIGN	0	0	0	0	0	10	20	100	100	100	100	100

Hour ----->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	100	100	100	100	80	50	10	10	5	5	0	0
Saturday	10	10	10	5	5	5	5	5	0	0	0	0
Sunday	6	5	5	5	5	5	0	0	0	0	0	0
DESIGN	100	100	100	100	100	100	100	20	10	0	0	0

MASTER SCHEDULE 2. LIGHTING Hourly Percentages

Hour ----->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	5	5	5	5	5	5	20	80	100	100	100	100
Saturday	5	5	5	5	5	5	15	15	20	40	50	50
Sunday	5	5	5	5	5	5	5	15	20	30	30	30
DESIGN	10	10	10	10	10	10	50	100	100	100	100	100

Hour ----->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	100	100	100	100	90	70	40	30	20	20	5	5
Saturday	50	50	50	50	50	40	30	20	5	5	5	5
Sunday	30	30	30	20	20	20	20	5	5	5	5	5
DESIGN	100	100	100	100	100	100	100	50	20	10	10	10

MASTER SCHEDULE 3. EQUIPMENT Hourly Percentages

Hour ----->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	5	5	5	5	5	5	20	50	100	100	100	100
Saturday	5	5	5	5	5	5	10	10	15	20	20	20
Sunday	5	5	5	5	5	5	5	10	10	10	20	20
DESIGN	10	10	10	10	10	20	40	100	100	100	100	100

Hour ----->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	100	100	100	100	80	50	20	10	5	5	5	5
Saturday	20	20	20	10	10	10	10	10	5	5	5	5
Sunday	15	15	10	10	10	10	5	5	5	5	5	5
DESIGN	100	100	100	100	100	100	100	40	20	10	10	10

MASTER SCHEDULE SUMMARY

Prepared By : ENGG APPLICATIONS CONSUL

02-05-91

Carrier Hourly Analysis Program

6100190202

MASTER SCHEDULE 4. DOMESTIC HOT WATER Hourly Percentages

Hour ----->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	0	0	0	0	0	5	10	10	20	20	20	80
Saturday	0	0	0	0	0	2	2	2	5	5	5	5
Sunday	0	0	0	0	0	0	0	2	2	2	2	2
DESIGN	0	0	0	0	0	5	5	20	20	20	20	80

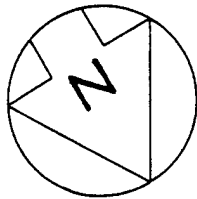
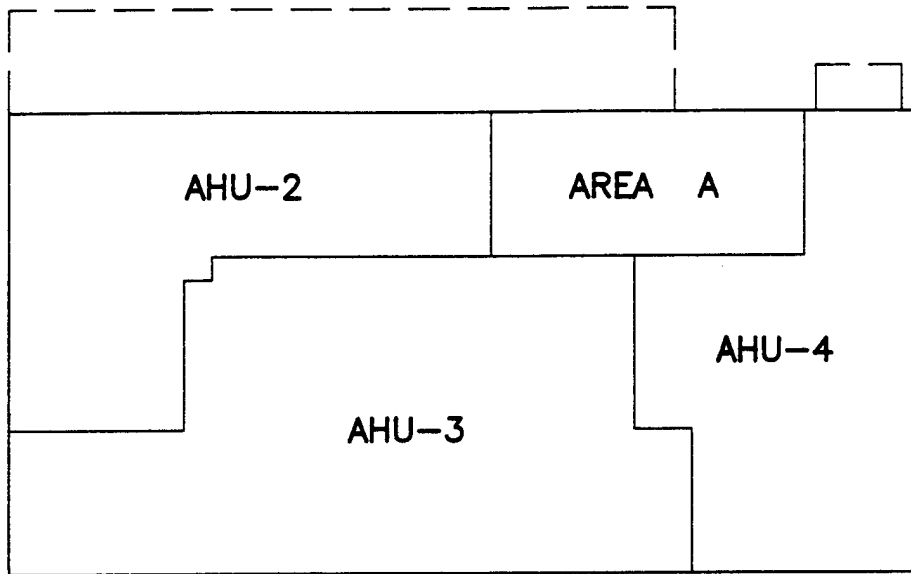
Hour ----->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	80	20	20	20	10	10	5	5	5	2	0	0
Saturday	5	5	5	2	2	2	2	2	0	0	0	0
Sunday	2	2	2	2	2	2	0	0	0	0	0	0
DESIGN	80	20	20	20	10	10	5	5	5	2	0	0

DAY TYPE DATA

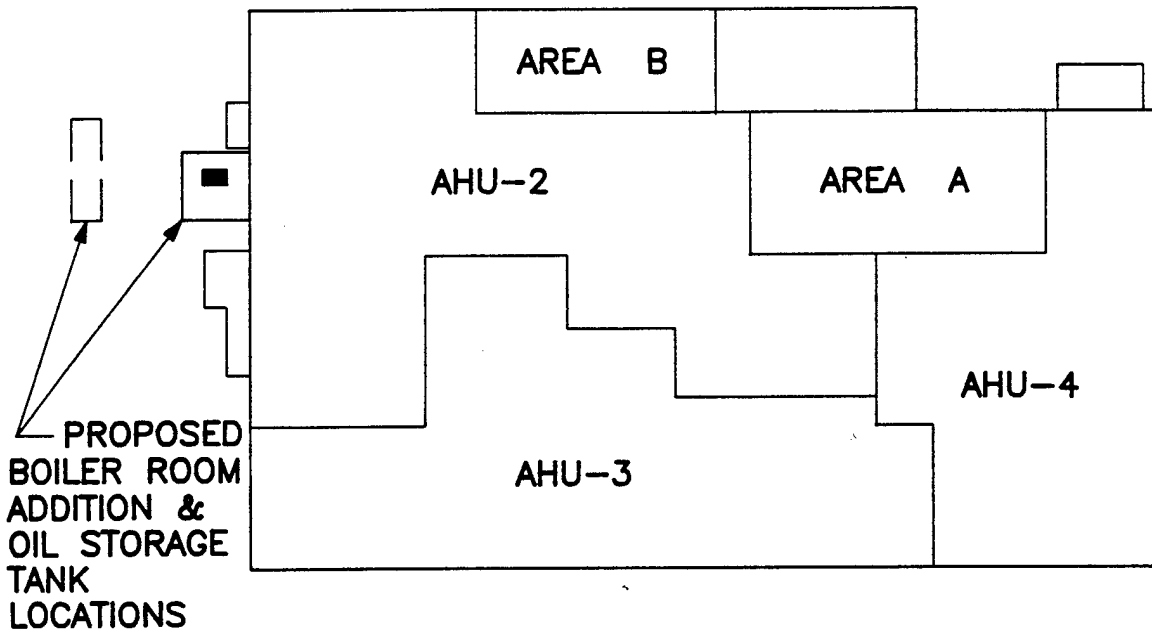
Prepared By : ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

08-29-90
 6022890201

Month	DAY TYPE 1 Weekday	DAY TYPE 2 Saturday	DAY TYPE 3 Sunday	Total Days/Month
January	21	4	6	31
February	19	4	5	28
March	22	5	4	31
April	21	4	5	30
May	22	4	5	31
June	21	5	4	30
July	21	4	6	31
August	23	4	4	31
September	19	5	6	30
October	23	4	4	31
November	21	4	5	30
December	20	5	6	31



MEZZANINE FLOOR PLAN



FIRST FLOOR PLAN

BUILDING 327 KEY PLAN

ENGINEERING ANALYSIS

Sheet 1 of 1

By: REF

Calculations for Infiltration

Building 327

Project: ESOS, Fort BELVOIR Date: 1990

Contract No: DACA-31-89-C=0189 EAC Project No.: 89034.01

Calculations based on ASHRAE 1989 Page F 2.3.14.

Building Leakage Area

	Effective Leakage Area, in ²	Building Component Parameter	Building Leakage Area D _L , in ²
	L _i	D _i	L
Sill foundation	0.19/ft. of perimeter	520 ft.	98.8
Joints, ceiling/wall	0.12/ft. of wall	520 ft.	62.4
Windows	0.063/ft ² . of window	345 ft ² .	21.8
Doors	0.215/ft ² . of doors	445 ft ² .	95.7
Wall - Window frames	0.15/ft ² . of window	195 ft ² .	29.3
- Door frames	0.072/ft ² . of door	240 ft ² .	17.3
Elec. outlet/switch	0.16/fixture	110 ft.	17.6
Recessed lights	1.6/fixture	186 ft.	297.6
Pipe penetration	1.55/in ² . of pipe,	30 ft.	46.5
Exhaust fans	6.0/fan	10 ft.	60.
Duct penetration	2.2/SF	160.4 SF	352.9
FCU openings	0 x 1/3(SF/unit) x 2.2/SF		<u>1098.9</u> in ² .

Infiltration Q(cfm) = L x (A at + Bv²)^{1/2}

(ASHRAE 1989, P. 23.17, EQ.33)

Winter

Summer

Q(cfm) =
= L(0.01313 x 51 + 0.0157 x 14²)^{1/2}
= L x 2.2
= 1100 x 2.2 = 2420 CFM

= L(0.0313 x 15 + 0.0157 x 10²)^{1/2}
= L x 1.45
= 1100 x 1.45 = 1595 CFM

Rate = $\frac{2420}{27,516} = 0.09$ CFM/SF

Rate = $\frac{1595}{27,516} = 0.06$ CFM/SF

SIMPLE SPACE DESCRIPTION

Space Name : 1 & 2 RH-29 2 M/1 09-13-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.066 Roof 0.060 Glass 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 500.0 Schedule = 3 Activity Level = 2
Lights : W/sqft = 1.92 Schedule = 4 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 1 & 2 RH-29 2 M/1

Exposure : SW SE Floor Area : 500.0 sqft
Wall Area : 60.0 375.0 Roof Area : 500.0 sqft
Glass Area : 0.0 0.0 Current
Elements : El,Gr,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 3.32
Total Watts = 1,660
Schedule No. = 3

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 500.0 sqft
Perimeter = 25.0 ft
Depth = 0.0 ft

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.06 CFM/sqft = 30 CFM
Heating : 0.09 CFM/sqft = 45 CFM
Typical : 0.09 CFM/sqft = 45 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 3 RH-27 2 M/1 09-13-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

Walls Roof Glass
U-Value : 0.066 0.060 1.060 Building Weight : M
Weight : 100 L Glass Factor : 0.00
Color : D D Internal Shades ? N

People : sqft/person = 166.6 Schedule = 3 Activity Level = 2
Lights : W/sqft = 2.56 Schedule = 4 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 3 RH-27 2 M/1

Floor Area : 500.0 sqft
Exposure : SW SE Roof Area : 500.0 sqft
Wall Area : 60.0 375.0 Current
Glass Area : 0.0 0.0 Elements : El,Gr,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 4.98
Total Watts = 2,490
Schedule No. = 3

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 500.0 sqft
Perimeter = 25.0 ft
Depth = 0.0 ft

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.06 CFM/sqft = 30 CFM
Heating : 0.09 CFM/sqft = 45 CFM
Typical : 0.09 CFM/sqft = 45 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 4 & 5 RH-26 2 M/1

09-13-90

Prepared By : ENGG APPLICATIONS CONSUL

6022890201

Carrier Hourly Analysis Program

Page 1 of 1

	Walls	Roof	Glass		
U-Value :	0.066	0.060	1.060	Building Weight	: M
Weight :	100	L		Glass Factor	: 1.00
Color :	D	D		Internal Shades	? N

People : sqft/person = 166.6 Schedule = 3 Activity Level = 2
 Lights : W/sqft = 2.56 Schedule = 4 Wattage Mult. = 1.20
 : Fixture Type = 1 Recessed, not vented

SPACE NAME = 4 & 5 RH-26 2 M/1

			Floor Area	:	650.0 sqft	
Exposure	:	SW	E	Roof Area	:	650.0 sqft
Wall Area	:	78.0	0.0	Current		
Glass Area	:	0.0	0.0	Elements	:	El,Gr,In

ADDITIONAL ELEMENT - Other Electric

W/sqft	=	2.55
Total Watts	=	1,660
Schedule No.	=	3

ADDITIONAL ELEMENT - Ground

Slab Floor Area	=	650.0 sqft
Perimeter	=	26.0 ft
Depth	=	0.0 ft

ADDITIONAL ELEMENT - Infiltration

Cooling	:	0.06 CFM/sqft	=	39 CFM
Heating	:	0.09 CFM/sqft	=	59 CFM
Typical	:	0.09 CFM/sqft	=	59 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 6 RH-25 2 M/1 09-13-90
 Prepared By : ENGG APPLICATIONS CONSUL 6022890201
 Carrier Hourly Analysis Program Page 1 of 1

 U-Value : Walls 0.066 Roof 0.060 Glass 1.060 Building Weight : M
 Weight : 100 L Glass Factor : 1.00
 Color : D D Internal Shades ? N

People : sqft/person = 350.0 Schedule = 3 Activity Level = 2
 Lights : W/sqft = 1.52 Schedule = 4 Wattage Mult. = 1.20
 : Fixture Type = 1 Recessed, not vented

 SPACE NAME = 6 RH-25 2 M/1

Exposure : SW E Floor Area : 1,050.0 sqft
 Wall Area : 126.0 0.0 Roof Area : 1,050.0 sqft
 Glass Area : 0.0 0.0 Current
 Elements : El,Gr,In

 ADDITIONAL ELEMENT - Other Electric

 W/sqft = 2.37
 Total Watts = 2,490
 Schedule No. = 3

 ADDITIONAL ELEMENT - Ground

 Slab Floor Area = 1,050.0 sqft
 Perimeter = 42.0 ft
 Depth = 0.0 ft

 ADDITIONAL ELEMENT - Infiltration

 Cooling : 0.06 CFM/sqft = 63 CFM
 Heating : 0.09 CFM/sqft = 95 CFM
 Typical : 0.09 CFM/sqft = 95 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 9,10,11,12 RH-30 2 1 09-13-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.066 Roof 0.060 Glass 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 179.4 Schedule = 3 Activity Level = 2
Lights : W/sqft = 1.60 Schedule = 4 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 9,10,11,12 RH-30 2 1

Exposure : SE E Floor Area : 897.0 sqft
Wall Area : 390.0 0.0 Roof Area : 0.0 sqft
Glass Area : 0.0 0.0 Current
Elements : El,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 4.63
Total Watts = 4,150
Schedule No. = 3

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.06 CFM/sqft = 54 CFM
Heating : 0.09 CFM/sqft = 81 CFM
Typical : 0.09 CFM/sqft = 81 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 106 RH-22 2 1 09-13-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.066 Roof 0.060 Glass 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 143.8 Schedule = 3 Activity Level = 2
Lights : W/sqft = 2.50 Schedule = 4 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 106 RH-22 2 1

Exposure : SW E Floor Area : 575.0 sqft
Wall Area : 0.0 0.0 Roof Area : 0.0 sqft
Glass Area : 0.0 0.0 Current
Elements : El,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 5.77
Total Watts = 3,320
Schedule No. = 3

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.06 CFM/sqft = 35 CFM
Heating : 0.09 CFM/sqft = 52 CFM
Typical : 0.09 CFM/sqft = 52 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 203 RH-9 3 M 09-13-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.066 Roof 0.060 Glass 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 256.0 Schedule = 3 Activity Level = 2
Lights : W/sqft = 2.50 Schedule = 4 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 203 RH-9 3 M

Exposure : NE E Floor Area : 512.0 sqft
Wall Area : 0.0 0.0 Roof Area : 512.0 sqft
Glass Area : 0.0 0.0 Current
Elements : El,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 3.24
Total Watts = 1,660
Schedule No. = 3

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.06 CFM/sqft = 31 CFM
Heating : 0.09 CFM/sqft = 46 CFM
Typical : 0.09 CFM/sqft = 46 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 116A RH-11 3 M/1 09-13-90
 Prepared By : ENGG APPLICATIONS CONSUL 6022890201
 Carrier Hourly Analysis Program Page 1 of 1

 Walls Roof Glass
 U-Value : 0.066 0.060 1.060 Building Weight : M
 Weight : 100 L Glass Factor : 1.00
 Color : D D Internal Shades ? N

People : sqft/person = 400.0 Schedule = 3 Activity Level = 2
 Lights : W/sqft = 1.20 Schedule = 4 Wattage Mult. = 1.20
 : Fixture Type = 1 Recessed, not vented

 SPACE NAME = 116A RH-11 3 M/1

Floor Area : 400.0 sqft
 Exposure : NE E Roof Area : 400.0 sqft
 Wall Area : 53.0 0.0 Current
 Glass Area : 0.0 0.0 Elements : Wl,El,Gr,In

 ADDITIONAL ELEMENT - Wall

 Weight = L (lb/sqft) Exposure = NE
 Color = D Net Area = 187.0 sqft
 U-Value = 0.600 BTU/hr/sqft/F

 ADDITIONAL ELEMENT - Other Electric

 W/sqft = 2.08
 Total Watts = 830
 Schedule No. = 3

 ADDITIONAL ELEMENT - Ground

 Slab Floor Area = 400.0 sqft
 Perimeter = 16.0 ft
 Depth = 0.0 ft

 ADDITIONAL ELEMENT - Infiltration

 Cooling : 0.06 CFM/sqft = 24 CFM
 Heating : 0.09 CFM/sqft = 36 CFM
 Typical : 0.09 CFM/sqft = 36 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 112A RH-19 4 M/1 09-13-90
 Prepared By : ENGG APPLICATIONS CONSUL 6022890201
 Carrier Hourly Analysis Program Page 1 of 1

 Walls Roof Glass
 U-Value : 0.066 0.060 1.060 Building Weight : M
 Weight : 100 L Glass Factor : 1.00
 Color : D D Internal Shades ? N

People : sqft/person = 171.0 Schedule = 3 Activity Level = 2
 Lights : W/sqft = 2.50 Schedule = 4 Wattage Mult. = 1.20
 : Fixture Type = 1 Recessed, not vented

 SPACE NAME = 112A RH-19 4 M/1

Floor Area : 513.0 sqft
 Exposure : NW E Roof Area : 513.0 sqft
 Wall Area : 375.0 0.0 Current
 Glass Area : 0.0 0.0 Elements : Gr,El,In

 ADDITIONAL ELEMENT - Ground

 Slab Floor Area = 513.0 sqft
 Perimeter = 25.0 ft
 Depth = 0.0 ft

 ADDITIONAL ELEMENT - Other Electric

 W/sqft = 4.85
 Total Watts = 2,490
 Schedule No. = 3

 ADDITIONAL ELEMENT - Infiltration

 Cooling : 0.06 CFM/sqft = 31 CFM
 Heating : 0.09 CFM/sqft = 46 CFM
 Typical : 0.09 CFM/sqft = 46 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 208 & 208A RH-20 4 M 09-13-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.066 Roof 0.060 Glass 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 305.0 Schedule = 3 Activity Level = 2
Lights : W/sqft = 2.01 Schedule = 4 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 208 & 208A RH-20 4 M

Floor Area : 610.0 sqft
Exposure : NW SW Roof Area : 610.0 sqft
Wall Area : 458.0 300.0 Current
Glass Area : 0.0 0.0 Elements : El,Gr,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 2.72
Total Watts = 1,660
Schedule No. = 3

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 610.0 sqft
Perimeter = 50.5 ft
Depth = 0.0 ft

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.06 CFM/sqft = 37 CFM
Heating : 0.09 CFM/sqft = 55 CFM
Typical : 0.09 CFM/sqft = 55 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 112 RH-21 4 M/1 09-13-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

Walls Roof Glass
U-Value : 0.066 0.060 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 130.8 Schedule = 3 Activity Level = 2
Lights : W/sqft = 2.45 Schedule = 4 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 112 RH-21 4 M/1

Floor Area : 523.0 sqft
Exposure : NW NE Roof Area : 523.0 sqft
Wall Area : 383.0 307.0 Current
Glass Area : 0.0 0.0 Elements : El,Gr,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 6.35
Total Watts = 3,320
Schedule No. = 3

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 523.0 sqft
Perimeter = 46.0 ft
Depth = 0.0 ft

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.06 CFM/sqft = 31 CFM
Heating : 0.09 CFM/sqft = 47 CFM
Typical : 0.09 CFM/sqft = 47 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 113 RH-16 4 M/1 09-13-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.066 Roof 0.060 Glass 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 261.5 Schedule = 3 Activity Level = 2
Lights : W/sqft = 1.83 Schedule = 4 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 113 RH-16 4 M/1

Exposure : NW NE Floor Area : 523.0 sqft
Wall Area : 308.0 0.0 Roof Area : 523.0 sqft
Glass Area : 0.0 0.0 Current Elements : El,Gr,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 3.17
Total Watts = 1,660
Schedule No. = 3

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 523.0 sqft
Perimeter = 20.5 ft
Depth = 0.0 ft

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.06 CFM/sqft = 31 CFM
Heating : 0.09 CFM/sqft = 47 CFM
Typical : 0.09 CFM/sqft = 47 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 109 & 110 RH-17 4 1 09-13-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

Walls Roof Glass
U-Value : 0.066 0.060 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 201.5 Schedule = 3 Activity Level = 2
Lights : W/sqft = 2.38 Schedule = 4 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 109 & 110 RH-17 4 1

Floor Area : 403.0 sqft
Exposure : NW NE Roof Area : 0.0 sqft
Wall Area : 0.0 0.0 Current
Glass Area : 0.0 0.0 Elements : El,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 4.12
Total Watts = 1,660
Schedule No. = 3

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.06 CFM/sqft = 24 CFM
Heating : 0.09 CFM/sqft = 36 CFM
Typical : 0.09 CFM/sqft = 36 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 108 & 111 RH-15 4 1 09-13-90
 Prepared By : ENGG APPLICATIONS CONSUL 6022890201
 Carrier Hourly Analysis Program Page 1 of 1

 Walls Roof Glass
 U-Value : 0.066 0.060 1.060 Building Weight : M
 Weight : 100 L Glass Factor : 1.00
 Color : D D Internal Shades ? N

People : sqft/person = 201.5 Schedule = 3 Activity Level = 2
 Lights : W/sqft = 2.38 Schedule = 4 Wattage Mult. = 1.20
 : Fixture Type = 1 Recessed, not vented

 SPACE NAME = 108 & 111 RH-15 4 1

Floor Area : 403.0 sqft
 Exposure : NW NE Roof Area : 0.0 sqft
 Wall Area : 0.0 0.0 Current
 Glass Area : 0.0 0.0 Elements : El,In

 ADDITIONAL ELEMENT - Other Electric

 W/sqft = 4.12
 Total Watts = 1,660
 Schedule No. = 3

 ADDITIONAL ELEMENT - Infiltration

 Cooling : 0.06 CFM/sqft = 24 CFM
 Heating : 0.09 CFM/sqft = 36 CFM
 Typical : 0.09 CFM/sqft = 36 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 114 & 115 RH-14 4 1 09-13-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.066 Roof 0.060 Glass 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 300.0 Schedule = 3 Activity Level = 2
Lights : W/sqft = 2.13 Schedule = 4 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 114 & 115 RH-14 4 1

Exposure : NW NE Floor Area : 300.0 sqft
Wall Area : 300.0 0.0 Roof Area : 0.0 sqft
Glass Area : 6.0 0.0 Current
Elements : Gr,El,In

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 300.0 sqft
Perimeter = 15.0 ft
Depth = 0.0 ft

ADDITIONAL ELEMENT - Other Electric

W/sqft = 2.77
Total Watts = 830
Schedule No. = 3

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.06 CFM/sqft = 18 CFM
Heating : 0.09 CFM/sqft = 27 CFM
Typical : 0.09 CFM/sqft = 27 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 209,210 & 210A RH-18 4 M
Prepared By : ENGG APPLICATIONS CONSUL
Carrier Hourly Analysis Program

09-13-90
6022890201
Page 1 of 1

Walls Roof Glass
U-Value : 0.066 0.060 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 450.0 Schedule = 3 Activity Level = 2
Lights : W/sqft = 1.06 Schedule = 4 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 209,210 & 210A RH-18 4 M

Exposure : NW NE Floor Area : 900.0 sqft
Wall Area : 0.0 0.0 Roof Area : 900.0 sqft
Glass Area : 0.0 0.0 Current
Elements : El,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 1.84
Total Watts = 1,660
Schedule No. = 3

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.06 CFM/sqft = 54 CFM
Heating : 0.09 CFM/sqft = 81 CFM
Typical : 0.09 CFM/sqft = 81 CFM

AIR SYSTEM DESCRIPTION

Name : AHU-2 10-08-90
 Carrier Hourly Analysis Program 6022890201
 Prepared By : ENGG APPLICATIONS CONSUL Page 1 of 2

1. SYSTEM NAME AND TYPE

System Name = AHU-2
 System Class = Constant Volume
 System Type = (CV/RH) Constant Volume w/ Terminal Reheat
 Number of Zones = 9

2. SPACE SELECTION (see separate printout)

3. THERMOSTAT & EQUIPMENT SCHEDULING DATA

Operation Period	Thermostat Setpoints		Ventilation Dampers
	Cooling	Heating	
Occupied	75.0 F	68.0 F	OPEN
Unoccupied	75.0 F	68.0 F	OPEN

Weekday	: Occupied Period Begins at	0	; Duration = 24 hrs
Saturday	: Occupied Period Begins at	0	; Duration = 24 hrs
Sunday	: Occupied Period Begins at	0	; Duration = 24 hrs
Design Day	: Occupied Period Begins at	0	; Duration = 24 hrs

4. SUPPLY, VENTILATION, RETURN AIR DATA

SUPPLY AIR

Supply air flow rate = 15410.00 CFM
 Supply temperature control = 1 Constant

VENTILATION AIR

Nominal ventilation flow rate = 3852.00 CFM
 Minimum ventilation flow rate = 3852.00 CFM
 Damper leak rate = 5 % of vent air

RETURN AIR

Zone exhaust air flow rate = 100.00 % of vent. air
 Zone exhaust fan power = 0.0 kW
 Is a return plenum used ? N

AIR SYSTEM DESCRIPTION

Name : AHU-2

10-08-90

Carrier Hourly Analysis Program

6022890201

Prepared By : ENGG APPLICATIONS CONSUL

Page 2 of 2

5. FAN DATA

SUPPLY FAN

Type = 7:Backward inclined or air foil
Static = 1.75 in wg
Efficiency = 54 %
Configuration = 1 Draw-thru

RETURN FAN

Type = 1:(Fan does not exist)

6. ACCESSORY DEVICES AND SYSTEMS

PREHEAT COIL

Setpoint temperature = 60.0 F

OUTDOOR AIR ECONOMIZER CONTROL

(Not used)

VENTILATION AIR RECLAIM

(Not used)

HUMIDITY CONTROL

Upper RH setpoint = 50 %

Lower RH setpoint = 0 %

7. MISCELLANEOUS SYSTEM DATA

Cooling coil bypass factor = 0.050

Type of supplemental heating = 1 Not Used

AIR SYSTEM DESCRIPTION

Name : AHU-3

10-08-90

Carrier Hourly Analysis Program

6022890201

Prepared By : ENGG APPLICATIONS CONSUL

Page 1 of 2

1. SYSTEM NAME AND TYPE

System Name = AHU-3
 System Class = Constant Volume
 System Type = (CV/RH) Constant Volume w/ Terminal Reheat
 Number of Zones = 10

2. SPACE SELECTION (see separate printout)

3. THERMOSTAT & EQUIPMENT SCHEDULING DATA

Operation Period	Thermostat Setpoints		Ventilation Dampers
	Cooling	Heating	
Occupied	75.0 F	68.0 F	OPEN
Unoccupied	75.0 F	68.0 F	OPEN

Weekday : Occupied Period Begins at 0 ; Duration = 24 hrs
 Saturday : Occupied Period Begins at 0 ; Duration = 24 hrs
 Sunday : Occupied Period Begins at 0 ; Duration = 24 hrs
 Design Day : Occupied Period Begins at 0 ; Duration = 24 hrs

4. SUPPLY, VENTILATION, RETURN AIR DATA

SUPPLY AIR

Supply air flow rate = 17175.00 CFM
 Supply temperature control = 1 Constant

VENTILATION AIR

Nominal ventilation flow rate = 4293.00 CFM
 Minimum ventilation flow rate = 4293.00 CFM
 Damper leak rate = 5 % of vent air

RETURN AIR

Zone exhaust air flow rate = 4293.00 CFM
 Zone exhaust fan power = 0.0 kW
 Is a return plenum used ? N

SIMPLE SPACE DESCRIPTION

Space Name : 104 RH-23 2 1

09-13-90

Prepared By : ENGG APPLICATIONS CONSUL

6022890201

Carrier Hourly Analysis Program

Page 1 of 1

	Walls	Roof	Glass		
U-Value :	0.066	0.060	1.060	Building Weight :	M
Weight :	100	L		Glass Factor :	1.00
Color :	D	D		Internal Shades ?	N

People : sqft/person = 247.0 Schedule = 3 Activity Level = 2
 Lights : W/sqft = 2.59 Schedule = 4 Wattage Mult. = 1.20
 : Fixture Type = 1 Recessed, not vented

SPACE NAME = 104 RH-23 2 1

		Floor Area :	247.0 sqft
Exposure :	SW	E Roof Area :	0.0 sqft
Wall Area :	0.0	0.0 Current	
Glass Area :	0.0	0.0 Elements :	El,In

ADDITIONAL ELEMENT - Other Electric

W/sqft	=	3.36
Total Watts	=	830
Schedule No.	=	3

ADDITIONAL ELEMENT - Infiltration

Cooling	:	0.06 CFM/sqft	=	15 CFM
Heating	:	0.09 CFM/sqft	=	22 CFM
Typical	:	0.09 CFM/sqft	=	22 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 107 RH-24 2 1 09-13-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.066 Roof 0.060 Glass 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 143.8 Schedule = 3 Activity Level = 2
Lights : W/sqft = 2.23 Schedule = 4 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 107 RH-24 2 1

Floor Area : 575.0 sqft
Exposure : SW E Roof Area : 0.0 sqft
Wall Area : 0.0 0.0 Current
Glass Area : 0.0 0.0 Elements : El,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 5.77
Total Watts = 3,320
Schedule No. = 3

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.06 CFM/sqft = 35 CFM
Heating : 0.09 CFM/sqft = 52 CFM
Typical : 0.09 CFM/sqft = 52 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 217-220 RH-28 2 M 09-13-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

Walls Roof Glass
U-Value : 0.066 0.060 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 246.5 Schedule = 3 Activity Level = 2
Lights : W/sqft = 1.46 Schedule = 4 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 217-220 RH-28 2 M

Floor Area : 986.0 sqft
Exposure : SE E Roof Area : 986.0 sqft
Wall Area : 465.0 0.0 Current
Glass Area : 0.0 0.0 Elements : El, In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 3.37
Total Watts = 3,320
Schedule No. = 3

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.06 CFM/sqft = 59 CFM
Heating : 0.09 CFM/sqft = 89 CFM
Typical : 0.09 CFM/sqft = 89 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 119 RH-1 3 M/1 09-13-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.066 Roof 0.060 Glass 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 262.7 Schedule = 3 Activity Level = 2
Lights : W/sqft = 1.22 Schedule = 4 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 119 RH-1 3 M/1

Exposure : NE SE Floor Area : 788.0 sqft
Wall Area : 472.5 375.0 Roof Area : 788.0 sqft
Glass Area : 0.0 0.0 Current Elements : El,Gr,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 3.16
Total Watts = 2,490
Schedule No. = 3

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 788.0 sqft
Perimeter = 56.5 ft
Depth = 0.0 ft

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.06 CFM/sqft = 47 CFM
Heating : 0.09 CFM/sqft = 71 CFM
Typical : 0.09 CFM/sqft = 71 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 117,118 RH-7,4 3 M/1

09-13-90

Prepared By : ENGG APPLICATIONS CONSUL

6022890201

Carrier Hourly Analysis Program

Page 1 of 1

	Walls	Roof	Glass		
U-Value :	0.066	0.060	1.060	Building Weight	: M
Weight :	100	L		Glass Factor	: 1.00
Color :	D	D		Internal Shades	? N

People : sqft/person = 185.7 Schedule = 3 Activity Level = 2
 Lights : W/sqft = 1.48 Schedule = 4 Wattage Mult. = 1.20
 : Fixture Type = 1 Recessed, not vented

 SPACE NAME = 117,118 RH-7,4 3 M/1

		Floor Area	:	1,300.0 sqft
Exposure	:	NE	E	Roof Area : 1,300.0 sqft
Wall Area	:	780.0	0.0	Current
Glass Area	:	0.0	0.0	Elements : El,Gr,In

ADDITIONAL ELEMENT - Other Electric

W/sqft	=	4.47
Total Watts	=	5,810
Schedule No.	=	3

ADDITIONAL ELEMENT - Ground

Slab Floor Area	=	1,300.0 sqft
Perimeter	=	52.0 ft
Depth	=	0.0 ft

ADDITIONAL ELEMENT - Infiltration

Cooling	:	0.06 CFM/sqft	=	78 CFM
Heating	:	0.09 CFM/sqft	=	117 CFM
Typical	:	0.09 CFM/sqft	=	117 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 101 RH-2 3 1 09-13-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.066 Roof 0.060 Glass 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 237.7 Schedule = 3 Activity Level = 2
Lights : W/sqft = 2.02 Schedule = 4 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 101 RH-2 3 1

Floor Area : 713.0 sqft
Exposure : NE E Roof Area : 0.0 sqft
Wall Area : 0.0 0.0 Current
Glass Area : 0.0 0.0 Elements : El,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 3.49
Total Watts = 2,490
Schedule No. = 3

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.06 CFM/sqft = 43 CFM
Heating : 0.09 CFM/sqft = 64 CFM
Typical : 0.09 CFM/sqft = 64 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 201 RH-3 3 M 09-13-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

Walls Roof Glass
U-Value : 0.066 0.060 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 270.0 Schedule = 3 Activity Level = 2
Lights : W/sqft = 1.77 Schedule = 4 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 201 RH-3 3 M

Floor Area : 270.0 sqft
Exposure : NE E Roof Area : 270.0 sqft
Wall Area : 0.0 0.0 Current
Glass Area : 0.0 0.0 Elements : El,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 6.15
Total Watts = 1,660
Schedule No. = 3

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.06 CFM/sqft = 16 CFM
Heating : 0.09 CFM/sqft = 24 CFM
Typical : 0.09 CFM/sqft = 24 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 202,203 RH-5,9 3 M 09-13-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.066 Roof 0.060 Glass 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 470.0 Schedule = 3 Activity Level = 2
Lights : W/sqft = 2.60 Schedule = 4 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 202,203 RH-5,9 3 M

Exposure : NE E Floor Area : 982.0 sqft
Wall Area : 0.0 0.0 Roof Area : 982.0 sqft
Glass Area : 0.0 0.0 Current Elements : El,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 3.38
Total Watts = 3,320
Schedule No. = 3

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.06 CFM/sqft = 59 CFM
Heating : 0.09 CFM/sqft = 88 CFM
Typical : 0.09 CFM/sqft = 88 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 102 RH-6 3 1 09-13-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

Walls Roof Glass
U-Value : 0.066 0.060 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 72.0 Schedule = 3 Activity Level = 2
Lights : W/sqft = 4.44 Schedule = 4 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 102 RH-6 3 1

Floor Area : 72.0 sqft
Exposure : NE E Roof Area : 0.0 sqft
Wall Area : 0.0 0.0 Current
Glass Area : 0.0 0.0 Elements : El,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 11.53
Total Watts = 830
Schedule No. = 3

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.06 CFM/sqft = 4 CFM
Heating : 0.09 CFM/sqft = 6 CFM
Typical : 0.09 CFM/sqft = 6 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 105 RH-8 3 1

09-13-90

Prepared By : ENGG APPLICATIONS CONSUL

6022890201

Carrier Hourly Analysis Program

Page 1 of 1

	Walls	Roof	Glass		
U-Value :	0.066	0.060	1.060	Building Weight :	M
Weight :	100	L		Glass Factor :	1.00
Color :	D	D		Internal Shades ?	N

People : sqft/person = 123.5 Schedule = 3 Activity Level = 2
 Lights : W/sqft = 2.59 Schedule = 4 Wattage Mult. = 1.20
 : Fixture Type = 1 Recessed, not vented

SPACE NAME = 105 RH-8 3 1

		Floor Area :	247.0 sqft
Exposure :	NE	E Roof Area :	0.0 sqft
Wall Area :	0.0	0.0 Current	
Glass Area :	0.0	0.0 Elements :	E1,In

ADDITIONAL ELEMENT - Other Electric

W/sqft	=	6.72
Total Watts	=	1,660
Schedule No.	=	3

ADDITIONAL ELEMENT - Infiltration

Cooling	:	0.06 CFM/sqft	=	15 CFM
Heating	:	0.09 CFM/sqft	=	22 CFM
Typical	:	0.09 CFM/sqft	=	22 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 204-207 & 212-215 RH-IO
Prepared By : ENGG APPLICATIONS CONSUL
Carrier Hourly Analysis Program

09-13-90
6022890201
Page 1 of 1

	Walls	Roof	Glass		
U-Value :	0.066	0.060	1.060	Building Weight	: M
Weight :	100	L		Glass Factor	: 1.00
Color :	D	D		Internal Shades	? N

People : sqft/person = 182.6 Schedule = 3 Activity Level = 2
 Lights : W/sqft = 1.94 Schedule = 4 Wattage Mult. = 1.20
 : Fixture Type = 1 Recessed, not vented

SPACE NAME = 204-207 & 212-215 RH-IO

		Floor Area	:	1,643.0 sqft
Exposure	:	NE	E	Roof Area
Wall Area	:	0.0	0.0	Current
Glass Area	:	0.0	0.0	Elements
				: Li,El,In

ADDITIONAL ELEMENT - Lights

W/sqft	=	0.22	Schedule No.	=	4
Total Watts	=	361	Wattage Multiplier	=	1.00
Fixture Type	=	3 (Free-hanging)			

ADDITIONAL ELEMENT - Other Electric

W/sqft	=	4.55
Total Watts	=	7,470
Schedule No.	=	3

ADDITIONAL ELEMENT - Infiltration

Cooling	:	0.06 CFM/sqft	=	99 CFM
Heating	:	0.09 CFM/sqft	=	148 CFM
Typical	:	0.09 CFM/sqft	=	148 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 116A,116 RH-11,12 3 M/1 09-13-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.066 Roof 0.060 Glass 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 325.0 Schedule = 3 Activity Level = 2
Lights : W/sqft = 1.15 Schedule = 4 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 116A,116 RH-11,12 3 M/1

Exposure : NE E Floor Area : 975.0 sqft
Wall Area : 398.0 0.0 Roof Area : 975.0 sqft
Glass Area : 0.0 0.0 Current
Elements : Wl,El,Gr,In

ADDITIONAL ELEMENT - Wall

Weight = L (lb/sqft) Exposure = NE
Color = D Net Area = 187.0 sqft
U-Value = 0.600 BTU/hr/sqft/F

ADDITIONAL ELEMENT - Other Electric

W/sqft = 3.41
Total Watts = 3,320
Schedule No. = 3

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 975.0 sqft
Perimeter = 39.0 ft
Depth = 0.0 ft

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.06 CFM/sqft = 59 CFM
Heating : 0.09 CFM/sqft = 88 CFM
Typical : 0.09 CFM/sqft = 88 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 216 RH-13 3 M 09-13-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.066 Roof 0.060 Glass 1.060 Building Weight : M
Weight : 100 L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 166.7 Schedule = 3 Activity Level = 2
Lights : W/sqft = 2.88 Schedule = 4 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = 216 RH-13 3 M

Exposure : NE E Floor Area : 500.0 sqft
Wall Area : 300.0 0.0 Roof Area : 500.0 sqft
Glass Area : 0.0 0.0 Current
Glass Area : 0.0 0.0 Elements : El,In,Gr

ADDITIONAL ELEMENT - Other Electric

W/sqft = 4.98
Total Watts = 2,490
Schedule No. = 3

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.06 CFM/sqft = 30 CFM
Heating : 0.09 CFM/sqft = 45 CFM
Typical : 0.09 CFM/sqft = 45 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 500.0 sqft
Perimeter = 20.0 ft
Depth = 0.0 ft

AIR SYSTEM DESCRIPTION

Name : AHU-3

10-08-90

Carrier Hourly Analysis Program

6022890201

Prepared By : ENGG APPLICATIONS CONSUL

Page 2 of 2

5. FAN DATA

SUPPLY FAN

Type = 7:Backward inclined or air foil
Static = 1.75 in wg
Efficiency = 54 %
Configuration = 1 Draw-thru

RETURN FAN

Type = 1:(Fan does not exist)

6. ACCESSORY DEVICES AND SYSTEMS

PREHEAT COIL

Setpoint temperature = 60.0 F

OUTDOOR AIR ECONOMIZER CONTROL

(Not used)

VENTILATION AIR RECLAIM

(Not used)

HUMIDITY CONTROL

Upper RH setpoint = 50 %
Lower RH setpoint = 0 %

7. MISCELLANEOUS SYSTEM DATA

Cooling coil bypass factor = 0.050
Type of supplemental heating = 1 Not Used

AIR SYSTEM DESCRIPTION

Name : AHU-4 10-08-90
 Carrier Hourly Analysis Program 6022890201
 Prepared By : ENGG APPLICATIONS CONSUL Page 1 of 2

1. SYSTEM NAME AND TYPE

System Name = AHU-4
 System Class = Constant Volume
 System Type = (CV/RH) Constant Volume w/ Terminal Reheat
 Number of Zones = 8

2. SPACE SELECTION (see separate printout)

3. THERMOSTAT & EQUIPMENT SCHEDULING DATA

Operation Period	Thermostat Setpoints		Ventilation Dampers
	Cooling	Heating	
Occupied	75.0 F	68.0 F	OPEN
Unoccupied	75.0 F	68.0 F	OPEN

Weekday : Occupied Period Begins at 0 ; Duration = 24 hrs
 Saturday : Occupied Period Begins at 0 ; Duration = 24 hrs
 Sunday : Occupied Period Begins at 0 ; Duration = 24 hrs
 Design Day : Occupied Period Begins at 0 ; Duration = 24 hrs

4. SUPPLY, VENTILATION, RETURN AIR DATA

SUPPLY AIR

Supply air flow rate = 10565.00 CFM
 Supply temperature control = 1 Constant

VENTILATION AIR

Nominal ventilation flow rate = 2641.00 CFM
 Minimum ventilation flow rate = 2641.00 CFM
 Damper leak rate = 5 % of vent air

RETURN AIR

Zone exhaust air flow rate = 2641.00 CFM
 Zone exhaust fan power = 0.0 kW
 Is a return plenum used ? N

AIR SYSTEM DESCRIPTION

Name : AHU-4

10-08-90

Carrier Hourly Analysis Program

6022890201

Prepared By : ENGG APPLICATIONS CONSUL

Page 2 of 2

5. FAN DATA

SUPPLY FAN

Type = 2:Forward curved
Static = 1.75 in wg
Efficiency = 54 %
Configuration = 1 Draw-thru

RETURN FAN

Type = 1:(Fan does not exist)

6. ACCESSORY DEVICES AND SYSTEMS

PREHEAT COIL

Setpoint temperature = 60.0 F

OUTDOOR AIR ECONOMIZER CONTROL

(Not used)

VENTILATION AIR RECLAIM

(Not used)

HUMIDITY CONTROL

Upper RH setpoint = 50 %
Lower RH setpoint = 0 %

7. MISCELLANEOUS SYSTEM DATA

Cooling coil bypass factor = 0.050
Type of supplemental heating = 1 Not Used

PLANT DESCRIPTIONS

Plant : #2 OIL FIRED STM BOILER 02-05-91
 Prepared By : ENGG APPLICATIONS CONSUL 6100190202
 Carrier Hourly Analysis Program Page 1 of 1

1 PLANT NAME AND TYPES

Class = Individual Plants
 Name = #2 OIL FIRED STM BOILER
 Cooling Plant Type = Water Cooled Centrifugal
 Heating Plant Type = Combustion

2 AIR SYSTEM SELECTION

Air System Name	Mult	Air System Name	Mult
AHU-2	1	AHU-3	1
AHU-4	1		

3a COOLING PLANT DATA (Water Cooled Centrifugal)

PLANT DATA
 Estimated maximum cooling coil load = 94.93 Ton
 Capacity at 85.0 F condenser entering water = 148.00 Ton
 Input power rate at 85.0 F condenser entering water = 0.850 kW/Ton
 Is chilled water reset used ? N
 Number of sequenced chillers = 1

HEAT SINK DATA
 Heat sink type = Open Tower
 Minimum condenser entering water temperature = 60.0 F

3b HEATING PLANT DATA (Combustion)

Estimated maximum heating coil load = 933.14 MBH
 Fuel type = Fuel Oil
 Rated plant output = 1016.4 MBH
 Type of heating = Hydronic
 Is plant efficiency computer generated ? N
 Seasonal plant efficiency = 61 %

4 PUMP SYSTEM DATA

Chilled water pumping system head = 60.00 ft wg
 Chilled water pumping system delta T = 10.00 F
 Condenser water pumping system head = 30.00 ft wg
 Condenser water pumping system delta T = 10.00 F
 Hot water pumping system head = 30.00 ft wg
 Hot water pumping system delta T = 20.00 F

BUILDING DESCRIPTION

Building : BUILDING #327 02-05-91
 Prepared By: ENGG APPLICATIONS CONSUL 6100190202
 Carrier Hourly Analysis Program Page 1 of 1

1. BUILDING INPUTS

BUILDING NAME = BUILDING #327

MISCELLANEOUS ELECTRIC

Maximum power = 0.0 kW
 Power schedule = 1

DOMESTIC WATER HEATING

Is a domestic hot water system used ? Y
 Maximum hourly hot water use = 60.0 gal
 Hot water schedule = 1
 Average entering water temperature = 55.0 F
 Average hot water supply temperature = 140.0 F
 Heating plant type = 2 : Combustion
 Fuel type = 2 : Fuel Oil
 Plant capacity = 1016.4 MBH
 Is plant efficiency computer generated ? N
 Annual plant efficiency = 61 %

OTHER INPUTS

Additional building floor area = 0.0 sqft
 Electrical generating efficiency = 100.00 %

2. PLANT SELECTION

Plant Name	Mult	Plant Name	Mult
#2 OIL FIRED STM BOILER	1		

3. FUEL & ELECTRIC RATE SELECTION

Fuel or Energy	No.	Name of Rate Schedule	Currency
Electric	10	GENERIC	MBTU
Natural Gas	5	NATURAL GAS (GENERIC)	MBTU
Fuel Oil	4	DOMESTIC FUEL OIL #2	MBTU
Propane	10	Empty...	MBTU
Remote Source Heating	6	HEAVY FUEL OIL #6	MBTU
Remote Source Cooling	10	Empty...	MBTU

MONTHLY ENERGY COSTS

Building : BUILDING #327
 Site : FT. BELVOIR, VIRGINIA
 Prepared By : ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

02-05-91
 6100190202

 TABLE 1. HVAC COSTS (MBTU)

Month	Electric	Natural Gas	Fuel Oil	Propane	Remote Heating	Remote Cooling
Jan	137	0	610	0	0	0
Feb	125	0	527	0	0	0
Mar	143	0	513	0	0	0
Apr	148	0	454	0	0	0
May	167	0	429	0	0	0
June	192	0	382	0	0	0
July	228	0	383	0	0	0
Aug	220	0	383	0	0	0
Sept	178	0	412	0	0	0
Oct	156	0	461	0	0	0
Nov	141	0	495	0	0	0
Dec	139	0	575	0	0	0
Tot.	1,973	0	5,624	0	0	0

 TABLE 2. NON-HVAC COSTS (MBTU)

Month	Electric	Natural Gas	Fuel Oil	Propane	Remote Heating
Jan	70	0	16	0	0
Feb	63	0	14	0	0
Mar	73	0	16	0	0
Apr	69	0	16	0	0
May	72	0	16	0	0
June	70	0	16	0	0
July	70	0	16	0	0
Aug	75	0	17	0	0
Sept	64	0	14	0	0
Oct	75	0	17	0	0
Nov	69	0	16	0	0
Dec	68	0	15	0	0
Tot.	838	0	189	0	0

FUEL OIL COSTS

Building : BUILDING #327

02-05-91

Site : FT. BELVOIR, VIRGINIA

6100190202

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Page 1 of 1

TABLE 1. MONTHLY COMPONENT CHARGES (MBTU)

Month	Energy Charges	Fixed Charges	Taxes	Total Charges
Jan	626	0	0	626
Feb	542	0	0	542
Mar	530	0	0	530
Apr	470	0	0	470
May	445	0	0	445
June	398	0	0	398
July	399	0	0	399
Aug	400	0	0	400
Sept	426	0	0	426
Oct	478	0	0	478
Nov	511	0	0	511
Dec	590	0	0	590
Tot.	5,812	0	0	5,812

TABLE 2. MONTHLY TOTALS

Month	Charges (MBTU)	Energy (Gallon)	Effective Rate (MBTU/Gallon)
Jan	626	4,511	0.13870
Feb	542	3,905	0.13870
Mar	530	3,819	0.13870
Apr	470	3,387	0.13870
May	445	3,210	0.13870
June	398	2,867	0.13870
July	399	2,874	0.13870
Aug	400	2,882	0.13870
Sept	426	3,075	0.13870
Oct	478	3,444	0.13870
Nov	511	3,682	0.13870
Dec	590	4,252	0.13870
Tot.	5,812	41,907	0.13870

THE EST. MAX. HTG. COIL LOAD (933,14 MBH) IS WORST CASE AND PROBABLY OCCURES DURING WINTER BUT ONLY REPRESENTS THE SYSTEMS SIMULATED,

∴ WE WILL NOT NEED AS LARGE A BOILER AS IS INDICATED ON PLANT DESCRIPTION.

IF WE TAKE THE AVERAGE MBTU FOR DAYS IN APRIL (WORST CASE) AND ADD ABOUT 20% AS A SAFETY FACTOR THE RESULTANT LOAD WILL BE SUFFICIENT TO SELECT A LOCAL STEAM BOILER TO ACCOMMODATE THE STEAM REQUIREMENT OF THE BUILDING DURING THE SUMMER.

MONTHLY MBTU EXPENDED FOR SUMMER REHEAT
AND DOMESTIC HOT WATER GENERATION AS SIMULATED
BY CARRIER E-20 COMPUTER PROGRAM.

APR	470 1/2	=	235 MBTU	1910 GALS
MAY		=	445	3210
JUNE		=	398	2867
JULY		=	399	2874
AUG.		=	400	2882
SEPT.		=	426	3075
OCT.	478 1/2	=	239	1722
			<hr/>	<hr/>
			2542 MBTU	18,540 GALS.

● REHEAT & DOM. HOT WATER

AVG. MBTU/DAY



APR = 15.66 ← WORST CASE

MAY = 14.36

JUNE = 13.27

JULY = 12.87

AUG = 12.91

SEPT = 14.2

OCT = 15.42

SAY 16 MBTU / 24 HRS = 667 MBH / HR.

667 x 1.20 = 800.4 MBH LOAD

● SELECT: PEERLESS SERIES 7FDA INDUSTRIAL/COMMERCIAL
(80*WP) CAST IRON BOILER-BURNER UNIT

↑ MODEL 709 FDA SU, 33 BHP, 10" VENT, 9 SECTIONS

OVERALL EFF W/ PIPING LOSSES & PICKUP = 61% (2) 4" TAPS
3" RET

INPUT @ 9.6 GPH, #2 = 1331.5 MBH 50" x 35" W x 60" H

CORRECTED NET OUTPUT = 816.3

SELECT: 3000 GAL OIL STORAGE TANK (UNDERGROUND)

5'-4" φ x 18' (5-2" TAPS) 2750 LBS HIGHLAND 7 GA.

CONSTRUCTION COST ESTIMATE

DATE PREPARED
FEB 1991

SHEET OF

PROJECT
ENERGY SAVINGS OPPORTUNITY SURVEY

LOCATION
FT. BELVOIR, VIRGINIA BLDG 327

ARCHITECT ENGINEER
ENGINEERING APPLICATIONS CONSULTANTS

BASIS FOR ESTIMATE

CODE A (No design completed)

CODE B (Preliminary design)

CODE C (Final design)

OTHER (Specify) _____

DRAWING NO.
OIL FIRED MP STEAM BOILER

ESTIMATOR

CHECKED BY

SUMMARY	QUANTITY		LABOR		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	PER UNIT	TOTAL	
BOILER HOUSE ADDITION	144	SF	23.	3312	14.	2016	5328
OIL FIRED MP STEAM BOILER	1	EA		2000		9830	11,830
3000 GAL OIL STOR. EQUIP.		LS		5000		10,743	15,743
MISC OIL HOOK-UP COSTS		LS		240		306	546
VENT CHIMNEY 10"φ	17	EA	7.30	124	58.30	991	1115.
FITTINGS, FINISHING, TOP, ETC.	1	LS		109		1687	1796.
AUTO DRAFT REGULATOR	1	EA		19		141	160.
STEAM PIPING, FITTINGS, VALVES, ETC.		LS		2400		918	3318.
CONDENSATE PIPING TRAPS ETC.		LS		649		898	1547.
RETURN FEEDWATER SYSTEM		LS		880		574	1454.
ELECTRICAL WORK, LIGHTS & POWER	144	SF	3.70	535	5.50	792	1327.
SUB-TOTAL				15,268		28,896	44,164
LABOR MARKUP 21%				3206			3206
TAXES 4.5%						1300	1300
SUB-TOTAL							48,670
OVERHEAD 10%							4,867
SUB-TOTAL							53,537
PROFIT 10%							5,354
SUB-TOTAL							58,891
TOTAL							\$ 58,891

STEAM VALVES, PIPING, FITTINGS, VALVES ETC.

	L	M	T
4" STM. VALVES OS 1/4	120	215	335
BOILER DRAIN VALVE	5.80	11.90	17.70
4" PIPING (40')	9.60	6.77	11.03
PIPING ()			
PIPING ()			
III 4" WN/FLANGE (4)	36.	14.80	3.82
90° ELL (10)	71.	14.90	7.65
TEE (2)	120	27	12.75
4 WELDING JOINT (20)	39.82	-	
	<u>2400</u>	<u>918</u>	<u>3318</u>

CONDENSATE PIPING, TRAPS

	L	M	T
2" PIPING (40')	6.25	3.30	.67
203 (2) TRAP ASSEMBLY	90	320	410
MISC 10%	43		
	<u>473</u>	<u>879</u>	<u>1352</u>
WELDING LABOR (8)	22	2.39	24.39
	649	898	1547

RETURN FEEDWATER

	L	M	T
2" PIPING (50')	5.85	2.68	.63
VALVE	40	84	124.
MISC FITTINGS	25	30	55.
	<u>358</u>	<u>280</u>	<u>638</u>
WELDING LABOR (10)	22	2.39	24.39
CONTROL CHANGES	300	270	570
	<u>880</u>	<u>327.50</u>	<u>574</u>
		574	1454

186 ● ALL FUEL CHIMNEY, UL LISTED, DOUBLE WALL, 304 INNER - STL OUTER

	L	M	T
(17) STR 10" φ	7.30	58.30	65.60
(2) 45° EL	14.60	195	209.60
90° TEE	16.70	214	230.70
PLT. SUPPORT	17.55	123	140.55
ROOF THIMBLE	17.55	310	327.55
ROOF SUP. ASSEM.	18.45	405	423.45
STACK CAP	8.75	245	253.75
	<u>233.</u>	<u>2678</u>	<u>2911</u>

OIL HOOK-UP

	L	M	T
✓ ● FILTER	9.90	9.95	19.95
✓ VALVE	8.25	4.25	12.50
✓ VALVE	16.50	8.60	25.00
✓ 2" VENT CAP	6.20	7.50	13.70
✓ TUBE (10')	2.53	1.28	3.81
✓ 2" STL V.P. (20')	6.25	4.08	11.00
✓ LOUVERS (2)	7.20	24.00	31.20
✓ DAMPERS (2)	17.70	58.30	76.
✓ FILL CAP	6.20	7.50	13.70
	<u>240</u>	<u>306</u>	<u>546</u>

$1,331,500 / 4000 = 330 \text{ sq ft} \times 1.5 = 495$
 $= 3.4 \phi$

OIL STORAGE

REQD. 3000 GAL UNDERGROUND, STEEL, DOUBLE WALL, UL LISTED,

STI-P3 CORROSION PROTECTION 30 YR WARRANTY

	L	M	T		L	M	T
TANK	380	5200	5580				
HOLD DNS.	63	450	513				
1/2" PIPING (26')	4.18	1.69	6.32	(40') INCREASED =	6.60	9.20	16.51
FOOT VALUE	9.90	31.25	41.15				
PUMP (2)	59	395	454				
TANK GAGE SYS	79	715	794				
VALVES (2)	8.25	7.75	16.00				
SHUT OFF (4)	19.80	11.75	31.55				
PAD (8) CY	25.	94.00	119				
(80) EXCAVATION CY	46	-	-				
	<u>5000</u>	<u>8413</u>	<u>13,413</u>				

LEAK DETECTION SYS 2 PROBES MASTER W/ALARM	M	725	
SOIL PROBE		650	
TANK PROBE		650	
LF CABLE (30)		.68	20
TEST KIT		<u>285</u>	
		<u>2330</u>	

5000 + 10,743 = 15,743

BUILDING 331

DESIGN PARAMETERS, SHGs

Location : FT. BELVOIR, VIRGINIA
 Prepared By : ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

02-04-91
 6100190202
 Page 1 of 1

DESIGN WEATHER PARAMETERS

City Name.....: FT. BELVOIR
 Location.....: VIRGINIA
 Latitude.....: 38.4 deg
 Elevation.....: 69.0 ft
 Summer Design Dry Bulb Temp.....: 90.0 F
 Summer Design Wet Bulb Temp.....: 75.0 F
 Daily Temperature Range.....: 23.0 F
 Winter Design Dry Bulb Temp.....: 12.0 F
 Atmospheric Clearness Number.....: 1.00

TABLE 1. MAXIMUM SOLAR HEAT GAINS - AVERAGE DAYS
 (BTU/hr/sqft)

Month	NE	E	SE	S	SW	W	NW	N	Hor
Jan	24.2	61.1	97.3	110.1	97.3	61.1	24.2	24.2	80.0
Feb	31.8	74.8	105.7	113.8	105.7	74.8	31.8	31.8	107.2
Mar	40.8	87.0	106.9	108.0	106.9	87.0	40.8	40.8	136.8
Apr	60.0	97.4	104.4	97.2	104.4	97.4	60.0	49.3	164.3
May	74.9	103.0	98.4	84.0	98.4	103.0	74.9	54.9	181.8
Jun	85.1	109.3	97.5	79.2	97.5	109.3	85.1	57.9	195.2
Jul	80.6	106.7	98.1	81.4	98.1	106.7	80.6	56.4	189.3
Aug	69.1	104.1	105.7	94.4	105.7	104.1	69.1	52.2	177.6
Sep	52.3	99.3	114.8	111.6	114.8	99.3	52.3	45.4	158.1
Oct	36.4	88.3	117.7	122.9	117.7	88.3	36.4	36.4	128.2
Nov	26.7	66.5	101.8	113.3	101.8	66.5	26.7	26.7	89.4
Dec	21.4	53.0	87.6	100.9	87.6	53.0	21.4	21.4	68.4

TABLE 2. MAXIMUM SOLAR HEAT GAINS - DESIGN DAYS
 (BTU/hr/sqft)

Month	NE	E	SE	S	SW	W	NW	N	Hor
Jan	20.4	158.9	243.9	253.8	243.9	158.9	20.4	20.4	142.0
Feb	53.0	189.1	246.5	237.5	246.5	189.1	53.0	24.7	187.7
Mar	95.9	219.8	234.5	200.7	234.5	219.8	95.9	29.4	229.0
Apr	141.6	224.4	200.1	146.7	200.1	224.4	141.6	34.1	256.0
May	166.1	220.1	170.7	104.6	170.7	220.1	166.1	37.4	268.0
Jun	173.2	215.4	156.7	87.8	156.7	215.4	173.2	47.4	269.7
Jul	163.7	215.7	166.5	101.4	166.5	215.7	163.7	38.3	264.7
Aug	136.4	216.6	193.1	141.7	193.1	216.6	136.4	35.8	251.3
Sep	90.3	207.2	224.7	194.9	224.7	207.2	90.3	30.6	221.4
Oct	52.0	182.7	238.2	230.6	238.2	182.7	52.0	25.5	184.4
Nov	20.7	156.1	239.8	249.9	239.8	156.1	20.7	20.7	141.3
Dec	18.5	141.9	236.4	254.2	236.4	141.9	18.5	18.5	122.2

MASTER SCHEDULE SUMMARY

Prepared By : ENGG APPLICATIONS CONSUL

02-04-91

Carrier Hourly Analysis Program

6100190202

MASTER SCHEDULE 1. OCCUPANCY Hourly Percentages

Hour ---->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	0	0	0	0	0	0	10	50	100	100	100	100
Saturday	0	0	0	0	0	0	5	5	5	10	10	10
Sunday	0	0	0	0	0	0	0	5	5	5	5	5
DESIGN	0	0	0	0	0	10	20	100	100	100	100	100

Hour ---->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	100	100	100	100	80	50	10	10	5	5	0	0
Saturday	10	10	10	5	5	5	5	5	0	0	0	0
Sunday	5	5	5	5	5	5	0	0	0	0	0	0
DESIGN	100	100	100	100	100	100	100	20	10	0	0	0

MASTER SCHEDULE 2. LIGHTING Hourly Percentages

Hour ---->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	5	5	5	5	5	5	20	80	100	100	100	100
Saturday	5	5	5	5	5	5	15	15	20	40	50	50
Sunday	5	5	5	5	5	5	5	15	20	30	30	30
DESIGN	10	10	10	10	10	20	50	100	100	100	100	100

Hour ---->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	100	100	100	100	90	70	40	30	20	20	5	5
Saturday	50	50	50	50	50	40	30	20	5	5	5	5
Sunday	30	30	30	20	20	20	20	5	5	5	5	5
DESIGN	100	100	100	100	100	100	100	50	20	10	10	10

MASTER SCHEDULE 3. EQUIPMENT Hourly Percentages

Hour ---->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	5	5	5	5	5	5	20	50	100	100	100	100
Saturday	5	5	5	5	5	5	10	10	15	20	20	20
Sunday	5	5	5	5	5	5	5	10	10	10	10	20
DESIGN	10	10	10	10	10	20	40	100	100	100	100	100

Hour ---->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	100	100	100	100	80	50	20	10	5	5	5	5
Saturday	20	20	20	10	10	10	10	10	5	5	5	5
Sunday	20	15	15	10	10	10	10	5	5	5	5	5
DESIGN	100	100	100	100	100	100	100	40	20	10	10	10

MASTER SCHEDULE SUMMARY

Prepared By : ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

02-04-91
 6100190202

MASTER SCHEDULE 4. DOMESTIC HOT WATER Hourly Percentages

Hour ---->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	0	0	0	0	0	5	10	10	20	20	20	80
Saturday	0	0	0	0	0	2	2	2	5	5	5	5
Sunday	0	0	0	0	0	0	0	2	2	2	2	2
DESIGN	0	0	0	0	0	5	5	20	20	20	20	80

Hour ---->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	80	20	20	20	10	10	5	5	5	2	0	0
Saturday	5	5	5	2	2	2	2	2	0	0	0	0
Sunday	2	2	2	2	2	2	0	0	0	0	0	0
DESIGN	80	20	20	20	10	10	5	5	2	2	0	0

DAY TYPE DATA

Prepared By : ENGG APPLICATIONS CONSUL

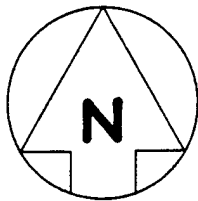
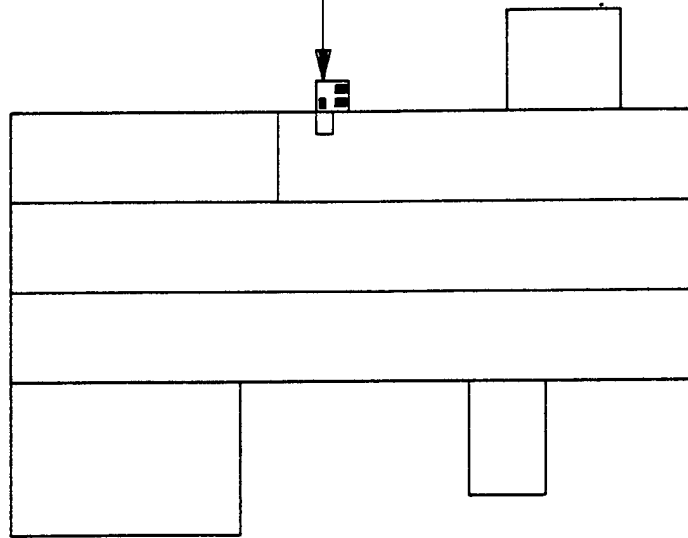
02-04-91

Carrier Hourly Analysis Program

6100190202

Month	DAY TYPE 1 Weekday	DAY TYPE 2 Saturday	DAY TYPE 3 Sunday	Total Days/Month
January	21	4	6	31
February	19	4	5	28
March	22	5	4	31
April	21	4	5	30
May	22	4	5	31
June	21	5	4	30
July	21	4	6	31
August	23	4	4	31
September	19	5	6	30
October	23	4	4	31
November	21	4	5	30
December	20	5	6	31

PROPOSED OIL FIRED
STEAM BOILER & OIL TANK
LOCATION



FIRST FLOOR PLAN

BUILDING 331 KEY PLAN

BUILDING DESCRIPTION

Building : BUILDING 331 (#2 OIL)
 Prepared By: ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

02-04-91
 6100190202
 Page 1 of 1

1. BUILDING INPUTS

BUILDING NAME = BUILDING 331 (#2 OIL)

MISCELLANEOUS ELECTRIC

Maximum power = 0.0 kW
 Power schedule = 1

DOMESTIC WATER HEATING

Is a domestic hot water system used ? Y
 Maximum hourly hot water use = 100.0 gal
 Hot water schedule = 4
 Average entering water temperature = 65.0 F
 Average hot water supply temperature = 140.0 F
 Heating plant type = 2 : Combustion
 Fuel type = 2 : Fuel Oil
 Plant capacity = 1135.0 MBH
 Is plant efficiency computer generated ? N
 Annual plant efficiency = 63 %

OTHER INPUTS

Additional building floor area = 0.0 sqft
 Electrical generating efficiency = 100.00 %

2. PLANT SELECTION

Plant Name	Mult	Plant Name	Mult
#2 Oil Fired Boiler	1		

3. FUEL & ELECTRIC RATE SELECTION

Fuel or Energy	No.	Name of Rate Schedule	Currency
Electric	10	ELECTRIC RATE (GENERIC)	MBTU
Natural Gas	5	NATURAL GAS (GENERIC)	MBTU
Fuel Oil	4	DOMESTIC FUEL OIL #2 (GENERIC)	MBTU
Propane	9	Empty...	MBTU
Remote Source Heating	6	HEAVY FUEL OIL #6 (GENERIC)	MBTU
Remote Source Cooling	9	Empty...	MBTU

FUEL OIL COSTS

Building : BUILDING 331 (#2 OIL)

02-04-91

Site : FT. BELVOIR, VIRGINIA

6100190202

Prepared By : ENGG APPLICATIONS CONSUL

Page 1 of 1

Carrier Hourly Analysis Program

TABLE 1. MONTHLY COMPONENT CHARGES (MBTU)

Month	Energy Charges	Fixed Charges	Taxes	Total Charges
Jan	8	0	0	8
Feb	7	0	0	7
Mar	8	0	0	8
Apr	8	0	0	8
May	8	0	0	8
June	8	0	0	8
July	8	0	0	8
Aug	8	0	0	8
Sept	7	0	0	7
Oct	8	0	0	8
Nov	8	0	0	8
Dec	7	0	0	7
Tot.	91	0	0	91

TABLE 2. MONTHLY TOTALS

Month	Charges (MBTU)	Energy (gallon)	Effective Rate (MBTU/gallon)
Jan	8	55	0.13870
Feb	7	50	0.13870
Mar	8	57	0.13870
Apr	8	55	0.13870
May	8	57	0.13870
June	8	55	0.13870
July	8	55	0.13870
Aug	8	59	0.13870
Sept	7	50	0.13870
Oct	8	59	0.13870
Nov	8	55	0.13870
Dec	7	53	0.13870
Tot.	91	658	0.13870

TOTAL MBTU ESTIMATED FOR HEATING AND AIR CONDITIONING
LABORATORY

IF LAB USES 100% OF EQUIPMENT CAPACITY FOR 40%
OF THE NORMAL OPERATING HOURS (10 HRS) PER DAY

∴

100% LOAD = 1014 MBH & OVERALL SYSTEM EFFICIENCY = 62.4%

THEN INPUT ENERGY REQUIRED = $1014 / 62.4 \times 100 = 1625$ MBH

	WORKDAYS	HRS	(11.71 GPH) x 1625 MBH =	MBTU	GALS
APR	11	44		71.5	516
MAY	22	88		143.	1031
JUNE	21	84		136.5	984
JULY	21	84		136.5	984
AUG	23	92		149.5	1078
SEPT	19	76		123.5	891
OCT	12	48		78.	563
	<u>129</u>	<u>516</u>		<u>838.5</u>	<u>6047</u>

$$516 \text{ HRS.} \times 1625 \text{ MBH} = 838.5 \text{ MBTU}$$

SELECT: 1100 GAL OIL STORAGE
USE (2) 550 GAL TANKS IN BOILER HOUSE ADDITION

TOTAL MBTU ESTIMATED FOR DOMESTIC HOT WATER

APR	=	4 MBTU	28 GAL
MAY	=	8	57
JUNE	=	8	55
JULY	=	8	55
AUG	=	8	59
SEPT	=	7	50
OCT	=	<u>4</u>	<u>30</u>
		47 MBTU	334 GAL
		(46,325.8 MBH)	

GRAND TOTAL		47 MBTU	334 GAL
		<u>838.5</u>	<u>6047</u>
		885.5 MBTU	6381 GALS

$$8,000,000 / 31 \text{ DAYS} = 258.064 \text{ MBH} / 8 \text{ HR} = 32.25 \text{ MBH}$$

$$\text{SAY} = 36 \text{ MBH}$$

331

TOTAL SUMMER LOAD FOR BLDG #331 FROM DISTRIBUTION SYS.

HEATING & AIR CONDITIONING LAB LOAD = 1014

DOMESTIC HOT WATER LOAD = 36
1050

GROSS ENERGY REQD. W/PIPING LOSSES

& PICKUP LOADS = $1050 / 62.5 \times 100 =$

1625 MEH

MUST BE
AVAILABLE

HEATING AND AIR CONDITIONING LABORATORY

BOILER SIZING (WORST CASE = FULL LOAD)

HUMIDIFIERS = 150 lbs/hr MAX. SAY 174 MBH

HTG. H.W. CONV. = MLX. 840 MBH

1014

DOM HW WORST CASE =

36 MBH

1050 MBH

SELECT: PEERLESS SERIES 7FDA INDUSTRIAL/COMMERCIAL
CAST IRON BOILER-BURNER UNIT # 712 FDA SU
w/ GROSS IBR OUTPUT OF 1488 MBH

NET = 1135 MBH w/OVERALL EFF. OF 62.4% INCLUDING

ALLOWANCE FOR PIPING LOSS & PICKUP LOAD

12" VENT, 13 GPH INPUT, 45 BHP

66" L x 35" W x 60" h, (2) 4" SUPPLY, (1) 3" RET.

CONSTRUCTION COST ESTIMATE

DATE PREPARED
FEB 1991

SHEET **OF**

PROJECT

ENERGY SAVINGS OPPORTUNITY SURVEY

BASIS FOR ESTIMATE

- CODE A (No design completed)
- CODE B (Preliminary design)
- CODE C (Final design)
- OTHER (Specify) _____

LOCATION

FT. BELVOIR, VIRGINIA BLDG 331

ARCHITECT ENGINEER

ENGINEERING APPLICATIONS CONSULTANTS

DRAWING NO.

OIL FIRED LP STEAM BOILER

ESTIMATOR

CHECKED BY

SUMMARY	QUANTITY			LABOR		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	PER UNIT	TOTAL		
BOILER HOUSE ADDITION	272	SF	23.	6256	14.	3808	10,064	
OIL FIRED LP STEAM BOILER	1	EA		2450		10,910	13,360	
550 GAL OIL STOR. TANK	2	EA	89	178	1050	2100	2,278.	
OIL LINE, VALVES, HOOK UP	1	LS		355		329	684.	
VENT CHIMNEY 12"Ø	18	LF	7.95	143	66.60	1199	1342.	
FITTINGS, FLASHING, TOP	1	LS		119		1905	2024.	
AUTO DRAFT REGULATOR	1	EA		19		157	176.	
STEAM PIPING, FITTINGS, VALVES etc		LS		2220		1250	3470.	
CONDENSATE PIPING TRAPS ETC		LS		896		1124	2020.	
ELECTRICAL WORK LIGHTS/POWER		LS		1000		1500	2500.	
SUB-TOTAL				13,636		24,282	37,918	
LABOR MARKUP 21%				2864			2864	
TAXES 4.5%						1093	1093	
SUB-TOTAL							41,875	
OVERHEAD 10%							4,188	
SUB-TOTAL							46,063	
PROFIT 10%							4,606	
SUB-TOTAL							50,669	
TOTAL							50,670	

ALL FUEL CHIMNEY, UL LISTED, DOUBLE WALL, 304 INNER - STL OUTER

(18')	STR	12" Ø	L	M	T
(2)	45° EL		15.95	220	235.95
	90° TEE		17.55	251	268.55
	PLT. SUPPORT		19.50	129	148.50
	ROOF THIMBLE		19.50	325	344.50
	ROOF SUP. ASSEM.		21.	475	496.
	STACK CAP		9.25	285	294.25
			<u>118.70</u>		
			119	1905	2024

OIL HOOK-UP

		L	M	T
	FILTER	9.90	9.95	19.95
	VALVE	8.25	4.25	12.50
	VALVE	16.50	8.60	25.00
	2" VENT CAP	6.20	7.50	13.70
	TUBE (35')	2.53	1.28	3.81
	2" STL V.P. (25')	6.25	4.08 .67	11.00
	LOUVERS (2)	7.20	24.00	31.20
	DAMPERS (2)	24.00	48.00	72.00
	FILL CAP	6.20	7.50	13.70
		<u>355</u>	<u>329</u>	<u>684</u>

			L	M	T
32	4" STEAM VALVES	OSTY	120	215	335
	3" (15')	DRAIN w/VB	5.80	11.90	17.70
	4" (50')	PIPING	8.25	4.69	13.83
91	2" (50')	PIPING	9.60	6.77	17.40
110	4" (2)	WN/FLANGE	6.25	3.30	10.22
			36.	14.80	54.62
105	(10)	90° EL	71	14.90	7.65
106	4 (4)	TEE	120	27	12.75
	3" (3)	WN/FLANGE	25	14.10	2.73
	3" (6)	90° EL	51	9	5.45
203	(2)	TRAP AS ETC	90	320	410

		L	M	T
83	BOILER FEED RETURN SAY 2" (60')	5.85	2.68	63
				9.16

BUILDING 334

DESIGN PARAMETERS, SHGs

Location : FT. BELVOIR, VIRGINIA
 Prepared By : ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

11-23-90
 6100190202
 Page 1 of 1

DESIGN WEATHER PARAMETERS

City Name.....: FT. BELVOIR
 Location.....: VIRGINIA
 Latitude.....: 38.4 deg
 Elevation.....: 69.0 ft
 Summer Design Dry Bulb Temp.....: 90.0 F
 Summer Design Wet Bulb Temp.....: 75.0 F
 Daily Temperature Range.....: 23.0 F
 Winter Design Dry Bulb Temp.....: 12.0 F
 Atmospheric Clearness Number.....: 1.00

TABLE 1. MAXIMUM SOLAR HEAT GAINS - AVERAGE DAYS
 (BTU/hr/sqft)

Month	NE	E	SE	S	SW	W	NW	N	Hor
Jan	24.2	61.1	97.3	110.1	97.3	61.1	24.2	24.2	80.0
Feb	31.8	74.8	105.7	113.8	105.7	74.8	31.8	31.8	107.2
Mar	40.8	87.0	106.9	108.0	106.9	87.0	40.8	40.8	136.8
Apr	60.0	97.4	104.4	97.2	104.4	97.4	60.0	49.3	164.3
May	74.9	103.0	98.4	84.0	98.4	103.0	74.9	54.9	181.8
Jun	85.1	109.3	97.5	79.2	97.5	109.3	85.1	57.9	195.2
Jul	80.6	106.7	98.1	81.4	98.1	106.7	80.6	56.4	189.3
Aug	69.1	104.1	105.7	94.4	105.7	104.1	69.1	52.2	177.6
Sep	52.3	99.3	114.8	111.6	114.8	99.3	52.3	45.4	158.1
Oct	36.4	88.3	117.7	122.9	117.7	88.3	36.4	36.4	128.2
Nov	26.7	66.5	101.8	113.3	101.8	66.5	26.7	26.7	89.4
Dec	21.4	53.0	87.6	100.9	87.6	53.0	21.4	21.4	68.4

TABLE 2. MAXIMUM SOLAR HEAT GAINS - DESIGN DAYS
 (BTU/hr/sqft)

Month	NE	E	SE	S	SW	W	NW	N	Hor
Jan	20.4	158.9	243.9	253.8	243.9	158.9	20.4	20.4	142.0
Feb	53.0	189.1	246.5	237.5	246.5	189.1	53.0	24.7	187.7
Mar	95.9	219.8	234.5	200.7	234.5	219.8	95.9	29.4	229.0
Apr	141.6	224.4	200.1	146.7	200.1	224.4	141.6	34.1	256.0
May	166.1	220.1	170.7	104.6	170.7	220.1	166.1	37.4	268.0
Jun	173.2	215.4	156.7	87.8	156.7	215.4	173.2	47.4	269.7
Jul	163.7	215.7	166.5	101.4	166.5	215.7	163.7	38.3	264.7
Aug	136.4	216.6	193.1	141.7	193.1	216.6	136.4	35.8	251.3
Sep	90.3	207.2	224.7	194.9	224.7	207.2	90.3	30.6	221.4
Oct	52.0	182.7	238.2	230.6	238.2	182.7	52.0	25.5	184.4
Nov	20.7	156.1	239.8	249.9	239.8	156.1	20.7	20.7	141.3
Dec	18.5	141.9	236.4	254.2	236.4	141.9	18.5	18.5	122.2

MASTER SCHEDULE SUMMARY

Prepared By : ENGG APPLICATIONS CONSUL

11-23-90

Carrier Hourly Analysis Program

6100190202

MASTER SCHEDULE 1. OCCUPANCY

Hourly Percentages

Hour ----->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	0	0	0	0	0	0	10	50	100	100	100	100
Saturday	0	0	0	0	0	0	5	5	5	10	10	10
Sunday	0	0	0	0	0	0	0	5	5	5	5	5
DESIGN	0	0	0	0	0	10	20	100	100	100	100	100

Hour ----->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	100	100	100	100	80	50	10	10	5	5	0	0
Saturday	10	10	10	5	5	5	5	5	0	0	0	0
Sunday	5	5	5	5	5	5	0	0	0	0	0	0
DESIGN	100	100	100	100	100	100	100	20	10	0	0	0

MASTER SCHEDULE 2. LIGHTING

Hourly Percentages

Hour ----->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	5	5	5	5	5	5	20	80	100	100	100	100
Saturday	5	5	5	5	5	5	15	15	20	40	50	50
Sunday	5	5	5	5	5	5	5	15	20	30	30	30
DESIGN	10	10	10	10	10	20	50	100	100	100	100	100

Hour ----->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	100	100	100	100	90	70	40	30	20	20	5	5
Saturday	50	50	50	50	50	40	30	20	5	5	5	5
Sunday	30	30	30	20	20	20	20	5	5	5	5	5
DESIGN	100	100	100	100	100	100	100	50	20	10	10	10

MASTER SCHEDULE 3. EQUIPMENT

Hourly Percentages

Hour ----->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	5	5	5	5	5	5	20	50	100	100	100	100
Saturday	5	5	5	5	5	5	10	10	15	20	20	20
Sunday	5	5	5	5	5	5	5	10	10	10	10	20
DESIGN	10	10	10	10	10	20	40	100	100	100	100	100

Hour ----->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	100	100	100	100	80	50	20	10	5	5	5	5
Saturday	20	20	20	10	10	10	10	10	5	5	5	5
Sunday	20	15	15	10	10	10	10	5	5	5	5	5
DESIGN	100	100	100	100	100	100	100	40	20	10	10	10

MASTER SCHEDULE SUMMARY

Prepared By : ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

11-23-90
 6100190202

 MASTER SCHEDULE 4. DOMESTIC HOT WATER Hourly Percentages

Hour ---->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	0	0	0	0	0	5	10	10	20	20	20	80
Saturday	0	0	0	0	0	2	2	2	5	5	5	5
Sunday	0	0	0	0	0	0	0	2	2	2	2	2
DESIGN	0	0	0	0	0	5	5	20	20	20	20	80

Hour ---->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	80	20	20	20	10	10	5	5	5	2	0	0
Saturday	5	5	5	2	2	2	2	2	0	0	0	0
Sunday	2	2	2	2	2	2	0	0	0	0	0	0
DESIGN	80	20	20	20	10	10	5	5	2	2	0	0

DAY TYPE DATA

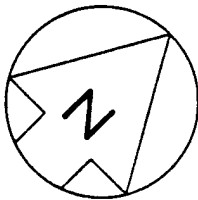
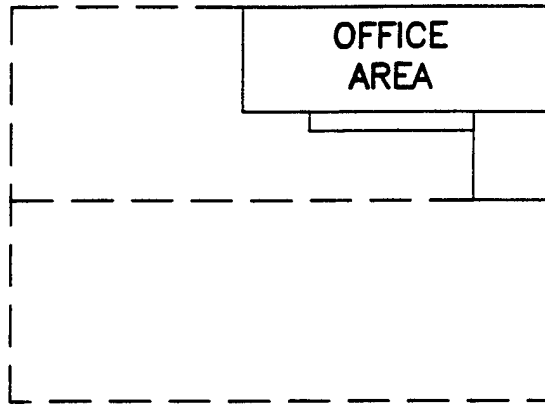
Prepared By : ENGG APPLICATIONS CONSUL

01-30-91

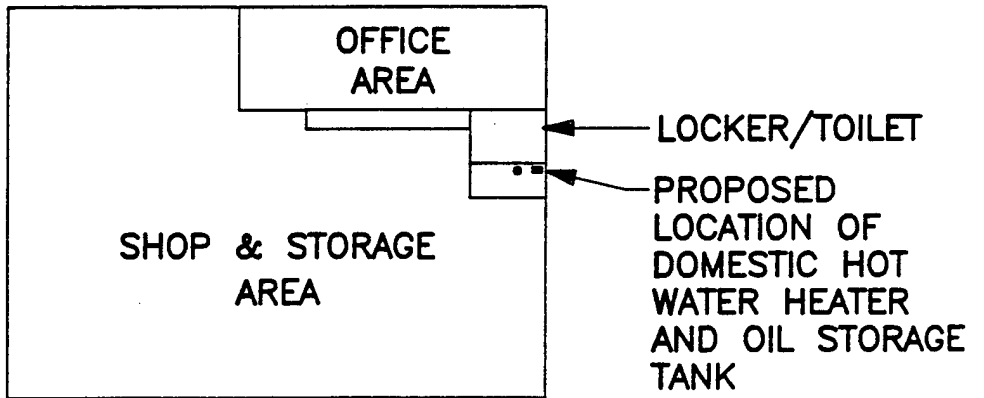
Carrier Hourly Analysis Program

6100190202

Month	DAY TYPE 1 Weekday	DAY TYPE 2 Saturday	DAY TYPE 3 Sunday	Total Days/Month
January	21	4	6	31
February	19	4	5	28
March	22	5	4	31
April	21	4	5	30
May	22	4	5	31
June	21	5	4	30
July	21	4	6	31
August	23	4	4	31
September	19	5	6	30
October	23	4	4	31
November	21	4	5	30
December	20	5	6	31



MEZZANINE FLOOR PLAN



FIRST FLOOR PLAN

BUILDING 334 KEY PLAN

BUILDING DESCRIPTION

Building : BUILDING 334 (#2 OIL) M
 Prepared By: ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

01-30-91
 6100190202
 Page 1 of 1

1. BUILDING INPUTS

BUILDING NAME = BUILDING 334 (#2 OIL) M

MISCELLANEOUS ELECTRIC

Maximum power = 0.0 kW
 Power schedule = 1

DOMESTIC WATER HEATING

Is a domestic hot water system used ? Y
 Maximum hourly hot water use = 90.0 gal
 Hot water schedule = 4
 Average entering water temperature = 65.0 F
 Average hot water supply temperature = 140.0 F
 Heating plant type = 2 : Combustion
 Fuel type = 2 : Fuel Oil
 Plant capacity = 230.5 MBH
 Is plant efficiency computer generated ? N
 Annual plant efficiency = 65 %

OTHER INPUTS

Additional building floor area = 0.0 sqft
 Electrical generating efficiency = 100.00 %

2. PLANT SELECTION

Plant Name	Mult	Plant Name	Mult
#2 Oil Fired Boiler	1		

3. FUEL & ELECTRIC RATE SELECTION

Fuel or Energy	No.	Name of Rate Schedule	Currency
Electric	10	ELECTRIC RATE (GENERIC)	MBTU
Natural Gas	5	NATURAL GAS (GENERIC)	MBTU
Fuel Oil	4	DOMESTIC FUEL OIL #2 (GENERIC)	MBTU
Propane	9	Empty...	MBTU
Remote Source Heating	6	HEAVY FUEL OIL #6 (GENERIC)	MBTU
Remote Source Cooling	9	Empty...	MBTU

MONTHLY ENERGY COSTS

Building : BUILDING 334 (#2 OIL) M

11-07-90

Site : FT. BELVOIR, VIRGINIA

6022890201

Prepared By : ENGG APPLICATIONS

Carrier Hourly Analysis Program

Page 1 of 1

TABLE 1. HVAC COSTS (MBTU)

Month	Electric	Natural Gas	Fuel Oil	Propane	Remote Heating	Remote Cooling
Jan	0	0	0	0	0	0
Feb	0	0	0	0	0	0
Mar	0	0	0	0	0	0
Apr	0	0	0	0	0	0
May	0	0	0	0	0	0
June	0	0	0	0	0	0
July	0	0	0	0	0	0
Aug	0	0	0	0	0	0
Sept	0	0	0	0	0	0
Oct	0	0	0	0	0	0
Nov	0	0	0	0	0	0
Dec	0	0	0	0	0	0
Tot.	0	0	0	0	0	0

TABLE 2. NON-HVAC COSTS (MBTU)

Month	Electric	Natural Gas	Fuel Oil	Propane	Remote Heating
Jan	0	0	7	0	0
Feb	0	0	6	0	0
Mar	0	0	7	0	0
Apr	0	0	7	0	0
May	0	0	7	0	0
June	0	0	7	0	0
July	0	0	7	0	0
Aug	0	0	7	0	0
Sept	0	0	6	0	0
Oct	0	0	7	0	0
Nov	0	0	7	0	0
Dec	0	0	6	0	0
Tot.	0	0	80	0	0

FUEL OIL COSTS

Building : BUILDING 334 (#2 OIL) M

11-07-90

Site : FT. BELVOIR, VIRGINIA

6022890201

Prepared By : ENGG APPLICATIONS

Carrier Hourly Analysis Program

Page 1 of 1

TABLE 1. MONTHLY COMPONENT CHARGES (MBTU)

Month	Energy Charges	Fixed Charges	Taxes	Total Charges
Jan	7	0	0	7
Feb	6	0	0	6
Mar	7	0	0	7
Apr	7	0	0	7
May	7	0	0	7
June	7	0	0	7
July	7	0	0	7
Aug	7	0	0	7
Sept	6	0	0	6
Oct	7	0	0	7
Nov	7	0	0	7
Dec	6	0	0	6
Tot.	80	0	0	80

TABLE 2. MONTHLY TOTALS

Month	Charges (MBTU)	Energy (gallon)	Effective Rate (MBTU/gallon)
Jan	7	48	0.13870
Feb	6	43	0.13870
Mar	7	50	0.13870
Apr	7	48	0.13870
May	7	50	0.13870
June	7	48	0.13870
July	7	48	0.13870
Aug	7	52	0.13870
Sept	6	44	0.13870
Oct	7	52	0.13870
Nov	7	48	0.13870
Dec	6	46	0.13870
Tot.	80	574	0.13870

FIRST FLOOR

OCCUPANCY ≈ 28 P

USE 2 TIME PER HOUR		FU	FU Tot	3/4 HW
}	LARGE TOILET			
	4 URINALS	3	12	
	3 TOILETS	3	9	
	2 SHOWERS	2	4	3
	2 LAVS	1	2	1.5
	1 SS	3	3	2.25

USED 3 TIME PER HOUR		FU	FU Tot	3/4 HW
}	WOMEN'S TOILET			
	1 TOILET	3	3	
	1 LAV	1	1	.75

MEZZ. TOILET (DIDN'T SEE, COL. SAID TO LEAVE)

?	ASSUME	FU	FU Tot	3/4 HW
}	1 TOILET	3	3	
	1 LAV	1	1	.75

8.25 = 6.5 GPM MAX.

- 2 SHOWERS IN OPERATION FOR 30 MIN AT MAX GPM = 90 GPH OF HW
 SAY MAX HW USAGE = 100 GPH ACTUAL USE BASE ON OBSERVATION IS MORE LIKE 23 GPH ABSOLUTE MAX. (1.5 x 3 MINUTES x 5 TIMES / HR.)
 HOWEVER DUE TO THE SIZE OF FACILITY AND POSSIBILITY OF MORE PERSONNEL BEING ADDED WE WILL SELECT A 70 GAL HW HEATER - OIL FIRED FOR SUMMER USE.

OIL FIRED DOMESTIC HOT WATER HEATER

SELECT: BOCK WATER HEATERS, INC.

MODEL 71E , 70 GAL STORAGE , 157 GPH @ 100°F RISE

1.25 GPH #2 , 120V 60HZ , 1½" , 1/8 HP , 2" FIBERGLASS INS.

494 LBS , 3 YR LIMITED WARRANTY , GLASS LINED , TURBOFLUE DESIGN

MAGNESIUM ANODES , ASHRAE 90A INPUT = 173 MBH

COST QUOTE: RE. MICHEL CO, INC. , E. VIENNA , 698-6244 , #875

OIL STORAGE TANK

SELECT: 275 GAL STD. INDOOR TANK

APR	= 3.5 MBTU	24 GALS
MAY	= 7	50
JUNE	= 7	48
JULY	= 7	48
AUG	= 7	52
SEPT	= 6	44
OCT	= <u>3.5</u>	<u>26</u>
	41 MBTU	270 GALS

$$7,000,000 / 30 \text{ DAYS} = 233.33 \text{ MBH} / 24 \text{ HRS} = 9.8 \text{ MBH}$$

$$9.8 \times 2 = 19.6 \text{ MBH w/LOSSES SAY 20 MBH}$$

$$\text{SAY ALL ENERGY EXPENDED WITH IN 10 HR WORK DAY} = 23.4 \text{ MBH}$$

$$\text{DOUBLE IT FOR PIPING LOSSES \& SAFETY FACTOR} = 47 \text{ MBH}$$

WORST CASE MAX. BASED ON

$$\text{SELECTED UNIT INPUT MBH} = 173 \text{ MBH}$$

CONSTRUCTION COST ESTIMATE

DATE PREPARED
FEB 1991

SHEET OF

PROJECT
ENERGY SAVINGS OPPORTUNITY SURVEY

LOCATION
FT. BELVOIR, VIRGINIA BLDG 334

ARCHITECT ENGINEER
ENGINEERING APPLICATIONS CONSULTANTS

BASIS FOR ESTIMATE

CODE A (No design completed)

CODE B (Preliminary design)

CODE C (Final design)

OTHER (Specify) _____

DRAWING NO.
OIL FIRED DOM. H.W. HEATER

ESTIMATOR
REF

CHECKED BY
VP

SUMMARY	QUANTITY		LABOR		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	PER UNIT	TOTAL	
OIL FIRED HW HEATER	1	EA		275.		875.	1150.
275 GAL DOM OIL STORAGE TANK	1	EA		71.		225.	296.
OIL LINE & Hook-UP	1	LS		152.		103.	255.
VENT & CHIMNEY	20	LF	5.85	117.	3.96	79.	196.
FITTINGS & FLASHING	1	LS		80.		73.	153.
AUTO VENT DAMPER	1	EA		16.		137.	153.
COMBUSTION AIR VENTS	2	EA	4.55	9.10	8.45	16.90	26.
MANUAL DAMPERS	2	EA	9.30	18.60	8.20	16.40	35.
ELECTRICAL WORK		LS		180		325	505.
MISCELLANEOUS 10%	1	LS		75.		150.	225.
SUB-TOTAL				994		2000	2994
LABOR MARKUP 21%				209			209
TAXES 4.5%						90.	90
SUB-TOTAL							3293.
OVERHEAD 10%							329.
SUB-TOTAL							3622.
PROFIT 10%							362
SUB-TOTAL							3984.
TOTAL							\$ 4000.

BUILDING 357

DESIGN PARAMETERS, SHGs

Location : FORT BELVOIR, VIRGINIA
 Prepared By : ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

10-24-90
 6022890201
 Page 1 of 1

DESIGN WEATHER PARAMETERS

City Name.....: FORT BELVOIR
 Location.....: VIRGINIA
 Latitude.....: 38.7 deg
 Elevation.....: 69.0 ft
 Summer Design Dry Bulb Temp.....: 90.0 F
 Summer Design Wet Bulb Temp.....: 75.0 F
 Daily Temperature Range.....: 23.0 F
 Winter Design Dry Bulb Temp.....: 12.0 F
 Atmospheric Clearness Number.....: 1.00

TABLE 1. MAXIMUM SOLAR HEAT GAINS - AVERAGE DAYS
 (BTU/hr/sqft)

Month	NE	E	SE	S	SW	W	NW	N	Hor
Jan	18.8	36.2	59.9	68.5	59.9	36.2	18.8	18.8	53.9
Feb	25.7	46.8	67.6	74.7	67.6	46.8	25.7	25.7	74.9
Mar	36.0	64.4	80.5	83.2	80.5	64.4	36.0	36.0	107.8
Apr	53.2	86.3	93.6	88.6	93.6	86.3	53.2	47.1	148.6
May	67.2	92.8	90.1	78.8	90.1	92.8	67.2	52.9	166.3
Jun	78.1	100.7	91.5	76.0	91.5	100.7	78.1	56.4	181.9
Jul	77.1	102.4	95.1	79.9	95.1	102.4	77.1	55.6	182.6
Aug	63.0	95.0	97.7	88.6	97.7	95.0	63.0	50.5	164.5
Sep	44.1	83.2	97.4	96.3	97.4	83.2	44.1	42.5	137.0
Oct	31.8	63.2	85.6	91.3	85.6	63.2	31.8	31.8	98.9
Nov	19.5	34.8	55.6	62.9	55.6	34.8	19.5	19.5	54.7
Dec	14.9	27.2	46.9	54.1	46.9	27.2	14.9	14.9	40.7

TABLE 2. MAXIMUM SOLAR HEAT GAINS - DESIGN DAYS
 (BTU/hr/sqft)

Month	NE	E	SE	S	SW	W	NW	N	Hor
Jan	20.2	157.9	243.4	253.9	243.4	157.9	20.2	20.2	140.3
Feb	52.5	188.6	246.3	238.2	246.3	188.6	52.5	24.6	186.3
Mar	95.5	219.4	234.8	201.8	234.8	219.4	95.5	29.3	227.8
Apr	141.3	224.3	200.7	148.1	200.7	224.3	141.3	34.1	255.2
May	165.9	220.1	171.5	106.1	171.5	220.1	165.9	37.3	267.4
Jun	173.0	215.4	157.5	89.2	157.5	215.4	173.0	47.4	269.3
Jul	163.5	215.7	167.2	102.9	167.2	215.7	163.5	38.2	264.2
Aug	136.2	216.5	193.7	143.1	193.7	216.5	136.2	35.7	250.5
Sep	89.8	206.8	224.9	195.9	224.9	206.8	89.8	30.4	220.2
Oct	51.4	182.2	238.2	231.2	238.2	182.2	51.4	25.4	183.0
Nov	20.6	155.1	239.4	250.0	239.4	155.1	20.6	20.6	139.7
Dec	18.3	140.7	235.7	254.0	235.7	140.7	18.3	18.3	120.5

MASTER SCHEDULE SUMMARY

Prepared By : ENGG APPLICATIONS CONSUL

01-29-91

Jarrier Hourly Analysis Program

6100190202

MASTER SCHEDULE 1. OCCUPANCY Hourly Percentages

Hour ---->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	0	0	0	0	0	0	10	50	100	100	100	100
Saturday	0	0	0	0	0	0	10	10	10	20	20	20
Sunday	0	0	0	0	0	0	10	10	10	10	10	10
DESIGN	0	0	0	0	0	0	10	50	100	100	100	100

Hour ---->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	80	80	100	100	100	50	50	25	0	0	0	0
Saturday	20	20	20	20	10	10	10	0	0	0	0	0
Sunday	10	10	10	10	10	10	10	0	0	0	0	0
DESIGN	100	100	100	100	100	50	50	25	0	0	0	0

MASTER SCHEDULE 2. LIGHTING Hourly Percentages

Hour ---->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	5	5	5	5	5	5	50	50	100	100	100	100
Saturday	5	5	5	5	5	5	5	10	20	20	20	20
Sunday	5	5	5	5	5	5	10	10	10	10	10	10
DESIGN	5	5	5	5	5	5	50	50	100	100	100	100

Hour ---->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	100	100	100	100	100	100	100	50	50	5	5	5
Saturday	20	20	20	20	20	20	20	5	5	5	5	5
Sunday	10	10	10	10	10	10	5	5	5	5	5	5
DESIGN	100	100	100	100	100	100	100	50	50	5	5	5

MASTER SCHEDULE 3. APPLIANCES Hourly Percentages

Hour ---->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	0	0	0	0	0	0	10	20	20	50	50	50
Saturday	0	0	0	0	0	0	10	10	10	10	10	10
Sunday	0	0	0	0	0	0	10	10	10	10	10	10
DESIGN	0	0	0	0	0	0	10	20	20	50	50	50

Hour ---->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	50	50	50	50	20	20	20	0	0	0	0	0
Saturday	10	10	10	10	10	10	10	0	0	0	0	0
Sunday	10	10	10	10	10	10	10	0	0	0	0	0
DESIGN	50	50	50	50	20	20	20	0	0	0	0	0

MASTER SCHEDULE SUMMARY

Prepared By : ENGG APPLICATIONS CONSUL

01-29-91

Carrier Hourly Analysis Program

6100190202

MASTER SCHEDULE 4. PC's Hourly Percentages

Hour ----->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	0	0	0	0	0	0	10	50	100	100	100	100
Saturday	0	0	0	0	0	0	10	10	10	20	20	20
Sunday	0	0	0	0	0	0	10	10	10	10	10	10
DESIGN	0	0	0	0	0	0	10	50	100	100	100	100

Hour ----->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	80	80	100	100	100	50	50	20	0	0	0	0
Saturday	20	20	20	20	10	10	10	0	0	0	0	0
Sunday	10	10	10	10	10	10	10	0	0	0	0	0
DESIGN	100	100	100	100	100	50	50	20	0	0	0	0

MASTER SCHEDULE 5. DOMESTIC HOT WATER Hourly Percentages

Hour ----->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	0	0	0	0	0	5	10	10	20	20	20	80
Saturday	0	0	0	0	0	2	2	2	5	5	5	5
Sunday	0	0	0	0	0	0	0	2	2	2	2	2
DESIGN	0	0	0	0	0	5	5	20	20	20	20	80

Hour ----->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	80	20	20	20	10	10	5	5	5	2	0	0
Saturday	5	5	5	2	2	2	2	2	0	0	0	0
Sunday	2	2	2	2	2	2	0	0	0	0	0	0
DESIGN	80	20	20	20	10	10	5	5	2	2	0	0

DAY TYPE DATA

Prepared By : ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

01-29-91
 6100190202

Month	DAY TYPE 1 Weekday	DAY TYPE 2 Saturday	DAY TYPE 3 Sunday	Total Days/Month
January	21	4	6	31
February	19	4	5	28
March	22	5	4	31
April	22	4	4	30
May	22	4	5	31
June	20	5	5	30
July	22	4	5	31
August	22	5	4	31
September	20	4	6	30
October	22	4	5	31
November	19	5	6	30
December	21	4	6	31

ENGINEERING ANALYSIS

Sheet _____ of _____

By: REF

Calculations for Infiltration # 357

Building

Project: ESOS, Fort BELVOIR Date: OCT, 1990

Contract No: DACA-31-89-C=0189 EAC Project No.: 89034.0

Calculations based on ASHRAE 1989 Page F 2.3.14.

Building Leakage Area

	Effective Leakage Area, in ²	Building Component Parameter	Building Leakage Area D _L , in ²
	L _i	D _i	L
Sill foundation	0.19/ft. of perimeter	518 ft.	98.4
Joints, ceiling/wall	0.12/ft. of wall	518 ft.	62.1
Windows	0.063/ft ² . of window	2068 ft ² .	130.3
Doors	0.215/ft ² . of doors	259 ft ² .	55.7
Wall - Window frames	0.15/ft ² . of window	2068 ft ² .	309.5
- Door frames	0.072/ft ² . of door	259 ft ² .	18.6
Elec. outlet/switch	0.16/fixture	120 ft.	19.2
Recessed lights	1.6/fixture	NA ft.	—
Pipe penetration	1.55/in ² . of pipe	288 ft.	446.4
Exhaust fans	6.0/fan	105 ft.	630.0
Duct penetration	2.2/SF	110 SF	242.0
FCU openings	60 x 1/3(SF/unit) x 2.2/SF		—
			<u>2012.2 in².</u>

Infiltration $Q(\text{cfm}) = L \times (A \Delta t + Bv^2)^{1/2}$

(ASHRAE 1989, P. 23.17, EQ.33)

Winter

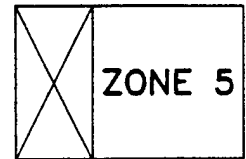
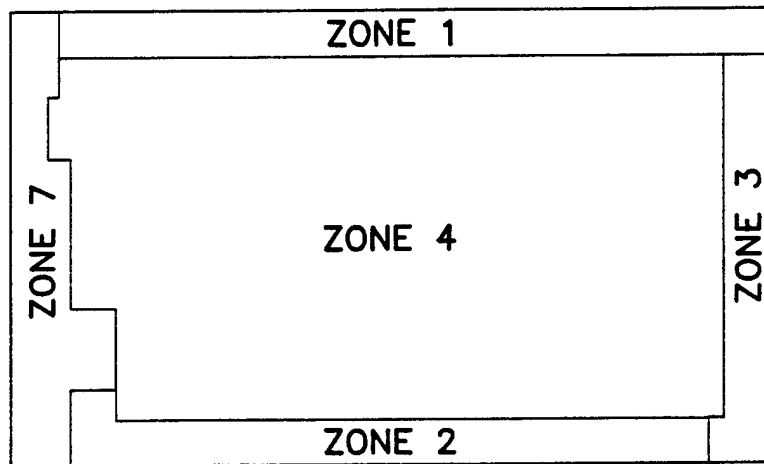
Summer

$Q(\text{cfm}) =$
 $= L(0.01313 \times 51 + 0.0157 \times 14^2)^{1/2}$
 $= L \times 2.2$
 $= 2012.2 \times 2.2 = 4427 \text{ CFM}$

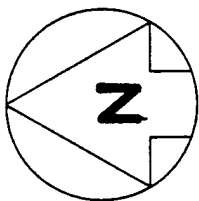
$= L(0.0313 \times 15 + 0.0157 \times 10^2)^{1/2}$
 $= L \times 1.45$
 $= 2012.2 \times 1.45 = 2918 \text{ CFM}$

$\text{Rate} = \frac{4427}{49,960} = 0.089 \text{ CFM/SF}$

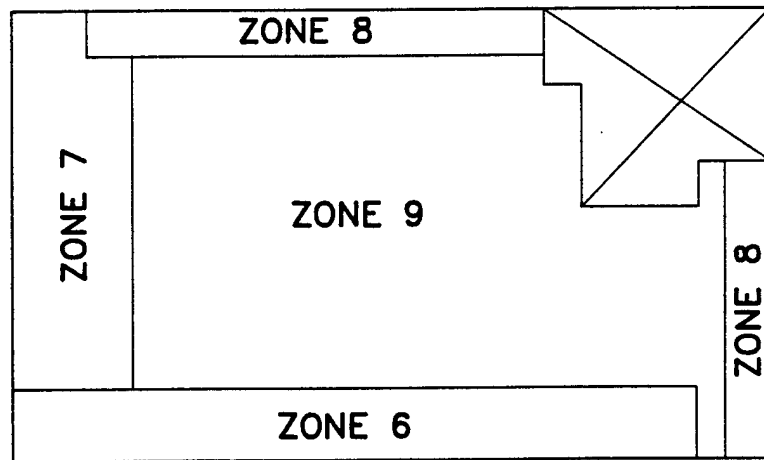
$\text{Rate} = \frac{2918}{49,960} = 0.059 \text{ CFM/SF}$



PENTHOUSE



UPPER LEVEL FLOOR PLAN



UNDERGROUND OIL STORAGE TANK

PROPOSED BOILER ROOM ADDITION

LOWER LEVEL FLOOR PLAN

BUILDING 357 KEY PLAN

COMPLEX SPACE DESCRIPTION

Space Name : #357-II FL WEST EXPOSURE
 Prepared By : ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

10-24-90
 6022890201
 Page 1 of 2

1. SPACE NAME = #357-II FL WEST EXPOSURE

2. WALL INFORMATION (Number of Wall Types = 3)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)
Wall Type 1	M	M	0.310
Wall Type 2	M	M	0.230
Wall Type 3	M	M	0.310

Exposure	Net Wall Areas (sqft)		
	Wall Type 1	Wall Type 2	Wall Type 3
NE	0.0	0.0	0.0
E	0.0	0.0	0.0
SE	0.0	0.0	0.0
S	0.0	0.0	0.0
SW	0.0	0.0	0.0
W	0.0	1,642.0	0.0
NW	0.0	0.0	0.0
N	0.0	0.0	0.0

3. ROOF INFORMATION (Number of Roof Types = 1)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)	Area (sqft)
Roof 1	M	M	0.110	1,704.0

4. GLASS INFORMATION (Number of Glass Types = 1)

	U-Value (BTU/hr/sqft/F)	Glass Factor	Internal Shades
Glass Type 1	0.500	0.90	N

External Shading Information							
	Window Height (ft)	Window Width (ft)	Reveal Depth (in)	Overhang Height (in)	Overhang Extension (in)	Fin Separation (in)	Fin Exten. (in)
Shade 1	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 2	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 3	8.0	4.0	0.0	0.0	0.0	0.0	0.0

COMPLEX SPACE DESCRIPTION

Space Name : #357-II FL WEST EXPOSURE
 Prepared By : ENGG APPLICATIONS CONSUL
 Jarrier Hourly Analysis Program

10-24-90
 6022890201
 Page 2 of 2

 4. GLASS INFORMATION (continued)

Exposure	Glass Areas (sqft)					
	Type 1		Type 2		Type 3	
	Area	Shade	Area	Shade	Area	Shade
NE	0.0	0	NA	NA	NA	NA
E	0.0	0	NA	NA	NA	NA
SE	0.0	0	NA	NA	NA	NA
S	0.0	0	NA	NA	NA	NA
SW	0.0	0	NA	NA	NA	NA
W	48.0	0	NA	NA	NA	NA
NW	0.0	0	NA	NA	NA	NA
N	0.0	0	NA	NA	NA	NA
H	0.0	0	NA	NA	NA	NA

 5. INTERNAL LOADS

SPACE DATA : Floor Area = 1,704 sqft Building Wt. = M lb/sqft

PEOPLE : sqft/person = 131.1 Total People = 13
 Schedule No. = 1 Activity Level = 2

LIGHTING : W/sqft = 2.07 Total Watts = 3,520
 Schedule No. = 2 Wattage Mult. = 1.00
 Fixture Type = 1 Recessed, not vented

OTHER ELECTRIC: W/sqft = 1.52 Total Watts = 2,598
 Schedule No. = 3

MISC. SENSIBLE: Load = 19,300 BTU/hr Schedule No. = 4
 MISC. LATENT : Load = 0 BTU/hr Schedule No. = 4

 6. PARTITIONS, INFILTRATION, GROUND

PARTITIONS (Next to Unconditioned Spaces)	Area (sqft)	U-Value (BTU/hr/sqft/F)	Unconditioned Space Temp.	
			Cooling (deg F or %)	Heating (deg F or %)
Walls	207.0	0.310	85.0 F	55.0 F
Ceilings	0.0	0.100	90.0 F	50.0 F
Floors	0.0	0.100	90.0 F	50.0 F

INFILTRATION : Cooling : 0.06 CFM/sqft = 102 CFM
 Heating : 0.10 CFM/sqft = 170 CFM
 Typical : 0.10 CFM/sqft = 170 CFM

GROUND ELEMENT : Area : 0.0 sqft
 Perimeter : 0.0 ft
 Depth : 0.0 ft

COMPLEX SPACE DESCRIPTION

Space Name : #357 II FL. NW CORNER 10-24-90
 Prepared By : ENGG APPLICATIONS CONSUL 6022890201
 Carrier Hourly Analysis Program Page 1 of 2

 1. SPACE NAME = #357 II FL. NW CORNER

2. WALL INFORMATION (Number of Wall Types = 3)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)
Wall Type 1	M	M	0.310
Wall Type 2	M	M	0.230
Wall Type 3	M	M	0.310

Exposure	<----- Net Wall Areas (sqft) ----->		
	Wall Type 1	Wall Type 2	Wall Type 3
NE	0.0	0.0	0.0
E	0.0	0.0	0.0
SE	0.0	0.0	0.0
S	0.0	0.0	0.0
SW	0.0	0.0	0.0
W	0.0	218.0	0.0
NW	0.0	0.0	0.0
N	0.0	218.0	0.0

 3. ROOF INFORMATION (Number of Roof Types = 1)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)	Area (sqft)
Roof 1	M	M	0.110	342.0

 4. GLASS INFORMATION (Number of Glass Types = 1)

	U-Value (BTU/hr/sqft/F)	Glass Factor	Internal Shades
Glass Type 1	0.500	0.90	N

	<----- External Shading Information ----->						
	Window Height (ft)	Window Width (ft)	Reveal Depth (in)	Overhang Height (in)	Overhang Extension (in)	Fin Separation (in)	Fin Exten. (in)
Shade 1	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 2	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 3	8.0	4.0	0.0	0.0	0.0	0.0	0.0

COMPLEX SPACE DESCRIPTION

Space Name : #357 II FL. NW CORNER
 Prepared By : ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

10-24-90
 6022890201
 Page 2 of 2

4. GLASS INFORMATION (continued)

Exposure	Glass Areas (sqft)					
	Type 1		Type 2		Type 3	
	Area	Shade	Area	Shade	Area	Shade
NE	0.0	0	NA	NA	NA	NA
E	0.0	0	NA	NA	NA	NA
SE	0.0	0	NA	NA	NA	NA
S	0.0	0	NA	NA	NA	NA
SW	0.0	0	NA	NA	NA	NA
W	0.0	0	NA	NA	NA	NA
NW	0.0	0	NA	NA	NA	NA
N	0.0	0	NA	NA	NA	NA
H	0.0	0	NA	NA	NA	NA

5. INTERNAL LOADS

SPACE DATA	: Floor Area	=	342 sqft	Building Wt.	=	M lb/sqft
PEOPLE	: sqft/person	=	0.0	Total People	=	0
	Schedule No.	=	1	Activity Level	=	2
LIGHTING	: W/sqft	=	2.81	Total Watts	=	960
	Schedule No.	=	2	Wattage Mult.	=	1.00
	Fixture Type	=	1 Recessed, not vented			
OTHER ELECTRIC:	W/sqft	=	0.00	Total Watts	=	0
	Schedule No.	=	3			
MISC. SENSIBLE:	Load	=	0 BTU/hr	Schedule No.	=	4
MISC. LATENT	: Load	=	0 BTU/hr	Schedule No.	=	4

6. PARTITIONS, INFILTRATION, GROUND

PARTITIONS (Next to Unconditioned Spaces)	Area (sqft)	U-Value (BTU/hr/sqft/F)	Unconditioned Space Temp.	
			Cooling (deg F or %)	Heating (deg F or %)
Walls	0.0	0.310	85.0 F	55.0 F
Ceilings	0.0	0.100	90.0 F	50.0 F
Floors	0.0	0.100	90.0 F	50.0 F

INFILTRATION	GROUND ELEMENT
Cooling : 0.06 CFM/sqft =	21 CFM Area : 0.0 sqft
Heating : 0.10 CFM/sqft =	34 CFM Perimeter : 0.0 ft
Typical : 0.10 CFM/sqft =	34 CFM Depth : 0.0 ft

COMPLEX SPACE DESCRIPTION

Space Name : #357-II FL. NORTH EXPOSU 10-24-90
 Prepared By : ENGG APPLICATIONS CONSUL 6022890201
 Carrier Hourly Analysis Program Page 1 of 2

1. SPACE NAME = #357-II FL. NORTH EXPOSU

2. WALL INFORMATION (Number of Wall Types = 3)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)
Wall Type 1	M	M	0.310
Wall Type 2	M	M	0.230
Wall Type 3	M	M	0.310

Exposure	<----- Net Wall Areas (sqft) ----->		
	Wall Type 1	Wall Type 2	Wall Type 3
NE	0.0	0.0	0.0
E	0.0	0.0	0.0
SE	0.0	0.0	0.0
S	0.0	0.0	0.0
SW	0.0	0.0	0.0
W	0.0	0.0	0.0
NW	0.0	0.0	0.0
N	0.0	680.0	0.0

3. ROOF INFORMATION (Number of Roof Types = 1)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)	Area (sqft)
Roof 1	M	M	0.110	1,018.0

4. GLASS INFORMATION (Number of Glass Types = 1)

	U-Value (BTU/hr/sqft/F)	Glass Factor	Internal Shades
Glass Type 1	0.500	0.90	N

<----- External Shading Information ----->							
	Window Height (ft)	Window Width (ft)	Reveal Depth (in)	Overhang Height (in)	Overhang Extension (in)	Fin Separation (in)	Fin Exten. (in)
Shade 1	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 2	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 3	8.0	4.0	0.0	0.0	0.0	0.0	0.0

COMPLEX SPACE DESCRIPTION

Space Name : #357-II FL. NORTH EXPOSU 10-24-90
 Prepared By : ENGG APPLICATIONS CONSUL 6022890201
 Carrier Hourly Analysis Program Page 2 of 2

4. GLASS INFORMATION (continued)

Exposure	Glass Areas (sqft)					
	Type 1		Type 2		Type 3	
	Area	Shade	Area	Shade	Area	Shade
NE	0.0	0	NA	NA	NA	NA
E	0.0	0	NA	NA	NA	NA
SE	0.0	0	NA	NA	NA	NA
S	0.0	0	NA	NA	NA	NA
SW	0.0	0	NA	NA	NA	NA
W	0.0	0	NA	NA	NA	NA
NW	0.0	0	NA	NA	NA	NA
N	0.0	0	NA	NA	NA	NA
H	0.0	0	NA	NA	NA	NA

5. INTERNAL LOADS

SPACE DATA : Floor Area = 1,018 sqft Building Wt. = M lb/sqft

PEOPLE : sqft/person = 339.3 Total People = 3
 Schedule No. = 1 Activity Level = 2

LIGHTING : W/sqft = 2.20 Total Watts = 2,240
 Schedule No. = 2 Wattage Mult. = 1.00
 Fixture Type = 1 Recessed, not vented

OTHER ELECTRIC: W/sqft = 4.92 Total Watts = 5,010
 Schedule No. = 3

MISC. SENSIBLE: Load = 7,540 BTU/hr Schedule No. = 4
 MISC. LATENT : Load = 0 BTU/hr Schedule No. = 4

6. PARTITIONS, INFILTRATION, GROUND

PARTITIONS (Next to Unconditioned Spaces)	Area (sqft)	U-Value (BTU/hr/sqft/F)	Unconditioned Space Temp.	
			Cooling (deg F or %)	Heating (deg F or %)
Walls	0.0	0.310	85.0 F	55.0 F
Ceilings	0.0	0.100	90.0 F	50.0 F
Floors	0.0	0.100	90.0 F	50.0 F

INFILTRATION	GROUND ELEMENT
Cooling : 0.06 CFM/sqft = 61 CFM	Area : 0.0 sqft
Heating : 0.10 CFM/sqft = 102 CFM	Perimeter : 0.0 ft
Typical : 0.10 CFM/sqft = 102 CFM	Depth : 0.0 ft

COMPLEX SPACE DESCRIPTION

Space Name : #357-II FL. NE CORNER
 Prepared By : ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

10-24-90
 6022890201
 Page 1 of 2

1. SPACE NAME = #357-II FL. NE CORNER

2. WALL INFORMATION (Number of Wall Types = 3)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)
Wall Type 1	M	M	0.310
Wall Type 2	M	M	0.230
Wall Type 3	M	M	0.310

Exposure	----- Net Wall Areas (sqft) ----->		
	Wall Type 1	Wall Type 2	Wall Type 3
NE	0.0	0.0	0.0
E	0.0	152.0	0.0
SE	0.0	0.0	0.0
S	0.0	0.0	0.0
SW	0.0	0.0	0.0
W	0.0	0.0	0.0
NW	0.0	0.0	0.0
N	0.0	86.0	50.0

3. ROOF INFORMATION (Number of Roof Types = 1)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)	Area (sqft)
Roof 1	M	M	0.110	368.0

4. GLASS INFORMATION (Number of Glass Types = 1)

	U-Value (BTU/hr/sqft/F)	Glass Factor	Internal Shades
Glass Type 1	0.500	0.90	N

----- External Shading Information ----->							
Window Height (ft)	Window Width (ft)	Reveal Depth (in)	Overhang Height (in)	Overhang Extension (in)	Fin Separation (in)	Fin Exten. (in)	
Shade 1	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 2	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 3	8.0	4.0	0.0	0.0	0.0	0.0	0.0

COMPLEX SPACE DESCRIPTION

Space Name : #357-II FL. NE CORNER
 Prepared By : ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

10-24-90
 6022890201
 Page 2 of 2

4. GLASS INFORMATION (continued)

Exposure	Glass Areas (sqft)					
	Type 1		Type 2		Type 3	
	Area	Shade	Area	Shade	Area	Shade
NE	0.0	0	NA	NA	NA	NA
E	32.0	0	NA	NA	NA	NA
SE	0.0	0	NA	NA	NA	NA
S	0.0	0	NA	NA	NA	NA
SW	0.0	0	NA	NA	NA	NA
W	0.0	0	NA	NA	NA	NA
NW	0.0	0	NA	NA	NA	NA
N	128.0	0	NA	NA	NA	NA
H	0.0	0	NA	NA	NA	NA

5. INTERNAL LOADS

SPACE DATA : Floor Area = 368 sqft Building Wt. = M lb/sqft

PEOPLE : sqft/person = 368.0 Total People = 1
 Schedule No. = 1 Activity Level = 2

LIGHTING : W/sqft = 2.17 Total Watts = 800
 Schedule No. = 2 Wattage Mult. = 1.00
 Fixture Type = 1 Recessed, not vented

OTHER ELECTRIC: W/sqft = 3.07 Total Watts = 1,130
 Schedule No. = 3

MISC. SENSIBLE: Load = 0 BTU/hr Schedule No. = 4
 MISC. LATENT : Load = 0 BTU/hr Schedule No. = 4

6. PARTITIONS, INFILTRATION, GROUND

PARTITIONS (Next to Unconditioned Spaces)	Area (sqft)	U-Value (BTU/hr/sqft/F)	Unconditioned Space Temp.	
			Cooling (deg F or %)	Heating (deg F or %)
Walls	0.0	0.310	85.0 F	55.0 F
Ceilings	0.0	0.100	90.0 F	50.0 F
Floors	0.0	0.100	90.0 F	50.0 F

INFILTRATION		GROUND ELEMENT	
Cooling : 0.06 CFM/sqft =	22 CFM	Area :	0.0 sqft
Heating : 0.10 CFM/sqft =	37 CFM	Perimeter :	0.0 ft
Typical : 0.10 CFM/sqft =	37 CFM	Depth :	0.0 ft

COMPLEX SPACE DESCRIPTION

Space Name : #357-II FL. EAST EXPOSUR 10-24-90
 Prepared By : ENGG APPLICATIONS CONSUL 6022890201
 Carrier Hourly Analysis Program Page 1 of 2

1. SPACE NAME = #357-II FL. EAST EXPOSUR

2. WALL INFORMATION (Number of Wall Types = 3)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)
Wall Type 1	M	M	0.310
Wall Type 2	M	M	0.230
Wall Type 3	M	M	0.310

Exposure	----- Net Wall Areas (sqft) ----->		
	Wall Type 1	Wall Type 2	Wall Type 3
NE	0.0	0.0	0.0
E	0.0	1,347.0	0.0
SE	0.0	0.0	0.0
S	0.0	0.0	0.0
SW	0.0	0.0	0.0
W	0.0	0.0	0.0
NW	0.0	0.0	0.0
N	0.0	0.0	0.0

3. ROOF INFORMATION (Number of Roof Types = 1)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)	Area (sqft)
Roof 1	M	M	0.110	2,040.0

4. GLASS INFORMATION (Number of Glass Types = 1)

	U-Value (BTU/hr/sqft/F)	Glass Factor	Internal Shades
Glass Type 1	0.500	0.90	N

<----- External Shading Information ----->							
	Window Height (ft)	Window Width (ft)	Reveal Depth (in)	Overhang Height (in)	Overhang Extension (in)	Fin Separation (in)	Fin Exten. (in)
Shade 1	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 2	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 3	8.0	4.0	0.0	0.0	0.0	0.0	0.0

COMPLEX SPACE DESCRIPTION

Space Name : #357-II FL. EAST EXPOSUR
 Prepared By : ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

10-24-90
 6022890201
 Page 2 of 2

4. GLASS INFORMATION (continued)

Exposure	Glass Areas (sqft)					
	Type 1		Type 2		Type 3	
	Area	Shade	Area	Shade	Area	Shade
NE	0.0	0	NA	NA	NA	NA
E	608.0	0	NA	NA	NA	NA
SE	0.0	0	NA	NA	NA	NA
S	0.0	0	NA	NA	NA	NA
SW	0.0	0	NA	NA	NA	NA
W	0.0	0	NA	NA	NA	NA
NW	0.0	0	NA	NA	NA	NA
N	0.0	0	NA	NA	NA	NA
H	0.0	0	NA	NA	NA	NA

5. INTERNAL LOADS

SPACE DATA	: Floor Area	=	2,040 sqft	Building Wt.	=	M lb/sqft
PEOPLE	: sqft/person	=	136.0	Total People	=	15
	Schedule No.	=	1	Activity Level	=	2
LIGHTING	: W/sqft	=	2.35	Total Watts	=	4,800
	Schedule No.	=	2	Wattage Mult.	=	1.00
	Fixture Type	=	1 Recessed, not vented			
OTHER ELECTRIC:	W/sqft	=	6.10	Total Watts	=	12,450
	Schedule No.	=	3			
MISC. SENSIBLE:	Load	=	0 BTU/hr	Schedule No.	=	4
MISC. LATENT	: Load	=	0 BTU/hr	Schedule No.	=	4

6. PARTITIONS, INFILTRATION, GROUND

PARTITIONS (Next to Unconditioned Spaces)	Area (sqft)	U-Value (BTU/hr/sqft/F)	Unconditioned Space Temp.	
			Cooling (deg F or %)	Heating (deg F or %)
Walls	0.0	0.310	85.0 F	55.0 F
Ceilings	0.0	0.100	90.0 F	50.0 F
Floors	0.0	0.100	90.0 F	50.0 F

INFILTRATION		GROUND ELEMENT	
Cooling	: 0.06 CFM/sqft =	122 CFM	Area : 0.0 sqft
Heating	: 0.10 CFM/sqft =	204 CFM	Perimeter : 0.0 ft
Typical	: 0.10 CFM/sqft =	204 CFM	Depth : 0.0 ft

COMPLEX SPACE DESCRIPTION

Space Name : #357-II FL SE EXPOSURE

10-24-90

Prepared By : ENGG APPLICATIONS CONSUL

6022890201

Carrier Hourly Analysis Program

Page 1 of 2

1. SPACE NAME = #357-II FL SE EXPOSURE

2. WALL INFORMATION (Number of Wall Types = 3)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)
Wall Type 1	M	M	0.310
Wall Type 2	M	M	0.230
Wall Type 3	M	M	0.310

Exposure	←----- Net Wall Areas (sqft) -----→		
	Wall Type 1	Wall Type 2	Wall Type 3
NE	0.0	0.0	0.0
E	0.0	152.0	0.0
SE	0.0	0.0	0.0
S	0.0	122.0	0.0
SW	0.0	0.0	0.0
W	0.0	0.0	0.0
NW	0.0	0.0	0.0
N	0.0	0.0	0.0

3. ROOF INFORMATION (Number of Roof Types = 1)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)	Area (sqft)
Roof 1	M	M	0.110	192.0

4. GLASS INFORMATION (Number of Glass Types = 1)

	U-Value (BTU/hr/sqft/F)	Glass Factor	Internal Shades
Glass Type 1	0.500	0.90	N

←----- External Shading Information -----→							
	Window Height (ft)	Window Width (ft)	Reveal Depth (in)	Overhang Height (in)	Overhang Extension (in)	Fin Separation (in)	Fin Exten. (in)
Shade 1	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 2	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 3	8.0	4.0	0.0	0.0	0.0	0.0	0.0

COMPLEX SPACE DESCRIPTION

Space Name : #357-II FL SE EXPOSURE 10-24-90
 Prepared By : ENGG APPLICATIONS CONSUL 6022890201
 Carrier Hourly Analysis Program Page 2 of 2

4. GLASS INFORMATION (continued)

Exposure	Glass Areas (sqft)					
	Type 1		Type 2		Type 3	
	Area	Shade	Area	Shade	Area	Shade
NE	0.0	0	NA	NA	NA	NA
E	23.0	0	NA	NA	NA	NA
SE	0.0	0	NA	NA	NA	NA
S	16.0	0	NA	NA	NA	NA
SW	0.0	0	NA	NA	NA	NA
W	0.0	0	NA	NA	NA	NA
NW	0.0	0	NA	NA	NA	NA
N	0.0	0	NA	NA	NA	NA
H	0.0	0	NA	NA	NA	NA

5. INTERNAL LOADS

SPACE DATA	: Floor Area	=	192 sqft	Building Wt.	=	M lb/sqft
PEOPLE	: sqft/person	=	192.0	Total People	=	1
	Schedule No.	=	1	Activity Level	=	2
LIGHTING	: W/sqft	=	2.50	Total Watts	=	480
	Schedule No.	=	2	Wattage Mult.	=	1.00
	Fixture Type	=	1 Recessed, not vented			
OTHER ELECTRIC:	W/sqft	=	4.32	Total Watts	=	830
	Schedule No.	=	3			
MISC. SENSIBLE:	Load	=	0 BTU/hr	Schedule No.	=	4
MISC. LATENT :	Load	=	0 BTU/hr	Schedule No.	=	4

6. PARTITIONS, INFILTRATION, GROUND

PARTITIONS (Next to Unconditioned Spaces)	Area (sqft)	U-Value (BTU/hr/sqft/F)	Unconditioned Space Temp.	
			Cooling (deg F or %)	Heating (deg F or %)
Walls	0.0	0.310	85.0 F	55.0 F
Ceilings	0.0	0.100	90.0 F	50.0 F
Floors	0.0	0.100	90.0 F	50.0 F

INFILTRATION		GROUND ELEMENT	
Cooling	: 0.06 CFM/sqft =	12 CFM	Area : 0.0 sqft
Heating	: 0.10 CFM/sqft =	19 CFM	Perimeter : 0.0 ft
Typical	: 0.10 CFM/sqft =	19 CFM	Depth : 0.0 ft

COMPLEX SPACE DESCRIPTION

Space Name : #357-II FL SOUTH EXP.
 Prepared By : ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

10-24-90
 6022890201
 Page 1 of 2

1. SPACE NAME = #357-II FL SOUTH EXP.

2. WALL INFORMATION (Number of Wall Types = 3)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)
Wall Type 1	M	M	0.310
Wall Type 2	M	M	0.230
Wall Type 3	M	M	0.310

Exposure	←----- Net Wall Areas (sqft) -----→		
	Wall Type 1	Wall Type 2	Wall Type 3
NE	0.0	0.0	0.0
E	0.0	0.0	0.0
SE	0.0	0.0	0.0
S	0.0	580.0	0.0
SW	0.0	0.0	0.0
W	0.0	0.0	0.0
NW	0.0	0.0	0.0
N	0.0	0.0	0.0

3. ROOF INFORMATION (Number of Roof Types = 1)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)	Area (sqft)
Roof 1	M	M	0.110	264.0

4. GLASS INFORMATION (Number of Glass Types = 1)

	U-Value (BTU/hr/sqft/F)	Glass Factor	Internal Shades
Glass Type 1	0.500	0.90	N

←----- External Shading Information -----→							
	Window Height (ft)	Window Width (ft)	Reveal Depth (in)	Overhang Height (in)	Overhang Extension (in)	Fin Separation (in)	Fin Exten. (in)
Shade 1	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 2	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 3	8.0	4.0	0.0	0.0	0.0	0.0	0.0

COMPLEX SPACE DESCRIPTION

Space Name : #357-II FL SOUTH EXP. 10-24-90
 Prepared By : ENGG APPLICATIONS CONSUL 6022890201
 Carrier Hourly Analysis Program Page 2 of 2

4. GLASS INFORMATION (continued)

Exposure	Glass Areas (sqft)					
	Type 1		Type 2		Type 3	
	Area	Shade	Area	Shade	Area	Shade
NE	0.0	0	NA	NA	NA	NA
E	0.0	0	NA	NA	NA	NA
SE	0.0	0	NA	NA	NA	NA
S	144.0	0	NA	NA	NA	NA
SW	0.0	0	NA	NA	NA	NA
W	0.0	0	NA	NA	NA	NA
NW	0.0	0	NA	NA	NA	NA
N	0.0	0	NA	NA	NA	NA
H	0.0	0	NA	NA	NA	NA

5. INTERNAL LOADS

SPACE DATA	: Floor Area	=	756 sqft	Building Wt.	=	M lb/sqft
PEOPLE	: sqft/person	=	151.2	Total People	=	5
	Schedule No.	=	1	Activity Level	=	2
LIGHTING	: W/sqft	=	2.54	Total Watts	=	1,920
	Schedule No.	=	2	Wattage Mult.	=	1.00
	Fixture Type	=	1 Recessed, not vented			
OTHER ELECTRIC:	W/sqft	=	1.76	Total Watts	=	1,330
	Schedule No.	=	3			
MISC. SENSIBLE:	Load	=	9,350 BTU/hr	Schedule No.	=	4
MISC. LATENT	: Load	=	0 BTU/hr	Schedule No.	=	4

6. PARTITIONS, INFILTRATION, GROUND

PARTITIONS (Next to Unconditioned Spaces)	Area (sqft)	U-Value (BTU/hr/sqft/F)	Unconditioned Space Temp.	
			Cooling (deg F or %)	Heating (deg F or %)
Walls	0.0	0.310	85.0 F	55.0 F
Ceilings	0.0	0.100	90.0 F	50.0 F
Floors	0.0	0.100	90.0 F	50.0 F

INFILTRATION			GROUND ELEMENT	
Cooling	: 0.06 CFM/sqft =	45 CFM	Area	: 0.0 sqft
Heating	: 0.10 CFM/sqft =	76 CFM	Perimeter	: 0.0 ft
Typical	: 0.10 CFM/sqft =	76 CFM	Depth	: 0.0 ft

COMPLEX SPACE DESCRIPTION

Space Name : #357-II FL SW CORNER 10-24-90
 Prepared By : ENGG APPLICATIONS CONSUL 6022890201
 Carrier Hourly Analysis Program Page 1 of 2

1. SPACE NAME = #357-II FL SW CORNER

2. WALL INFORMATION (Number of Wall Types = 3)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)
Wall Type 1	M	M	0.310
Wall Type 2	M	M	0.230
Wall Type 3	M	M	0.310

Exposure	Net Wall Areas (sqft)		
	Wall Type 1	Wall Type 2	Wall Type 3
NE	0.0	0.0	0.0
E	0.0	0.0	0.0
SE	0.0	0.0	0.0
S	0.0	122.0	0.0
SW	0.0	0.0	0.0
W	0.0	184.0	0.0
NW	0.0	0.0	0.0
N	0.0	0.0	0.0

3. ROOF INFORMATION (Number of Roof Types = 1)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)	Area (sqft)
Roof 1	M	M	0.110	192.0

4. GLASS INFORMATION (Number of Glass Types = 1)

	U-Value (BTU/hr/sqft/F)	Glass Factor	Internal Shades
Glass Type 1	0.500	0.90	N

External Shading Information							
	Window Height (ft)	Window Width (ft)	Reveal Depth (in)	Overhang Height (in)	Overhang Extension (in)	Fin Separation (in)	Fin Exten. (in)
Shade 1	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 2	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 3	8.0	4.0	0.0	0.0	0.0	0.0	0.0

COMPLEX SPACE DESCRIPTION

Space Name : #357-II FL SW CORNER 10-24-90
 Prepared By : ENGG APPLICATIONS CONSUL 6022890201
 Carrier Hourly Analysis Program Page 2 of 2

4. GLASS INFORMATION (continued)

Exposure	Glass Areas (sqft)					
	Type 1		Type 2		Type 3	
	Area	Shade	Area	Shade	Area	Shade
NE	0.0	0	NA	NA	NA	NA
E	0.0	0	NA	NA	NA	NA
SE	0.0	0	NA	NA	NA	NA
S	16.0	0	NA	NA	NA	NA
SW	0.0	0	NA	NA	NA	NA
W	0.0	0	NA	NA	NA	NA
NW	0.0	0	NA	NA	NA	NA
N	0.0	0	NA	NA	NA	NA
H	0.0	0	NA	NA	NA	NA

5. INTERNAL LOADS

SPACE DATA	: Floor Area	=	192 sqft	Building Wt. =	M lb/sqft
PEOPLE	: sqft/person	=	96.0	Total People =	2
	Schedule No.	=	1	Activity Level =	2
LIGHTING	: W/sqft	=	2.50	Total Watts =	480
	Schedule No.	=	2	Wattage Mult. =	1.00
	Fixture Type	=	1 Recessed, not vented		
OTHER ELECTRIC:	W/sqft	=	5.89	Total Watts =	1,130
	Schedule No.	=	3		
MISC. SENSIBLE:	Load	=	0 BTU/hr	Schedule No. =	4
MISC. LATENT	: Load	=	0 BTU/hr	Schedule No. =	4

6. PARTITIONS, INFILTRATION, GROUND

PARTITIONS (Next to Unconditioned Spaces)	Area (sqft)	U-Value (BTU/hr/sqft/F)	Unconditioned Space Temp.	
			Cooling (deg F or %)	Heating (deg F or %)
Walls	0.0	0.310	85.0 F	55.0 F
Ceilings	0.0	0.100	90.0 F	50.0 F
Floors	0.0	0.100	90.0 F	50.0 F

INFILTRATION	GROUND ELEMENT
Cooling : 0.06 CFM/sqft =	12 CFM Area : 0.0 sqft
Heating : 0.10 CFM/sqft =	19 CFM Perimeter : 0.0 ft
Typical : 0.10 CFM/sqft =	19 CFM Depth : 0.0 ft

COMPLEX SPACE DESCRIPTION

Space Name : #357-II FL SE INTERIOR 10-24-90
 Prepared By : ENGG APPLICATIONS CONSUL 6022890201
 Carrier Hourly Analysis Program Page 1 of 2

 1. SPACE NAME = #357-II FL SE INTERIOR

2. WALL INFORMATION (Number of Wall Types = 3)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)
Wall Type 1	M	M	0.310
Wall Type 2	M	M	0.230
Wall Type 3	M	M	0.310

Exposure	<----- Net Wall Areas (sqft) ----->		
	Wall Type 1	Wall Type 2	Wall Type 3
NE	0.0	0.0	0.0
E	0.0	0.0	0.0
SE	0.0	0.0	0.0
S	0.0	0.0	0.0
SW	0.0	0.0	0.0
W	0.0	0.0	0.0
NW	0.0	0.0	0.0
N	0.0	0.0	0.0

 3. ROOF INFORMATION (Number of Roof Types = 1)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)	Area (sqft)
Roof 1	M	M	0.110	1,640.0

 4. GLASS INFORMATION (Number of Glass Types = 1)

	U-Value (BTU/hr/sqft/F)	Glass Factor	Internal Shades
Glass Type 1	0.500	0.90	N

<----- External Shading Information ----->							
Window Height (ft)	Window Width (ft)	Reveal Depth (in)	Overhang Height (in)	Overhang Extension (in)	Fin Separation (in)	Fin Exten. (in)	
Shade 1	8.0	4.0	0.0	0.0	0.0	0.0	
Shade 2	8.0	4.0	0.0	0.0	0.0	0.0	
Shade 3	8.0	4.0	0.0	0.0	0.0	0.0	

COMPLEX SPACE DESCRIPTION

Space Name : #357-II FL SE INTERIOR
 Prepared By : ENGG APPLICATIONS CONSUL
 Jarrier Hourly Analysis Program

10-24-90
 6022890201
 Page 2 of 2

 4. GLASS INFORMATION (continued)

Exposure	Glass Areas (sqft)					
	Type 1		Type 2		Type 3	
	Area	Shade	Area	Shade	Area	Shade
NE	0.0	0	NA	NA	NA	NA
E	0.0	0	NA	NA	NA	NA
SE	0.0	0	NA	NA	NA	NA
S	0.0	0	NA	NA	NA	NA
SW	0.0	0	NA	NA	NA	NA
W	0.0	0	NA	NA	NA	NA
NW	0.0	0	NA	NA	NA	NA
N	0.0	0	NA	NA	NA	NA
H	0.0	0	NA	NA	NA	NA

 5. INTERNAL LOADS

SPACE DATA	: Floor Area	=	1,640 sqft	Building Wt.	=	M lb/sqft
PEOPLE	: sqft/person	=	328.0	Total People	=	5
	Schedule No.	=	1	Activity Level	=	2
LIGHTING	: W/sqft	=	1.85	Total Watts	=	3,040
	Schedule No.	=	2	Wattage Mult.	=	1.00
	Fixture Type	=	1 Recessed, not vented			
OTHER ELECTRIC:	W/sqft	=	1.19	Total Watts	=	1,950
	Schedule No.	=	3			
MISC. SENSIBLE:	Load	=	19,280 BTU/hr	Schedule No.	=	4
MISC. LATENT	: Load	=	0 BTU/hr	Schedule No.	=	4

 6. PARTITIONS, INFILTRATION, GROUND

PARTITIONS (Next to Unconditioned Spaces)	Area (sqft)	U-Value (BTU/hr/sqft/F)	Unconditioned Space Temp.	
			Cooling (deg F or %)	Heating (deg F or %)
Walls	0.0	0.310	85.0 F	55.0 F
Ceilings	0.0	0.100	90.0 F	50.0 F
Floors	0.0	0.100	90.0 F	50.0 F

INFILTRATION		GROUND ELEMENT	
Cooling	: 0.06 CFM/sqft =	98 CFM	Area : 0.0 sqft
Heating	: 0.10 CFM/sqft =	164 CFM	Perimeter : 0.0 ft
Typical	: 0.10 CFM/sqft =	164 CFM	Depth : 0.0 ft

COMPLEX SPACE DESCRIPTION

Space Name : #357 II FL CENTRAL INTER 10-24-90
 Prepared By : ENGG APPLICATIONS CONSUL 6022890201
 Carrier Hourly Analysis Program Page 1 of 2

 1. SPACE NAME = #357 II FL CENTRAL INTER

2. WALL INFORMATION (Number of Wall Types = 3)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)
Wall Type 1	M	M	0.310
Wall Type 2	M	M	0.230
Wall Type 3	M	M	0.310

Exposure	<----- Net Wall Areas (sqft) ----->		
	Wall Type 1	Wall Type 2	Wall Type 3
NE	0.0	0.0	0.0
E	0.0	0.0	0.0
SE	0.0	0.0	0.0
S	0.0	0.0	0.0
SW	0.0	0.0	0.0
W	0.0	0.0	0.0
NW	0.0	0.0	0.0
N	0.0	0.0	0.0

 3. ROOF INFORMATION (Number of Roof Types = 1)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)	Area (sqft)
Roof 1	M	M	0.110	11,234.0

 4. GLASS INFORMATION (Number of Glass Types = 1)

	U-Value (BTU/hr/sqft/F)	Glass Factor	Internal Shades
Glass Type 1	0.500	0.90	N

<----- External Shading Information ----->							
	Window Height (ft)	Window Width (ft)	Reveal Depth (in)	Overhang Height (in)	Overhang Extension (in)	Fin Separation (in)	Fin Exten. (in)
Shade 1	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 2	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 3	8.0	4.0	0.0	0.0	0.0	0.0	0.0

COMPLEX SPACE DESCRIPTION

Space Name : #357 II FL CENTRAL INTER
 Prepared By : ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

10-24-90
 6022890201
 Page 2 of 2

 4. GLASS INFORMATION (continued)

Exposure	Glass Areas (sqft)					
	Type 1		Type 2		Type 3	
	Area	Shade	Area	Shade	Area	Shade
NE	0.0	0	NA	NA	NA	NA
E	0.0	0	NA	NA	NA	NA
SE	0.0	0	NA	NA	NA	NA
S	0.0	0	NA	NA	NA	NA
SW	0.0	0	NA	NA	NA	NA
W	0.0	0	NA	NA	NA	NA
NW	0.0	0	NA	NA	NA	NA
N	0.0	0	NA	NA	NA	NA
H	0.0	0	NA	NA	NA	NA

 5. INTERNAL LOADS

SPACE DATA	: Floor Area	=	11,234 sqft	Building Wt.	=	M lb/sqft
PEOPLE	: sqft/person	=	1021.3	Total People	=	11
	Schedule No.	=	1	Activity Level	=	2
LIGHTING	: W/sqft	=	0.70	Total Watts	=	7,840
	Schedule No.	=	2	Wattage Mult.	=	1.00
	Fixture Type	=	1 Recessed, not vented			
OTHER ELECTRIC:	W/sqft	=	0.30	Total Watts	=	3,320
	Schedule No.	=	3			
MISC. SENSIBLE:	Load	=	41,450 BTU/hr	Schedule No.	=	4
MISC. LATENT	: Load	=	0 BTU/hr	Schedule No.	=	4

 6. PARTITIONS, INFILTRATION, GROUND

PARTITIONS (Next to Unconditioned Spaces)	Area (sqft)	U-Value (BTU/hr/sqft/F)	Unconditioned Space Temp.	
			Cooling (deg F or %)	Heating (deg F or %)
Walls	0.0	0.310	85.0 F	55.0 F
Ceilings	0.0	0.100	90.0 F	50.0 F
Floors	0.0	0.100	90.0 F	50.0 F

INFILTRATION	GROUND ELEMENT
Cooling : 0.06 CFM/sqft =	674 CFM Area : 0.0 sqft
Heating : 0.10 CFM/sqft =	1,123 CFM Perimeter : 0.0 ft
Typical : 0.10 CFM/sqft =	1,123 CFM Depth : 0.0 ft

COMPLEX SPACE DESCRIPTION

Space Name : #357-II FL NORTH INTRIOR

10-24-90

Prepared By : ENGG APPLICATIONS CONSUL

6022890201

Carrier Hourly Analysis Program

Page 1 of 2

1. SPACE NAME = #357-II FL NORTH INTRIOR

2. WALL INFORMATION (Number of Wall Types = 3)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)
Wall Type 1	M	M	0.310
Wall Type 2	M	M	0.230
Wall Type 3	M	M	0.310

Exposure	<----- Net Wall Areas (sqft) ----->		
	Wall Type 1	Wall Type 2	Wall Type 3
NE	0.0	0.0	0.0
E	0.0	0.0	0.0
SE	0.0	0.0	0.0
S	0.0	0.0	0.0
SW	0.0	0.0	0.0
W	0.0	0.0	0.0
NW	0.0	0.0	0.0
N	0.0	0.0	0.0

3. ROOF INFORMATION (Number of Roof Types = 1)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)	Area (sqft)
Roof 1	M	M	0.110	3,175.0

4. GLASS INFORMATION (Number of Glass Types = 1)

	U-Value (BTU/hr/sqft/F)	Glass Factor	Internal Shades
Glass Type 1	0.500	0.90	N

<----- External Shading Information ----->							
	Window Height (ft)	Window Width (ft)	Reveal Depth (in)	Overhang Height (in)	Overhang Extension (in)	Fin Separation (in)	Fin Exten. (in)
Shade 1	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 2	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 3	8.0	4.0	0.0	0.0	0.0	0.0	0.0

COMPLEX SPACE DESCRIPTION

Space Name : #357-II FL NORTH INTRIOR

10-24-90

Prepared By : ENGG APPLICATIONS CONSUL

6022890201

Carrier Hourly Analysis Program

Page 2 of 2

4. GLASS INFORMATION (continued)

Exposure	Glass Areas (sqft)					
	Type 1		Type 2		Type 3	
	Area	Shade	Area	Shade	Area	Shade
NE	0.0	0	NA	NA	NA	NA
E	0.0	0	NA	NA	NA	NA
SE	0.0	0	NA	NA	NA	NA
S	0.0	0	NA	NA	NA	NA
SW	0.0	0	NA	NA	NA	NA
W	0.0	0	NA	NA	NA	NA
NW	0.0	0	NA	NA	NA	NA
N	0.0	0	NA	NA	NA	NA
H	0.0	0	NA	NA	NA	NA

5. INTERNAL LOADS

SPACE DATA	: Floor Area	=	3,175 sqft	Building Wt.	=	M lb/sqft
PEOPLE	: sqft/person	=	211.7	Total People	=	15
	Schedule No.	=	1	Activity Level	=	2
LIGHTING	: W/sqft	=	2.62	Total Watts	=	8,320
	Schedule No.	=	2	Wattage Mult.	=	1.00
	Fixture Type	=	1 Recessed, not vented			
OTHER ELECTRIC:	W/sqft	=	3.18	Total Watts	=	10,110
	Schedule No.	=	3			
MISC. SENSIBLE:	Load	=	31,400 BTU/hr	Schedule No.	=	4
MISC. LATENT	: Load	=	0 BTU/hr	Schedule No.	=	4

6. PARTITIONS, INFILTRATION, GROUND

PARTITIONS (Next to Unconditioned Spaces)	Area (sqft)	U-Value (BTU/hr/sqft/F)	Unconditioned Space Temp.	
			Cooling (deg F or %)	Heating (deg F or %)
Walls	0.0	0.310	85.0 F	55.0 F
Ceilings	0.0	0.100	90.0 F	50.0 F
Floors	0.0	0.100	90.0 F	50.0 F

INFILTRATION		GROUND ELEMENT	
Cooling	: 0.06 CFM/sqft =	191 CFM	Area : 0.0 sqft
Heating	: 0.10 CFM/sqft =	318 CFM	Perimeter : 0.0 ft
Typical	: 0.10 CFM/sqft =	318 CFM	Depth : 0.0 ft

COMPLEX SPACE DESCRIPTION

Space Name : #357-II FL CORRIDORS 10-24-90
 Prepared By : ENGG APPLICATIONS CONSUL 6022890201
 Carrier Hourly Analysis Program Page 1 of 2

 1. SPACE NAME = #357-II FL CORRIDORS

2. WALL INFORMATION (Number of Wall Types = 3)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)
Wall Type 1	M	M	0.310
Wall Type 2	M	M	0.230
Wall Type 3	M	M	0.310

Exposure	<----- Net Wall Areas (sqft) ----->		
	Wall Type 1	Wall Type 2	Wall Type 3
NE	0.0	0.0	0.0
E	0.0	0.0	0.0
SE	0.0	0.0	0.0
S	0.0	0.0	0.0
SW	0.0	0.0	0.0
W	0.0	0.0	0.0
NW	0.0	0.0	0.0
N	0.0	0.0	0.0

 3. ROOF INFORMATION (Number of Roof Types = 1)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)	Area (sqft)
Roof 1	M	M	0.110	4,740.0

 4. GLASS INFORMATION (Number of Glass Types = 1)

	U-Value (BTU/hr/sqft/F)	Glass Factor	Internal Shades
Glass Type 1	0.500	0.90	N

	<----- External Shading Information ----->						
	Window Height (ft)	Window Width (ft)	Reveal Depth (in)	Overhang Height (in)	Overhang Extension (in)	Fin Separation (in)	Fin Exten. (in)
Shade 1	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 2	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 3	8.0	4.0	0.0	0.0	0.0	0.0	0.0

COMPLEX SPACE DESCRIPTION

Space Name : #357-II FL CORRIDORS 10-24-90
 Prepared By : ENGG APPLICATIONS CONSUL 6022890201
 Carrier Hourly Analysis Program Page 2 of 2

 4. GLASS INFORMATION (continued)

<----- Glass Areas (sqft) ----->

Exposure	Type 1		Type 2		Type 3	
	Area	Shade	Area	Shade	Area	Shade
NE	0.0	0	NA	NA	NA	NA
E	0.0	0	NA	NA	NA	NA
SE	0.0	0	NA	NA	NA	NA
S	0.0	0	NA	NA	NA	NA
SW	0.0	0	NA	NA	NA	NA
W	0.0	0	NA	NA	NA	NA
NW	0.0	0	NA	NA	NA	NA
N	0.0	0	NA	NA	NA	NA
H	0.0	0	NA	NA	NA	NA

 5. INTERNAL LOADS

SPACE DATA	: Floor Area	=	4,740 sqft	Building Wt.	=	M lb/sqft
PEOPLE	: sqft/person	=	0.0	Total People	=	0
	Schedule No.	=	1	Activity Level	=	2
LIGHTING	: W/sqft	=	1.49	Total Watts	=	7,040
	Schedule No.	=	2	Wattage Mult.	=	1.00
	Fixture Type	=	1 Recessed, not vented			
OTHER ELECTRIC:	W/sqft	=	0.00	Total Watts	=	0
	Schedule No.	=	3			
MISC. SENSIBLE:	Load	=	0 BTU/hr	Schedule No.	=	4
MISC. LATENT	: Load	=	0 BTU/hr	Schedule No.	=	4

 6. PARTITIONS, INFILTRATION, GROUND

PARTITIONS (Next to Unconditioned Spaces)	Area (sqft)	U-Value (BTU/hr/sqft/F)	Unconditioned Space Temp.	
			Cooling (deg F or %)	Heating (deg F or %)
Walls	0.0	0.310	85.0 F	55.0 F
Ceilings	0.0	0.100	90.0 F	50.0 F
Floors	0.0	0.100	90.0 F	50.0 F

INFILTRATION		GROUND ELEMENT	
Cooling	: 0.06 CFM/sqft =	284 CFM	Area : 0.0 sqft
Heating	: 0.10 CFM/sqft =	474 CFM	Perimeter : 0.0 ft
Typical	: 0.10 CFM/sqft =	474 CFM	Depth : 0.0 ft

COMPLEX SPACE DESCRIPTION

Space Name : #357-PENTHOUSE

10-24-90

Prepared By : ENGG APPLICATIONS CONSUL

6022890201

Carrier Hourly Analysis Program

Page 1 of 2

 1. SPACE NAME = #357-PENTHOUSE

2. WALL INFORMATION (Number of Wall Types = 3)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)
Wall Type 1	M	M	0.310
Wall Type 2	M	M	0.230
Wall Type 3	M	M	0.310

Exposure	←----- Net Wall Areas (sqft) ----->		
	Wall Type 1	Wall Type 2	Wall Type 3
NE	0.0	0.0	0.0
E	0.0	296.0	0.0
SE	0.0	0.0	0.0
S	0.0	140.0	0.0
SW	0.0	0.0	0.0
W	0.0	424.0	0.0
NW	0.0	0.0	0.0
N	0.0	424.0	0.0

 3. ROOF INFORMATION (Number of Roof Types = 1)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)	Area (sqft)
Roof 1	M	M	0.110	1,380.0

 4. GLASS INFORMATION (Number of Glass Types = 1)

	U-Value (BTU/hr/sqft/F)	Glass Factor	Internal Shades
Glass Type 1	0.500	0.90	N

←----- External Shading Information ----->							
	Window Height (ft)	Window Width (ft)	Reveal Depth (in)	Overhang Height (in)	Overhang Extension (in)	Fin Separation (in)	Fin Exten. (in)
Shade 1	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 2	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 3	8.0	4.0	0.0	0.0	0.0	0.0	0.0

COMPLEX SPACE DESCRIPTION

Space Name : #357-PENTHOUSE 10-24-90
 Prepared By : ENGG APPLICATIONS CONSUL 6022890201
 Carrier Hourly Analysis Program Page 2 of 2

 4. GLASS INFORMATION (continued)

Exposure	----- Glass Areas (sqft) ----->					
	Type 1		Type 2		Type 3	
	Area	Shade	Area	Shade	Area	Shade
NE	0.0	0	NA	NA	NA	NA
E	40.0	0	NA	NA	NA	NA
SE	0.0	0	NA	NA	NA	NA
S	28.0	0	NA	NA	NA	NA
SW	0.0	0	NA	NA	NA	NA
W	56.0	0	NA	NA	NA	NA
NW	0.0	0	NA	NA	NA	NA
N	56.0	0	NA	NA	NA	NA
H	0.0	0	NA	NA	NA	NA

 5. INTERNAL LOADS

SPACE DATA	: Floor Area	=	1,380 sqft	Building Wt.	=	M lb/sqft
PEOPLE	: sqft/person	=	172.5	Total People	=	8
	Schedule No.	=	1	Activity Level	=	2
LIGHTING	: W/sqft	=	2.09	Total Watts	=	2,880
	Schedule No.	=	2	Wattage Mult.	=	1.00
	Fixture Type	=	1 Recessed, not vented			
OTHER ELECTRIC:	W/sqft	=	3.61	Total Watts	=	4,986
	Schedule No.	=	3			
MISC. SENSIBLE:	Load	=	0 BTU/hr	Schedule No.	=	4
MISC. LATENT	: Load	=	0 BTU/hr	Schedule No.	=	4

 6. PARTITIONS, INFILTRATION, GROUND

PARTITIONS (Next to Unconditioned Spaces)	Area (sqft)	U-Value (BTU/hr/sqft/F)	Unconditioned Space Temp.	
			Cooling (deg F or %)	Heating (deg F or %)
Walls	0.0	0.310	85.0 F	55.0 F
Ceilings	0.0	0.100	90.0 F	50.0 F
Floors	0.0	0.100	90.0 F	50.0 F

INFILTRATION	GROUND ELEMENT			
Cooling : 0.06 CFM/sqft =	83 CFM	Area :	0.0 sqft	
Heating : 0.10 CFM/sqft =	138 CFM	Perimeter :	0.0 ft	
Typical : 0.10 CFM/sqft =	138 CFM	Depth :	0.0 ft	

COMPLEX SPACE DESCRIPTION

Space Name : #357-I FL WEST EXPOSURE
 Prepared By : ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

10-24-90
 6022890201
 Page 1 of 2

 1. SPACE NAME = #357-I FL WEST EXPOSURE

2. WALL INFORMATION (Number of Wall Types = 3)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)
Wall Type 1	M	M	0.310
Wall Type 2	M	M	0.230
Wall Type 3	M	M	0.310

Exposure	←----- Net Wall Areas (sqft) ----->		
	Wall Type 1	Wall Type 2	Wall Type 3
NE	0.0	0.0	0.0
E	0.0	0.0	0.0
SE	0.0	0.0	0.0
S	0.0	0.0	0.0
SW	0.0	0.0	0.0
W	0.0	1,460.0	0.0
NW	0.0	0.0	0.0
N	0.0	0.0	0.0

 3. ROOF INFORMATION (Number of Roof Types = 1)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)	Area (sqft)
Roof 1	M	M	0.110	0.0

 4. GLASS INFORMATION (Number of Glass Types = 1)

	U-Value (BTU/hr/sqft/F)	Glass Factor	Internal Shades
Glass Type 1	0.500	0.90	N

←----- External Shading Information ----->							
	Window Height (ft)	Window Width (ft)	Reveal Depth (in)	Overhang Height (in)	Overhang Extension (in)	Fin Separation (in)	Fin Exten. (in)
Shade 1	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 2	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 3	8.0	4.0	0.0	0.0	0.0	0.0	0.0

COMPLEX SPACE DESCRIPTION

Space Name : #357-I FL WEST EXPOSURE 10-24-90
 Prepared By : ENGG APPLICATIONS CONSUL 6022890201
 Carrier Hourly Analysis Program Page 2 of 2

 4. GLASS INFORMATION (continued)

Exposure	----- Glass Areas (sqft) ----->					
	Type 1		Type 2		Type 3	
	Area	Shade	Area	Shade	Area	Shade
NE	0.0	0	NA	NA	NA	NA
E	0.0	0	NA	NA	NA	NA
SE	0.0	0	NA	NA	NA	NA
S	0.0	0	NA	NA	NA	NA
SW	0.0	0	NA	NA	NA	NA
W	0.0	0	NA	NA	NA	NA
NW	0.0	0	NA	NA	NA	NA
N	0.0	0	NA	NA	NA	NA
H	0.0	0	NA	NA	NA	NA

 5. INTERNAL LOADS

SPACE DATA	: Floor Area	=	2,700 sqft	Building Wt.	=	M lb/sqft
PEOPLE	: sqft/person	=	540.0	Total People	=	5
	Schedule No.	=	1	Activity Level	=	2
LIGHTING	: W/sqft	=	2.21	Total Watts	=	5,960
	Schedule No.	=	2	Wattage Mult.	=	1.00
	Fixture Type	=	1 Recessed, not vented			
OTHER ELECTRIC:	W/sqft	=	4.40	Total Watts	=	11,880
	Schedule No.	=	3			
MISC. SENSIBLE:	Load	=	14,164 BTU/hr	Schedule No.	=	4
MISC. LATENT	: Load	=	0 BTU/hr	Schedule No.	=	4

 6. PARTITIONS, INFILTRATION, GROUND

PARTITIONS (Next to Unconditioned Spaces)	Area (sqft)	U-Value (BTU/hr/sqft/F)	Unconditioned Space Temp.	
			Cooling (deg F or %)	Heating (deg F or %)
Walls	563.0	0.310	85.0 F	55.0 F
Ceilings	0.0	0.100	90.0 F	50.0 F
Floors	0.0	0.100	90.0 F	50.0 F

INFILTRATION		GROUND ELEMENT	
Cooling	: 0.06 CFM/sqft =	162 CFM	Area : 2,700.0 sqft
Heating	: 0.10 CFM/sqft =	270 CFM	Perimeter : 127.0 ft
Typical	: 0.10 CFM/sqft =	270 CFM	Depth : 11.5 ft

COMPLEX SPACE DESCRIPTION

Space Name : #357-I FL NW CORNER

10-24-90

Prepared By : ENGG APPLICATIONS CONSUL

6022890201

Carrier Hourly Analysis Program

Page 1 of 2

1. SPACE NAME = #357-I FL NW CORNER

2. WALL INFORMATION (Number of Wall Types = 3)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)
Wall Type 1	M	M	0.310
Wall Type 2	M	M	0.230
Wall Type 3	M	M	0.310

Exposure	----- Net Wall Areas (sqft) ----->		
	Wall Type 1	Wall Type 2	Wall Type 3
NE	0.0	0.0	0.0
E	0.0	0.0	0.0
SE	0.0	0.0	0.0
S	0.0	115.0	0.0
SW	0.0	0.0	0.0
W	0.0	472.0	0.0
NW	0.0	0.0	0.0
N	0.0	345.0	0.0

3. ROOF INFORMATION (Number of Roof Types = 1)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)	Area (sqft)
Roof 1	M	M	0.110	0.0

4. GLASS INFORMATION (Number of Glass Types = 1)

	U-Value (BTU/hr/sqft/F)	Glass Factor	Internal Shades
Glass Type 1	0.500	0.90	N

<----- External Shading Information ----->							
	Window Height (ft)	Window Width (ft)	Reveal Depth (in)	Overhang Height (in)	Overhang Extension (in)	Fin Separation (in)	Fin Exten. (in)
Shade 1	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 2	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 3	8.0	4.0	0.0	0.0	0.0	0.0	0.0

COMPLEX SPACE DESCRIPTION

Space Name : #357-I FL NW CORNER 10-24-90
 Prepared By : ENGG APPLICATIONS CONSUL 6022890201
 Jarrier Hourly Analysis Program Page 2 of 2

4. GLASS INFORMATION (continued)

Exposure	Glass Areas (sqft)					
	Type 1		Type 2		Type 3	
	Area	Shade	Area	Shade	Area	Shade
NE	0.0	0	NA	NA	NA	NA
E	0.0	0	NA	NA	NA	NA
SE	0.0	0	NA	NA	NA	NA
S	0.0	0	NA	NA	NA	NA
SW	0.0	0	NA	NA	NA	NA
W	0.0	0	NA	NA	NA	NA
NW	0.0	0	NA	NA	NA	NA
N	0.0	0	NA	NA	NA	NA
H	0.0	0	NA	NA	NA	NA

5. INTERNAL LOADS

SPACE DATA	: Floor Area	=	900 sqft	Building Wt.	=	M lb/sqft
PEOPLE	: sqft/person	=	900.0	Total People	=	1
	Schedule No.	=	1	Activity Level	=	2
LIGHTING	: W/sqft	=	2.82	Total Watts	=	2,540
	Schedule No.	=	2	Wattage Mult.	=	1.00
	Fixture Type	=	1 Recessed, not vented			
OTHER ELECTRIC:	W/sqft	=	13.20	Total Watts	=	11,880
	Schedule No.	=	3			
MISC. SENSIBLE:	Load	=	0 BTU/hr	Schedule No.	=	4
MISC. LATENT	: Load	=	0 BTU/hr	Schedule No.	=	4

6. PARTITIONS, INFILTRATION, GROUND

PARTITIONS (Next to Unconditioned Spaces)	Area (sqft)	U-Value (BTU/hr/sqft/F)	Unconditioned Space Temp.	
			Cooling (deg F or %)	Heating (deg F or %)
Walls	0.0	0.310	85.0 F	55.0 F
Ceilings	0.0	0.100	90.0 F	50.0 F
Floors	0.0	0.100	90.0 F	50.0 F

INFILTRATION			GROUND ELEMENT	
Cooling	: 0.06 CFM/sqft =	54 CFM	Area	: 900.0 sqft
Heating	: 0.10 CFM/sqft =	90 CFM	Perimeter	: 71.0 ft
Typical	: 0.10 CFM/sqft =	90 CFM	Depth	: 11.5 ft

COMPLEX SPACE DESCRIPTION

Space Name : #357-I FL NORTH EXPOSURE 10-24-90
 Prepared By : ENGG APPLICATIONS CONSUL 6022890201
 Carrier Hourly Analysis Program Page 1 of 2

 1. SPACE NAME = #357-I FL NORTH EXPOSURE

2. WALL INFORMATION (Number of Wall Types = 3)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)
Wall Type 1	M	M	0.310
Wall Type 2	M	M	0.230
Wall Type 3	M	M	0.310

Exposure	<----- Net Wall Areas (sqft) ----->		
	Wall Type 1	Wall Type 2	Wall Type 3
NE	0.0	0.0	0.0
E	0.0	0.0	0.0
SE	0.0	0.0	0.0
S	0.0	0.0	0.0
SW	0.0	0.0	0.0
W	0.0	0.0	0.0
NW	0.0	0.0	0.0
N	0.0	748.0	0.0

 3. ROOF INFORMATION (Number of Roof Types = 1)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)	Area (sqft)
Roof 1	M	M	0.110	0.0

 4. GLASS INFORMATION (Number of Glass Types = 1)

	U-Value (BTU/hr/sqft/F)	Glass Factor	Internal Shades
Glass Type 1	0.500	0.90	N

<----- External Shading Information ----->							
Window Height (ft)	Window Width (ft)	Reveal Depth (in)	Overhang Height (in)	Overhang Extension (in)	Fin Separation (in)	Fin Exten. (in)	
Shade 1	8.0	4.0	0.0	0.0	0.0	0.0	
Shade 2	8.0	4.0	0.0	0.0	0.0	0.0	
Shade 3	8.0	4.0	0.0	0.0	0.0	0.0	

COMPLEX SPACE DESCRIPTION

Space Name : #357-I FL NORTH EXPOSURE

10-24-90

Prepared By : ENGG APPLICATIONS CONSUL

6022890201

Carrier Hourly Analysis Program

Page 2 of 2

4. GLASS INFORMATION (continued)

Exposure	Glass Areas (sqft)					
	Type 1		Type 2		Type 3	
	Area	Shade	Area	Shade	Area	Shade
NE	0.0	0	NA	NA	NA	NA
E	0.0	0	NA	NA	NA	NA
SE	0.0	0	NA	NA	NA	NA
S	0.0	0	NA	NA	NA	NA
SW	0.0	0	NA	NA	NA	NA
W	0.0	0	NA	NA	NA	NA
NW	0.0	0	NA	NA	NA	NA
N	0.0	0	NA	NA	NA	NA
H	0.0	0	NA	NA	NA	NA

5. INTERNAL LOADS

SPACE DATA : Floor Area = 1,233 sqft Building Wt. = M lb/sqft

PEOPLE : sqft/person = 411.0 Total People = 3
 Schedule No. = 1 Activity Level = 2

LIGHTING : W/sqft = 2.85 Total Watts = 3,520
 Schedule No. = 2 Wattage Mult. = 1.00
 Fixture Type = 1 Recessed, not vented

OTHER ELECTRIC: W/sqft = 1.67 Total Watts = 2,060
 Schedule No. = 3

MISC. SENSIBLE: Load = 18,570 BTU/hr Schedule No. = 4
 MISC. LATENT : Load = 0 BTU/hr Schedule No. = 4

6. PARTITIONS, INFILTRATION, GROUND

PARTITIONS (Next to Unconditioned Spaces)	Area (sqft)	U-Value (BTU/hr/sqft/F)	Unconditioned Space Temp.	
			Cooling (deg F or %)	Heating (deg F or %)
Walls	0.0	0.310	85.0 F	55.0 F
Ceilings	0.0	0.100	90.0 F	50.0 F
Floors	0.0	0.100	90.0 F	50.0 F

INFILTRATION		GROUND ELEMENT	
Cooling	: 0.06 CFM/sqft = 74 CFM	Area	: 1,233.0 sqft
Heating	: 0.10 CFM/sqft = 123 CFM	Perimeter	: 65.0 ft
Typical	: 0.10 CFM/sqft = 123 CFM	Depth	: 11.5 ft

COMPLEX SPACE DESCRIPTION

Space Name : #357-I FL NE CORNER 10-24-90
 Prepared By : ENGG APPLICATIONS CONSUL 6022890201
 Carrier Hourly Analysis Program Page 1 of 2

1. SPACE NAME = #357-I FL NE CORNER

2. WALL INFORMATION (Number of Wall Types = 3)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)
Wall Type 1	M	M	0.310
Wall Type 2	M	M	0.230
Wall Type 3	M	M	0.310

Exposure	----- Net Wall Areas (sqft) ----->		
	Wall Type 1	Wall Type 2	Wall Type 3
NE	0.0	0.0	0.0
E	0.0	199.0	0.0
SE	0.0	0.0	0.0
S	0.0	0.0	0.0
SW	0.0	0.0	0.0
W	0.0	0.0	0.0
NW	0.0	0.0	0.0
N	0.0	310.0	0.0

3. ROOF INFORMATION (Number of Roof Types = 1)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)	Area (sqft)
Roof 1	M	M	0.110	0.0

4. GLASS INFORMATION (Number of Glass Types = 1)

	U-Value (BTU/hr/sqft/F)	Glass Factor	Internal Shades
Glass Type 1	0.500	0.90	N

<----- External Shading Information ----->							
Window Height (ft)	Window Width (ft)	Reveal Depth (in)	Overhang Height (in)	Overhang Extension (in)	Fin Separation (in)	Fin Exten. (in)	
Shade 1	8.0	4.0	0.0	0.0	0.0	0.0	
Shade 2	8.0	4.0	0.0	0.0	0.0	0.0	
Shade 3	8.0	4.0	0.0	0.0	0.0	0.0	

COMPLEX SPACE DESCRIPTION

Space Name : #357-I FL NE CORNER

10-24-90

Prepared By : ENGG APPLICATIONS CONSUL

6022890201

Carrier Hourly Analysis Program

Page 2 of 2

4. GLASS INFORMATION (continued)

Exposure	Glass Areas (sqft)					
	Type 1		Type 2		Type 3	
	Area	Shade	Area	Shade	Area	Shade
NE	0.0	0	NA	NA	NA	NA
E	32.0	0	NA	NA	NA	NA
SE	0.0	0	NA	NA	NA	NA
S	0.0	0	NA	NA	NA	NA
SW	0.0	0	NA	NA	NA	NA
W	0.0	0	NA	NA	NA	NA
NW	0.0	0	NA	NA	NA	NA
N	0.0	0	NA	NA	NA	NA
H	0.0	0	NA	NA	NA	NA

5. INTERNAL LOADS

SPACE DATA	: Floor Area	=	740 sqft	Building Wt.	=	M lb/sqft
PEOPLE	: sqft/person	=	123.3	Total People	=	6
	Schedule No.	=	1	Activity Level	=	2
LIGHTING	: W/sqft	=	2.16	Total Watts	=	1,600
	Schedule No.	=	2	Wattage Mult.	=	1.00
	Fixture Type	=	1 Recessed, not vented			
OTHER ELECTRIC:	W/sqft	=	5.61	Total Watts	=	4,150
	Schedule No.	=	3			
MISC. SENSIBLE:	Load	=	0 BTU/hr	Schedule No.	=	4
MISC. LATENT	: Load	=	0 BTU/hr	Schedule No.	=	4

6. PARTITIONS, INFILTRATION, GROUND

PARTITIONS (Next to Unconditioned Spaces)	Area (sqft)	U-Value (BTU/hr/sqft/F)	Unconditioned Space Temp.	
			Cooling (deg F or %)	Heating (deg F or %)
Walls	0.0	0.310	85.0 F	55.0 F
Ceilings	0.0	0.100	90.0 F	50.0 F
Floors	0.0	0.100	90.0 F	50.0 F

INFILTRATION		GROUND ELEMENT	
Cooling	: 0.06 CFM/sqft =	44 CFM	Area : 740.0 sqft
Heating	: 0.10 CFM/sqft =	74 CFM	Perimeter : 47.0 ft
Typical	: 0.10 CFM/sqft =	74 CFM	Depth : 1.5 ft

COMPLEX SPACE DESCRIPTION

Space Name : #357-I FL EAST EXPOSURE
 Prepared By : ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

10-24-90
 6022890201
 Page 1 of 2

1. SPACE NAME = #357-I FL EAST EXPOSURE

2. WALL INFORMATION (Number of Wall Types = 3)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)
Wall Type 1	M	M	0.310
Wall Type 2	M	M	0.230
Wall Type 3	M	M	0.310

Exposure	<----- Net Wall Areas (sqft) ----->		
	Wall Type 1	Wall Type 2	Wall Type 3
NE	0.0	0.0	0.0
E	0.0	982.0	0.0
SE	0.0	0.0	0.0
S	0.0	0.0	0.0
SW	0.0	0.0	0.0
W	0.0	0.0	0.0
NW	0.0	0.0	0.0
N	0.0	0.0	0.0

3. ROOF INFORMATION (Number of Roof Types = 1)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)	Area (sqft)
Roof 1	M	M	0.110	0.0

4. GLASS INFORMATION (Number of Glass Types = 1)

	U-Value (BTU/hr/sqft/F)	Glass Factor	Internal Shades
Glass Type 1	0.500	0.90	N

<----- External Shading Information ----->							
	Window Height (ft)	Window Width (ft)	Reveal Depth (in)	Overhang Height (in)	Overhang Extension (in)	Fin Separation (in)	Fin Exten. (in)
Shade 1	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 2	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 3	8.0	4.0	0.0	0.0	0.0	0.0	0.0

COMPLEX SPACE DESCRIPTION

Space Name : #357-I FL EAST EXPOSURE
 Prepared By : ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

10-24-90
 6022890201
 Page 2 of 2

 4. GLASS INFORMATION (continued)

Exposure	Glass Areas (sqft)					
	Type 1		Type 2		Type 3	
	Area	Shade	Area	Shade	Area	Shade
NE	0.0	0	NA	NA	NA	NA
E	328.0	0	NA	NA	NA	NA
SE	0.0	0	NA	NA	NA	NA
S	0.0	0	NA	NA	NA	NA
SW	0.0	0	NA	NA	NA	NA
W	0.0	0	NA	NA	NA	NA
NW	0.0	0	NA	NA	NA	NA
N	0.0	0	NA	NA	NA	NA
H	0.0	0	NA	NA	NA	NA

 5. INTERNAL LOADS

SPACE DATA	: Floor Area	=	1,462 sqft	Building Wt.	=	M lb/sqft
PEOPLE	: sqft/person	=	121.8	Total People	=	12
	Schedule No.	=	1	Activity Level	=	2
LIGHTING	: W/sqft	=	2.74	Total Watts	=	4,000
	Schedule No.	=	2	Wattage Mult.	=	1.00
	Fixture Type	=	1 Recessed, not vented			
OTHER ELECTRIC:	W/sqft	=	3.73	Total Watts	=	5,450
	Schedule No.	=	3			
MISC. SENSIBLE:	Load	=	13,140 BTU/hr	Schedule No.	=	4
MISC. LATENT	: Load	=	0 BTU/hr	Schedule No.	=	4

 6. PARTITIONS, INFILTRATION, GROUND

PARTITIONS (Next to Unconditioned Spaces)	Area (sqft)	U-Value (BTU/hr/sqft/F)	Unconditioned Space Temp.	
			Cooling (deg F or %)	Heating (deg F or %)
Walls	0.0	0.310	85.0 F	55.0 F
Ceilings	0.0	0.100	90.0 F	50.0 F
Floors	0.0	0.100	90.0 F	50.0 F

INFILTRATION		GROUND ELEMENT	
Cooling	: 0.06 CFM/sqft =	88 CFM	Area : 1,462.0 sqft
Heating	: 0.10 CFM/sqft =	146 CFM	Perimeter : 52.0 ft
Typical	: 0.10 CFM/sqft =	146 CFM	Depth : 1.5 ft

COMPLEX SPACE DESCRIPTION

Space Name : #357-I FL SOUTH EXPOSURE

10-24-90

Prepared By : ENGG APPLICATIONS CONSUL

6022890201

Carrier Hourly Analysis Program

Page 1 of 2

1. SPACE NAME = #357-I FL SOUTH EXPOSURE

2. WALL INFORMATION (Number of Wall Types = 3)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)
Wall Type 1	M	M	0.310
Wall Type 2	M	M	0.230
Wall Type 3	M	M	0.310

Exposure	<----- Net Wall Areas (sqft) ----->		
	Wall Type 1	Wall Type 2	Wall Type 3
NE	0.0	0.0	0.0
E	0.0	196.0	0.0
SE	0.0	0.0	0.0
S	0.0	0.0	0.0
SW	0.0	0.0	0.0
W	0.0	0.0	0.0
NW	0.0	0.0	0.0
N	0.0	0.0	0.0

3. ROOF INFORMATION (Number of Roof Types = 1)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)	Area (sqft)
Roof 1	M	M	0.110	0.0

4. GLASS INFORMATION (Number of Glass Types = 1)

	U-Value (BTU/hr/sqft/F)	Glass Factor	Internal Shades
Glass Type 1	0.500	0.90	N

<----- External Shading Information ----->							
	Window Height (ft)	Window Width (ft)	Reveal Depth (in)	Overhang Height (in)	Overhang Extension (in)	Fin Separation (in)	Fin Exten. (in)
Shade 1	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 2	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 3	8.0	4.0	0.0	0.0	0.0	0.0	0.0

COMPLEX SPACE DESCRIPTION

Space Name : #357-I FL SOUTH EXPOSURE
 Prepared By : ENGG APPLICATIONS CONSUL
 Jarrier Hourly Analysis Program

10-24-90
 6022890201
 Page 2 of 2

4. GLASS INFORMATION (continued)

Exposure	Glass Areas (sqft)					
	Type 1		Type 2		Type 3	
	Area	Shade	Area	Shade	Area	Shade
NE	0.0	0	NA	NA	NA	NA
E	80.0	0	NA	NA	NA	NA
SE	0.0	0	NA	NA	NA	NA
S	0.0	0	NA	NA	NA	NA
SW	0.0	0	NA	NA	NA	NA
W	0.0	0	NA	NA	NA	NA
NW	0.0	0	NA	NA	NA	NA
N	0.0	0	NA	NA	NA	NA
H	0.0	0	NA	NA	NA	NA

5. INTERNAL LOADS

SPACE DATA	: Floor Area	=	288 sqft	Building Wt.	=	M lb/sqft
PEOPLE	: sqft/person	=	96.0	Total People	=	3
	Schedule No.	=	1	Activity Level	=	2
LIGHTING	: W/sqft	=	5.00	Total Watts	=	1,440
	Schedule No.	=	2	Wattage Mult.	=	1.00
	Fixture Type	=	1 Recessed, not vented			
OTHER ELECTRIC:	W/sqft	=	8.65	Total Watts	=	2,490
	Schedule No.	=	3			
MISC. SENSIBLE:	Load	=	1,450 BTU/hr	Schedule No.	=	4
MISC. LATENT	: Load	=	0 BTU/hr	Schedule No.	=	4

6. PARTITIONS, INFILTRATION, GROUND

PARTITIONS (Next to Unconditioned Spaces)	Area (sqft)	U-Value (BTU/hr/sqft/F)	Unconditioned Space Temp.	
			Cooling (deg F or %)	Heating (deg F or %)
Walls	0.0	0.310	85.0 F	55.0 F
Ceilings	0.0	0.100	90.0 F	50.0 F
Floors	0.0	0.100	90.0 F	50.0 F

INFILTRATION			GROUND ELEMENT		
Cooling	: 0.06 CFM/sqft =	17 CFM	Area	:	288.0 sqft
Heating	: 0.10 CFM/sqft =	29 CFM	Perimeter	:	24.0 ft
Typical	: 0.10 CFM/sqft =	29 CFM	Depth	:	0.0 ft

COMPLEX SPACE DESCRIPTION

Space Name : #357-I FL SW CORNER

10-24-90

Prepared By : ENGG APPLICATIONS CONSUL

6022890201

Carrier Hourly Analysis Program

Page 1 of 2

1. SPACE NAME = #357-I FL SW CORNER

2. WALL INFORMATION (Number of Wall Types = 3)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)
Wall Type 1	M	M	0.310
Wall Type 2	M	M	0.230
Wall Type 3	M	M	0.310

Exposure	←----- Net Wall Areas (sqft) -----→		
	Wall Type 1	Wall Type 2	Wall Type 3
NE	0.0	0.0	0.0
E	0.0	0.0	0.0
SE	0.0	0.0	0.0
S	0.0	146.0	0.0
SW	0.0	0.0	0.0
W	0.0	138.0	0.0
NW	0.0	0.0	0.0
N	0.0	0.0	0.0

3. ROOF INFORMATION (Number of Roof Types = 1)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)	Area (sqft)
Roof 1	M	M	0.110	0.0

4. GLASS INFORMATION (Number of Glass Types = 1)

	U-Value (BTU/hr/sqft/F)	Glass Factor	Internal Shades
Glass Type 1	0.500	0.90	N

←----- External Shading Information -----→							
	Window Height (ft)	Window Width (ft)	Reveal Depth (in)	Overhang Height (in)	Overhang Extension (in)	Fin Separation (in)	Fin Exten. (in)
Shade 1	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 2	8.0	4.0	0.0	0.0	0.0	0.0	0.0
Shade 3	8.0	4.0	0.0	0.0	0.0	0.0	0.0

COMPLEX SPACE DESCRIPTION

Space Name : #357-I FL SW CORNER
 Prepared By : ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

10-24-90
 6022890201
 Page 2 of 2

4. GLASS INFORMATION (continued)

<----- Glass Areas (sqft) ----->

Exposure	Type 1		Type 2		Type 3	
	Area	Shade	Area	Shade	Area	Shade
NE	0.0	0	NA	NA	NA	NA
E	0.0	0	NA	NA	NA	NA
SE	0.0	0	NA	NA	NA	NA
S	32.0	0	NA	NA	NA	NA
SW	0.0	0	NA	NA	NA	NA
W	0.0	0	NA	NA	NA	NA
NW	0.0	0	NA	NA	NA	NA
N	0.0	0	NA	NA	NA	NA
H	0.0	0	NA	NA	NA	NA

5. INTERNAL LOADS

SPACE DATA : Floor Area = 186 sqft Building Wt. = M lb/sqft

PEOPLE : sqft/person = 186.0 Total People = 1
 Schedule No. = 1 Activity Level = 2

LIGHTING : W/sqft = 2.58 Total Watts = 480
 Schedule No. = 2 Wattage Mult. = 1.00
 Fixture Type = 1 Recessed, not vented

OTHER ELECTRIC: W/sqft = 10.00 Total Watts = 1,860
 Schedule No. = 3

MISC. SENSIBLE: Load = 0 BTU/hr Schedule No. = 4
 MISC. LATENT : Load = 0 BTU/hr Schedule No. = 4

6. PARTITIONS, INFILTRATION, GROUND

PARTITIONS (Next to Unconditioned Spaces)	Area (sqft)	U-Value (BTU/hr/sqft/F)	Unconditioned Space Temp.	
			Cooling (deg F or %)	Heating (deg F or %)
Walls	0.0	0.310	85.0 F	55.0 F
Ceilings	0.0	0.100	90.0 F	50.0 F
Floors	0.0	0.100	90.0 F	50.0 F

INFILTRATION		GROUND ELEMENT	
Cooling	: 0.06 CFM/sqft = 11 CFM	Area	: 186.0 sqft
Heating	: 0.10 CFM/sqft = 19 CFM	Perimeter	: 28.0 ft
Typical	: 0.10 CFM/sqft = 19 CFM	Depth	: 0.0 ft

COMPLEX SPACE DESCRIPTION

Space Name : #357-I FL INTERIOR 10-24-90
 Prepared By : ENGG APPLICATIONS CONSUL 6022890201
 Carrier Hourly Analysis Program Page 1 of 2

 1. SPACE NAME = #357-I FL INTERIOR

2. WALL INFORMATION (Number of Wall Types = 3)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)
Wall Type 1	M	M	0.310
Wall Type 2	M	M	0.230
Wall Type 3	M	M	0.310

Exposure	<----- Net Wall Areas (sqft) ----->		
	Wall Type 1	Wall Type 2	Wall Type 3
NE	0.0	0.0	0.0
E	0.0	0.0	0.0
SE	0.0	0.0	0.0
S	0.0	0.0	0.0
SW	0.0	0.0	0.0
W	0.0	0.0	0.0
NW	0.0	0.0	0.0
N	0.0	0.0	0.0

 3. ROOF INFORMATION (Number of Roof Types = 1)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)	Area (sqft)
Roof 1	M	M	0.110	0.0

 4. GLASS INFORMATION (Number of Glass Types = 1)

	U-Value (BTU/hr/sqft/F)	Glass Factor	Internal Shades
Glass Type 1	0.500	0.90	N

<----- External Shading Information ----->							
Window Height (ft)	Window Width (ft)	Reveal Depth (in)	Overhang Height (in)	Overhang Extension (in)	Fin Separation (in)	Fin Exten. (in)	
Shade 1	8.0	4.0	0.0	0.0	0.0	0.0	
Shade 2	8.0	4.0	0.0	0.0	0.0	0.0	
Shade 3	8.0	4.0	0.0	0.0	0.0	0.0	

COMPLEX SPACE DESCRIPTION

Space Name : #357-I FL INTERIOR 10-24-90
 Prepared By : ENGG APPLICATIONS CONSUL 6022890201
 Carrier Hourly Analysis Program Page 2 of 2

 4. GLASS INFORMATION (continued)

Exposure	Glass Areas (sqft)					
	Type 1		Type 2		Type 3	
	Area	Shade	Area	Shade	Area	Shade
NE	0.0	0	NA	NA	NA	NA
E	0.0	0	NA	NA	NA	NA
SE	0.0	0	NA	NA	NA	NA
S	0.0	0	NA	NA	NA	NA
SW	0.0	0	NA	NA	NA	NA
W	0.0	0	NA	NA	NA	NA
NW	0.0	0	NA	NA	NA	NA
N	0.0	0	NA	NA	NA	NA
H	0.0	0	NA	NA	NA	NA

 5. INTERNAL LOADS

SPACE DATA	: Floor Area	=	7,541 sqft	Building Wt.	=	M lb/sqft
PEOPLE	: sqft/person	=	418.9	Total People	=	18
	Schedule No.	=	1	Activity Level	=	2
LIGHTING	: W/sqft	=	2.55	Total Watts	=	19,210
	Schedule No.	=	2	Wattage Mult.	=	1.00
	Fixture Type	=	1 Recessed, not vented			
OTHER ELECTRIC:	W/sqft	=	3.82	Total Watts	=	28,830
	Schedule No.	=	3			
MISC. SENSIBLE:	Load	=	15,190 BTU/hr	Schedule No.	=	4
MISC. LATENT	: Load	=	0 BTU/hr	Schedule No.	=	4

 6. PARTITIONS, INFILTRATION, GROUND

PARTITIONS (Next to Unconditioned Spaces)	Area (sqft)	U-Value (BTU/hr/sqft/F)	Unconditioned Space Temp.	
			Cooling (deg F or %)	Heating (deg F or %)
Walls	840.0	0.310	80.0 F	63.0 F
Ceilings	385.0	0.310	95.0 F	50.0 F
Floors	0.0	0.100	90.0 F	50.0 F

INFILTRATION		GROUND ELEMENT	
Cooling	: 0.06 CFM/sqft =	452 CFM	Area : 0.0 sqft
Heating	: 0.10 CFM/sqft =	754 CFM	Perimeter : 0.0 ft
Typical	: 0.10 CFM/sqft =	754 CFM	Depth : 0.0 ft

COMPLEX SPACE DESCRIPTION

Space Name : #357-I FL CORRIDORS

10-24-90

Prepared By : ENGG APPLICATIONS CONSUL

6022890201

Barrier Hourly Analysis Program

Page 1 of 2

1. SPACE NAME = #357-I FL CORRIDORS

2. WALL INFORMATION (Number of Wall Types = 3)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)
Wall Type 1	M	M	0.310
Wall Type 2	M	M	0.230
Wall Type 3	M	M	0.310

Exposure	----- Net Wall Areas (sqft) ----->		
	Wall Type 1	Wall Type 2	Wall Type 3
NE	0.0	0.0	0.0
E	0.0	80.0	0.0
SE	0.0	0.0	0.0
S	0.0	0.0	0.0
SW	0.0	0.0	0.0
W	0.0	0.0	0.0
NW	0.0	0.0	0.0
N	0.0	0.0	0.0

3. ROOF INFORMATION (Number of Roof Types = 1)

	Weight (lb/sqft)	Ext Color (D,M,L)	U-Value (BTU/hr/sqft/F)	Area (sqft)
Roof 1	M	M	0.110	0.0

4. GLASS INFORMATION (Number of Glass Types = 1)

	U-Value (BTU/hr/sqft/F)	Glass Factor	Internal Shades
Glass Type 1	0.500	0.90	N

<----- External Shading Information ----->							
Window Height (ft)	Window Width (ft)	Reveal Depth (in)	Overhang Height (in)	Overhang Extension (in)	Fin Separation (in)	Fin Exten. (in)	
Shade 1	8.0	4.0	0.0	0.0	0.0	0.0	
Shade 2	8.0	4.0	0.0	0.0	0.0	0.0	
Shade 3	8.0	4.0	0.0	0.0	0.0	0.0	

COMPLEX SPACE DESCRIPTION

Space Name : #357-I FL CORRIDORS 10-24-90
 Prepared By : ENGG APPLICATIONS CONSUL 6022890201
 Carrier Hourly Analysis Program Page 2 of 2

 4. GLASS INFORMATION (continued)

Exposure	Glass Areas (sqft)					
	Type 1		Type 2		Type 3	
	Area	Shade	Area	Shade	Area	Shade
NE	0.0	0	NA	NA	NA	NA
E	12.0	0	NA	NA	NA	NA
SE	0.0	0	NA	NA	NA	NA
S	0.0	0	NA	NA	NA	NA
SW	0.0	0	NA	NA	NA	NA
W	0.0	0	NA	NA	NA	NA
NW	0.0	0	NA	NA	NA	NA
N	0.0	0	NA	NA	NA	NA
H	0.0	0	NA	NA	NA	NA

 5. INTERNAL LOADS

SPACE DATA	: Floor Area	=	4,935 sqft	Building Wt.	=	M lb/sqft
PEOPLE	: sqft/person	=	0.0	Total People	=	0
	Schedule No.	=	1	Activity Level	=	2
LIGHTING	: W/sqft	=	1.07	Total Watts	=	5,280
	Schedule No.	=	2	Wattage Mult.	=	1.00
	Fixture Type	=	1 Recessed, not vented			
OTHER ELECTRIC:	W/sqft	=	0.00	Total Watts	=	0
	Schedule No.	=	3			
MISC. SENSIBLE:	Load	=	0 BTU/hr	Schedule No.	=	4
MISC. LATENT	: Load	=	0 BTU/hr	Schedule No.	=	4

 6. PARTITIONS, INFILTRATION, GROUND

PARTITIONS (Next to Unconditioned Spaces)	Area (sqft)	U-Value (BTU/hr/sqft/F)	Unconditioned Space Temp.	
			Cooling (deg F or %)	Heating (deg F or %)
Walls	1,328.0	0.310	85.0 F	55.0 F
Ceilings	0.0	0.100	90.0 F	50.0 F
Floors	0.0	0.100	90.0 F	50.0 F

INFILTRATION		GROUND ELEMENT	
Cooling	: 0.06 CFM/sqft =	296 CFM	Area : 0.0 sqft
Heating	: 0.10 CFM/sqft =	494 CFM	Perimeter : 0.0 ft
Typical	: 0.10 CFM/sqft =	494 CFM	Depth : 0.0 ft

AIR SYSTEM DESCRIPTION

Name : #357 CENTRAL AHU 01-29-91
 Carrier Hourly Analysis Program 6100190202
 Prepared By : ENGG APPLICATIONS CONSUL Page 1 of 2

1. SYSTEM NAME AND TYPE

System Name = #357 CENTRAL AHU
 System Class = Constant Volume
 System Type = (CV/RH) Constant Volume w/ Terminal Reheat
 Number of Zones = 10

2. SPACE SELECTION (see separate printout)

3. THERMOSTAT & EQUIPMENT SCHEDULING DATA

Operation Period	Thermostat Setpoints		Ventilation Dampers
	Cooling	Heating	
Occupied	75.0 F	68.0 F	OPEN
Unoccupied	75.0 F	68.0 F	OPEN

Weekday : Occupied Period Begins at 0 ; Duration = 24 hrs
 Saturday : Occupied Period Begins at 0 ; Duration = 24 hrs
 Sunday : Occupied Period Begins at 0 ; Duration = 24 hrs
 Design Day : Occupied Period Begins at 0 ; Duration = 24 hrs

4. SUPPLY, VENTILATION, RETURN AIR DATA

SUPPLY AIR

Supply air flow rate = 107610.00 CFM
 Supply temperature control = 1 Constant

VENTILATION AIR

Nominal ventilation flow rate = 25.00 % of supply air
 Minimum ventilation flow rate = 25.00 % of supply air
 Damper leak rate = 5 % of vent air

RETURN AIR

Zone exhaust air flow rate = 100.00 % of vent. air
 Zone exhaust fan power = 18.0 kW
 Is a return plenum used ? N

AIR SYSTEM DESCRIPTION

Name : #357 CENTRAL AHU

01-29-91

Carrier Hourly Analysis Program

6100190202

Prepared By : ENGG APPLICATIONS CONSUL

Page 2 of 2

5. FAN DATA

SUPPLY FAN

Type = 2:Forward curved
 Static = 4.00 in wg
 Efficiency = 54 %
 Configuration = 1 Draw-thru

RETURN FAN

Type = 1:(Fan does not exist)

6. ACCESSORY DEVICES AND SYSTEMS

PREHEAT COIL

(Not used)

OUTDOOR AIR ECONOMIZER CONTROL

(Not used)

VENTILATION AIR RECLAIM

(Not used)

HUMIDITY CONTROL

(Not used)

7. MISCELLANEOUS SYSTEM DATA

Cooling coil bypass factor = 0.050

Type of supplemental heating = 1 Not Used

PLANT DESCRIPTIONS

Plant : BUILDING #357 01-30-91
 Prepared By : ENGG APPLICATIONS CONSUL 6100190202
 Carrier Hourly Analysis Program Page 1 of 1

1 PLANT NAME AND TYPES

Class = Individual Plants
 Name = BUILDING #357
 Cooling Plant Type = Water Cooled Centrifugal
 Heating Plant Type = Combustion

2 AIR SYSTEM SELECTION

Air System Name	Mult	Air System Name	Mult
#357 CENTRAL AHU	1		

3a COOLING PLANT DATA (Water Cooled Centrifugal)

PLANT DATA

Estimated maximum cooling coil load = 414.11 Ton
 Capacity at 85.0 F condenser entering water = 432.00 Ton
 Input power rate at 85.0 F condenser entering water = 0.800 kW/Ton
 Is chilled water reset used ? N
 Number of sequenced chillers = 2
 Unloading schedule for sequenced chillers = Individual

HEAT SINK DATA

Heat sink type = Open Tower
 Minimum condenser entering water temperature = 85.0 F

3b HEATING PLANT DATA (Combustion)

Estimated maximum heating coil load = 3375.33 MBH
 Fuel type = Fuel Oil
 Rated plant output = 3346.3 MBH
 Type of heating = Hydronic
 Is plant efficiency computer generated ? N
 Seasonal plant efficiency = 64 %

4 PUMP SYSTEM DATA

Chilled water pumping system head = 90.00 ft wg
 Chilled water pumping system delta T = 10.00 F
 Condenser water pumping system head = 60.00 ft wg
 Condenser water pumping system delta T = 20.00 F
 Hot water pumping system head = 53.00 ft wg
 Hot water pumping system delta T = 30.00 F

BUILDING DESCRIPTION

Building : BUILDING #357 01-30-91
 Prepared By: ENGG APPLICATIONS CONSUL 6100190202
 Carrier Hourly Analysis Program Page 1 of 1

1. BUILDING INPUTS

BUILDING NAME = BUILDING #357

MISCELLANEOUS ELECTRIC

Maximum power = 0.0 kW
 Power schedule = 1

DOMESTIC WATER HEATING

Is a domestic hot water system used ? Y
 Maximum hourly hot water use = 400.0 gal
 Hot water schedule = 5
 Average entering water temperature = 65.0 F
 Average hot water supply temperature = 140.0 F
 Heating plant type = 2 : Combustion
 Fuel type = 2 : Fuel Oil
 Plant capacity = 3346.3 MBH
 Is plant efficiency computer generated ? N
 Annual plant efficiency = 64 %

OTHER INPUTS

Additional building floor area = 3012.0 sqft
 Electrical generating efficiency = 100.00 %

2. PLANT SELECTION

Plant Name	Mult	Plant Name	Mult
BUILDING #357	1		

3. FUEL & ELECTRIC RATE SELECTION

Fuel or Energy	No.	Name of Rate Schedule	Currency
Electric	10	ELECTRIC RATE (GENERIC)	MBTU
Natural Gas	6	NATURAL GAS (GENERIC)	MBTU
Fuel Oil	5	DOMESTIC FUEL OIL #2 (GENERIC)	MBTU
Propane	10	Empty...	MBTU
Remote Source Heating	10	Empty...	MBTU
Remote Source Cooling	10	Empty...	MBTU

MONTHLY ENERGY COSTS

Building : BUILDING #357

01-30-91

Site : FORT BELVOIR, VIRGINIA

6100190202

Prepared By : ENGG APPLICATIONS CONSUL

Carrier Hourly Analysis Program

Page 1 of 1

TABLE 1. HVAC COSTS (MBTU)

Month	Electric	Natural Gas	Fuel Oil	Propane	Remote Heating	Remote Cooling
Jan	527	0	1,993	0	0	0
Feb	479	0	1,771	0	0	0
Mar	558	0	1,807	0	0	0
Apr	581	0	1,551	0	0	0
May	644	0	1,454	0	0	0
June	696	0	1,288	0	0	0
July	807	0	1,260	0	0	0
Aug	788	0	1,301	0	0	0
Sept	657	0	1,386	0	0	0
Oct	620	0	1,587	0	0	0
Nov	563	0	1,722	0	0	0
Dec	543	0	1,931	0	0	0
Tot.	7,463	0	19,051	0	0	0

TABLE 2. NON-HVAC COSTS (MBTU)

Month	Electric	Natural Gas	Fuel Oil	Propane	Remote Heating
Jan	134	0	30	0	0
Feb	122	0	27	0	0
Mar	139	0	31	0	0
Apr	138	0	31	0	0
May	139	0	31	0	0
June	129	0	29	0	0
July	139	0	31	0	0
Aug	139	0	31	0	0
Sept	128	0	29	0	0
Oct	139	0	31	0	0
Nov	124	0	27	0	0
Dec	134	0	30	0	0
Tot.	1,605	0	358	0	0

FUEL OIL COSTS

Building : BUILDING #357

01-30-91

Site : FORT BELVOIR, VIRGINIA

6100190202

Prepared By : ENGG APPLICATIONS CONSUL

Carrier Hourly Analysis Program

Page 1 of 1

TABLE 1. MONTHLY COMPONENT CHARGES (MBTU)

Month	Energy Charges	Fixed Charges	Taxes	Total Charges
Jan	2,023	0	0	2,023
Feb	1,798	0	0	1,798
Mar	1,838	0	0	1,838
Apr	1,582	0	0	1,582
May	1,485	0	0	1,485
June	1,317	0	0	1,317
July	1,291	0	0	1,291
Aug	1,332	0	0	1,332
Sept	1,415	0	0	1,415
Oct	1,618	0	0	1,618
Nov	1,749	0	0	1,749
Dec	1,961	0	0	1,961
Tot.	19,409	0	0	19,409

TABLE 2. MONTHLY TOTALS

Month	Charges (MBTU)	Energy (Gallon)	Effective Rate (MBTU/Gallon)
Jan	2,023	14,582	0.13870
Feb	1,798	12,964	0.13870
Mar	1,838	13,251	0.13870
Apr	1,582	11,407	0.13870
May	1,485	10,709	0.13870
June	1,317	9,495	0.13870
July	1,291	9,307	0.13870
Aug	1,332	9,606	0.13870
Sept	1,415	10,199	0.13870
Oct	1,618	11,665	0.13870
Nov	1,749	12,613	0.13870
Dec	1,961	14,140	0.13870
Tot.	19,409	139,938	0.13870

THE SIMULATIONS ESTIMATED HEATING LOAD (3375.33 MBH) IS WORST CASE CONDITION AND PROBABLY OCCURES DURING JANUARY. THIS LOAD ONLY REPRESENTS THE SYSTEMS SIMULATED WHICH REQUIRE SUMMER STEAM,

SINCE THE NEW LOCAL BOILER WILL ONLY BE NEEDED FROM MID APRIL THRU MID OCTOBER WE WILL NOT NEED AS LARGE A BOILER LOAD AS INDICATED BY THE COMPUTER SIMULATION.

IF WE TAKE THE AVERAGE MBTU FOR DAYS IN APRIL (WORST CASE) AND ADD 20% AS A SAFETY FACTOR THE RESULTANT LOAD WILL BE SUFFICIENT TO SELECT A LOCAL STEAM BOILER TO ACCOMMODATE THE BUILDINGS STEAM REQUIREMENTS DURING THE SUMMER.

SUMMER STEAM

AVG MBTU/DAY



APR.	52.73	← WORST CASE	$52.73/24 = 2197 \times 1.2 =$
MAY	47.9		2636.5 MBH LOAD
JUNE	43.9		
JULY	41.64		
AUG.	42.96		
SEPT.	45.64		
OCT.	52.19		

SELECT: HB SMITH PRESSURIZED, WET-BASE BOILER BURNER
 MODEL 28-A-15, 110 BHP, 18" Ø VENT
 OVERALL EFFICIENCY W/ PIPING LOSSES & PICK-UP = 64%
 INPUT @ 32.5 GPH = 4508 MBH (CORRECTED)
 CORRECTED NET OUTPUT = 2838.3 MBH
 144" L X 40" W X 66" H (3) 5" SUP. TAPS (1) 5" RET

MONTHLY MBTU EXPENDED FOR SUMMER REHEAT AND
DOMESTIC HOT WATER GENERATION AS SIMULATED BY
CARRIER E-20 COMPUTER PROGRAM.

APR.	1582/2	=	791 MBTU	5704 GALS
MAY.		=	1485	10709
JUNE		=	1317	9495
JULY		=	1291	9307
AUG.		=	1332	9606
SEPT.		=	1415	10199
OCT.	1618/2	=	<u>809</u>	<u>5833</u>
			8,440 MBTU	60,853 GALS

SELECT: 10,000 GAL OIL STORAGE TANK
10'Ø x 17'-1" L, 9320lbs,

OIL STORAGE

REQD. 19,000 GAL. UNDERGROUND, DOUBLE WALL, STEEL
 UL LISTED, W/STI-P3 CORROSION PROTECTION
 & 30 YR WARRANTY

	L	M	T		
182 TANK	1250	11,000	12,250	10' x 17' L	32.5 GPM
HOLD DNS.	69	495	564		
2" PIPING (40')	5.85	2.68 .63	9.16		
INCASED PIPING (40')	8.50	12.70 .91	22.11		
158 FOOT VALVE	18	69	87		
PUMP (2)	60	400	460		
TANK GAGE SYS	79.	715.	794.		
VALVES (2)	40. 8.25	84. 7.75	124. 16.		
SHUT OFFS (4)	33 19.80	178. 11.75	211. 31.55		
PAD CY (14)	25.	94.	119		
EXCAVATION CY (280)	34 46.	-	-		
DEMO & PAVE (153Y)	9.42	23.80	33.22		
DEMO/TRENCH/PAVE (25')	4.15	8.68	12.83		
	<u>12,437</u>	<u>16,526</u>	<u>28,963</u>		

LEAK DETECTION SYSTEM

CONTROL MASTER W/ALARM	725
PROBES: 4" WELL	760
TANK WALL	650
CABLE	195
	<u>M</u>

OPTIONAL LEAK DETECTION = 2330

$$12,437 + 18,856 = 31,293$$

STEAM VALVES, PIPING, FITTINGS, VALVES ETC.

		L	M	T
132 (2)	8" STM. VALVES OS&Y	220	630	850
	BOILER DRAIN	5.80	11.90	17.70
87	5" PIPING (30')	11.10	11.33	1.19
	8" PIPING (40')	19.10	18.16	1.32
	PIPING ()			
110	8" WN/FLANGE (4)	79	45	545
	8" 90° ELL (4)	140	66	9.55
	8 TEE (2)	220	91	15.30
	5" WN/FL (3)	44	24	4.78
	5" 90° (2)	91	26	7.65
	5" INS (40)	2.87	5.71	8.58
	8" INS (50)	4.31	7.24	11.55
		<u>3503</u>	<u>3887</u>	<u>7390</u>

CONDENSATE PIPING, TRAPS

		L	M	T
	2" PIPING (40')	6.25	3.30	.67
203	TRAP ASSEMBLY (3)	90.	320	410
	MISC 10%	37	131	
	2" INS (1½") (60')	<u>1.82</u>	<u>2.57</u>	<u>4.39</u>
		516	1385	1901

RETURN FEEDWATER

		L	M	T
	3" PIPING (80')	8.25	4.69	.89
	3" VALVE (3)	79	115	194
	MISC FITTINGS 10%	89	79	
	3" INS (1½") (90)	<u>2.03</u>	<u>2.92</u>	<u>4.95</u>
		1080	1133	2213

ALL FUEL CHIMNEY, UL LISTED, DOUBLE WALL, 304 INNER - STL OUTER

	L	M	T
(36') STR 18" ϕ	9.25	95.70	104.95
(2) 45° EL	1845	320	338.45
90° TEE	25	370	395
PLT. SUPPORT (4)	23	169	192
ROOF THIMBLE	23	380	403
ROOF SUP. ASSEM.	25	545	570
STACK CAP	10	425	435
	212	3036	3248

OIL HOOK-UP

	L	M	T
FILTER	12.40 9.95	30. 9.95	42.40 19.95
VALVE	8.25	4.25	12.50
VALVE	16.50	8.60	25.00
2" VENT CAP	6.20	7.50	13.70
2" TUBE (20)	5.85	2.68, 63	9.16
2" STL V.P. (30)	6.25	4.08, 67	11.00
LOUVERS (2)	35.	72.	107.
DAMPERS (2)	91.	260.	351.
FILL CAP	6.70	7.50	13.70
	606	930	1536

$$2838.3 / 4000 = 710 \times 1.5 \quad 1065/144$$

$$7.44$$

BUILDING 362

DESIGN PARAMETERS, SHGs

Location : FT. BELVOIR, VIRGINIA
 Prepared By : ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

11-02-90
 6022890201
 Page 1 of 1

DESIGN WEATHER PARAMETERS

City Name.....: FT. BELVOIR
 Location.....: VIRGINIA
 Latitude.....: 38.4 deg
 Elevation.....: 69.0 ft
 Summer Design Dry Bulb Temp.....: 90.0 F
 Summer Design Wet Bulb Temp.....: 75.0 F
 Daily Temperature Range.....: 23.0 F
 Winter Design Dry Bulb Temp.....: 12.0 F
 Atmospheric Clearness Number.....: 1.00

TABLE 1. MAXIMUM SOLAR HEAT GAINS - AVERAGE DAYS
 (BTU/hr/sqft)

Month	NE	E	SE	S	SW	W	NW	N	Hor
Jan	24.2	61.1	97.3	110.1	97.3	61.1	24.2	24.2	80.0
Feb	31.8	74.8	105.7	113.8	105.7	74.8	31.8	31.8	107.2
Mar	40.8	87.0	106.9	108.0	106.9	87.0	40.8	40.8	136.8
Apr	60.0	97.4	104.4	97.2	104.4	97.4	60.0	49.3	164.3
May	74.9	103.0	98.4	84.0	98.4	103.0	74.9	54.9	181.8
Jun	85.1	109.3	97.5	79.2	97.5	109.3	85.1	57.9	195.2
Jul	80.6	106.7	98.1	81.4	98.1	106.7	80.6	56.4	189.3
Aug	69.1	104.1	105.7	94.4	105.7	104.1	69.1	52.2	177.6
Sep	52.3	99.3	114.8	111.6	114.8	99.3	52.3	45.4	158.1
Oct	36.4	88.3	117.7	122.9	117.7	88.3	36.4	36.4	128.2
Nov	26.7	66.5	101.8	113.3	101.8	66.5	26.7	26.7	89.4
Dec	21.4	53.0	87.6	100.9	87.6	53.0	21.4	21.4	68.4

TABLE 2. MAXIMUM SOLAR HEAT GAINS - DESIGN DAYS
 (BTU/hr/sqft)

Month	NE	E	SE	S	SW	W	NW	N	Hor
Jan	20.4	158.9	243.9	253.8	243.9	158.9	20.4	20.4	142.0
Feb	53.0	189.1	246.5	237.5	246.5	189.1	53.0	24.7	187.7
Mar	95.9	219.8	234.5	200.7	234.5	219.8	95.9	29.4	229.0
Apr	141.6	224.4	200.1	146.7	200.1	224.4	141.6	34.1	256.0
May	166.1	220.1	170.7	104.6	170.7	220.1	166.1	37.4	268.0
Jun	173.2	215.4	156.7	87.8	156.7	215.4	173.2	47.4	269.7
Jul	163.7	215.7	166.5	101.4	166.5	215.7	163.7	38.3	264.7
Aug	136.4	216.6	193.1	141.7	193.1	216.6	136.4	35.8	251.3
Sep	90.3	207.2	224.7	194.9	224.7	207.2	90.3	30.6	221.4
Oct	52.0	182.7	238.2	230.6	238.2	182.7	52.0	25.5	184.4
Nov	20.7	156.1	239.8	249.9	239.8	156.1	20.7	20.7	141.3
Dec	18.5	141.9	236.4	254.2	236.4	141.9	18.5	18.5	122.2

DAY TYPE DATA

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 Carrier Hourly Analysis Program

11-02-90
 6022890201

Month	DAY TYPE 1 Weekday	DAY TYPE 2 Saturday	DAY TYPE 3 Sunday	Total Days/Month
January	21	4	6	31
February	19	4	5	28
March	22	5	4	31
April	21	4	5	30
May	22	4	5	31
June	21	5	4	30
July	21	4	6	31
August	23	4	4	31
September	19	5	6	30
October	23	4	4	31
November	21	4	5	30
December	20	5	6	31

MASTER SCHEDULE SUMMARY

Prepared By : ENGG APPLICATIONS CONSUL

01-29-91

Barrier Hourly Analysis Program

6100190202

MASTER SCHEDULE 1. OCCUPANCY Hourly Percentages

Hour ----->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	0	0	0	0	0	0	10	50	100	100	100	100
Saturday	0	0	0	0	0	0	5	5	5	10	10	10
Sunday	0	0	0	0	0	0	0	5	5	5	5	5
DESIGN	0	0	0	0	0	10	20	100	100	100	100	100

Hour ----->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	100	100	100	100	80	50	10	10	5	5	0	0
Saturday	10	10	10	5	5	5	5	5	0	0	0	0
Sunday	5	5	5	5	5	5	0	0	0	0	0	0
DESIGN	100	100	100	100	100	100	100	20	10	0	0	0

MASTER SCHEDULE 2. LIGHTING Hourly Percentages

Hour ----->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	5	5	5	5	5	5	20	80	100	100	100	100
Saturday	5	5	5	5	5	5	15	15	20	40	50	50
Sunday	5	5	5	5	5	5	5	15	20	30	30	30
DESIGN	10	10	10	10	10	20	50	100	100	100	100	100

Hour ----->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	100	100	100	100	90	70	40	30	20	20	5	5
Saturday	50	50	50	50	50	40	30	20	5	5	5	5
Sunday	30	30	30	20	20	20	20	5	5	5	5	5
DESIGN	100	100	100	100	100	100	100	50	20	10	10	10

MASTER SCHEDULE 3. EQUIPMENT Hourly Percentages

Hour ----->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	5	5	5	5	5	5	20	50	100	100	100	100
Saturday	5	5	5	5	5	5	10	10	15	20	20	20
Sunday	5	5	5	5	5	5	5	10	10	10	10	20
DESIGN	10	10	10	10	10	20	40	100	100	100	100	100

Hour ----->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	100	100	100	100	80	50	20	10	5	5	5	5
Saturday	20	20	20	10	10	10	10	10	5	5	5	5
Sunday	20	15	15	10	10	10	10	5	5	5	5	5
DESIGN	100	100	100	100	100	100	100	40	20	10	10	10

MASTER SCHEDULE SUMMARY

Prepared By : ENGG APPLICATIONS CONSUL

01-29-91

Carrier Hourly Analysis Program

6100190202

MASTER SCHEDULE 4. DOMESTIC HOT WATER Hourly Percentages

Hour ----->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	0	0	0	0	0	5	10	10	20	20	20	80
Saturday	0	0	0	0	0	2	2	2	5	5	5	5
Sunday	0	0	0	0	0	0	0	2	2	2	2	2
DESIGN	0	0	0	0	0	5	5	20	20	20	20	80

Hour ----->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	80	20	20	20	10	10	5	5	5	2	0	0
Saturday	5	5	5	2	2	2	2	2	0	0	0	0
Sunday	2	2	2	2	2	2	0	0	0	0	0	0
DESIGN	80	20	20	20	10	10	5	5	5	2	0	0

ENGINEERING ANALYSIS

Sheet _____ of _____

By: REF

Calculations for Infiltration

Building 362

Project: ESOS, Fort BELVOIR Date: OCT 1990

Contract No: DACA-31-89-C=0189 EAC Project No.: 89034.0

Calculations based on ASHRAE 1989 Page F 2.3.14.

Building Leakage Area

	Effective Leakage Area, in ²	Building Component Parameter	Building Leakage Area D _i L _i , in ²
	L _i	D _i	L
Sill foundation	0.19/ft. of perimeter	255 ft.	48.45
Joints, ceiling/wall	0.12/ft. of wall	255 ft.	30.60
Windows	0.063/ft ² . of window	96 ft ² .	6.05
Doors	0.215/ft ² . of doors	165 ft ² .	35.48
Wall - Window frames	0.15/ft ² . of window	96 ft ² .	14.40
- Door frames	0.072/ft ² . of door	165 ft ² .	11.65
Elec. outlet/switch	0.16/fixture (SURFACE)	- ft.	-
Recessed lights	1.6/fixture	- ft.	-
Pipe penetration	1.55/in ² . of pipe	- ft.	-
Exhaust fans	6.0/fan	2 ft.	12.00
Duct penetration	2.2/SF	4 SF	8.80
FCU openings	60 x 1/3(SF/unit) x 2.2/SF	-	-
			<u>167.66</u> in ² .

Infiltration $Q(\text{cfm}) = L \times (A \text{ at} + Bv^2)^{1/2}$

(ASHRAE 1989, P. 2.3.17, EQ.33)

Winter

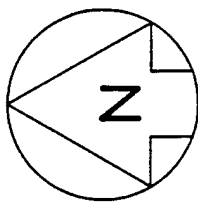
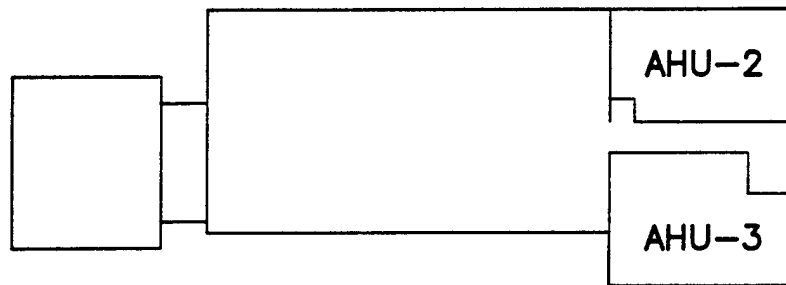
Summer

$Q(\text{cfm}) =$
 $= L(0.01313 \times 51 + 0.0157 \times 14^2)^{1/2}$
 $= L \times 2.2$
 $= 167.66 \times 2.2 = 369 \text{ CFM}$

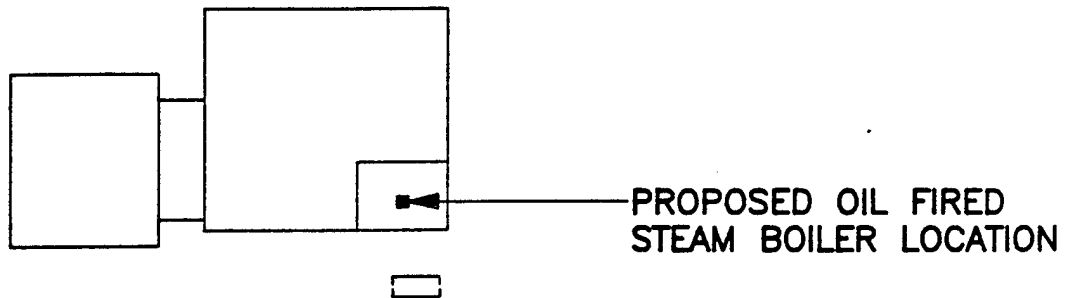
$= L(0.0313 \times 15 + 0.0157 \times 10^2)^{1/2}$
 $= L \times 1.45$
 $= 167.66 \times 1.45 = 243.1 \text{ CFM}$

$\text{Rate} = \frac{369}{3441} = 0.11 \text{ CFM/SF}$

$\text{Rate} = \frac{243.1}{3441} = 0.07 \text{ CFM/SF}$



FIRST FLOOR PLAN



BASEMENT FLOOR PLAN

BUILDING 362 KEY PLAN

SIMPLE SPACE DESCRIPTION

Space Name : ROOM 118 AHU-2 #362 11-02-90
 Prepared By : ENGG APPLICATIONS CONSUL 6022890201
 Carrier Hourly Analysis Program Page 1 of 1

 Walls Roof Glass
 U-Value : 0.250 0.096 1.040 Building Weight : M
 Weight : L L Glass Factor : 1.00
 Color : D D Internal Shades ? N

People : sqft/person = 1378.0 Schedule = 1 Activity Level = 3
 Lights : W/sqft = 3.57 Schedule = 2 Wattage Mult. = 1.20
 : Fixture Type = 3 Free-hanging

 SPACE NAME = ROOM 118 AHU-2 #362

Floor Area : 1,378.0 sqft
 Exposure : E S Roof Area : 1,378.0 sqft
 Wall Area : 360.0 402.0 Current
 Glass Area : 96.0 0.0 Elements : El,Pt,Wl,In,Gr

 ADDITIONAL ELEMENT - Other Electric

 W/sqft = 4.40
 Total Watts = 6,063
 Schedule No. = 3

 ADDITIONAL ELEMENT - Partition

 Area = 700.0 sqft Uncond. Space Temp:Cooling = 85.0 F
 U-Value = 0.330 BTU/hr/sqft/F Uncond. Space Temp:Heating = 68.0 F

 ADDITIONAL ELEMENT - Wall

 Weight = L (lb/sqft) Exposure = S
 Color = D Net Area = 202.0 sqft
 U-Value = 0.380 BTU/hr/sqft/F

 ADDITIONAL ELEMENT - Infiltration

 Cooling : 0.07 CFM/sqft = 96 CFM
 Heating : 0.11 CFM/sqft = 152 CFM
 Typical : 0.11 CFM/sqft = 152 CFM

 ADDITIONAL ELEMENT - Ground

 Slab Floor Area = 1,378.0 sqft
 Perimeter = 85.0 ft
 Depth = 1.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : ROOM 119 AHU-3 #362 11-02-90
Prepared By : ENGG APPLICATIONS CONSUL 6022890201
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.250 Roof 0.096 Glass 1.040 Building Weight : M
Weight : L L Glass Factor : 1.00
Color : D D Internal Shades ? N

People : sqft/person = 1565.0 Schedule = 1 Activity Level = 3
Lights : W/sqft = 3.48 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 3 Free-hanging

SPACE NAME = ROOM 119 AHU-3 #362

Exposure : S W Floor Area : 1,565.0 sqft
Wall Area : 402.0 360.0 Roof Area : 1,565.0 sqft
Glass Area : 0.0 96.0 Current Elements : El,Pt,Wl,In,Gr

ADDITIONAL ELEMENT - Other Electric

W/sqft = 4.40
Total Watts = 6,886
Schedule No. = 1

ADDITIONAL ELEMENT - Partition

Area = 780.0 sqft Uncond. Space Temp:Cooling = 85.0 F
U-Value = 0.330 BTU/hr/sqft/F Uncond. Space Temp:Heating = 68.0 F

ADDITIONAL ELEMENT - Wall

Weight = L (lb/sqft) Exposure = S
Color = D Net Area = 202.0 sqft
U-Value = 0.380 BTU/hr/sqft/F

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.07 CFM/sqft = 110 CFM
Heating : 0.11 CFM/sqft = 172 CFM
Typical : 0.11 CFM/sqft = 172 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 1,565.0 sqft
Perimeter = 85.0 ft
Depth = 1.0 ft

AIR SYSTEM DESCRIPTION

Name : AHU-2 ROOM 118 11-02-90
 Carrier Hourly Analysis Program 6022890201
 Prepared By : ENGG APPLICATIONS CONSUL Page 1 of 2

1. SYSTEM NAME AND TYPE

System Name = AHU-2 ROOM 118
 System Class = Constant Volume
 System Type = (CV/RH) Constant Volume w/ Terminal Reheat
 Number of Zones = 1

2. SPACE SELECTION (see separate printout)

3. THERMOSTAT & EQUIPMENT SCHEDULING DATA

Operation Period	Thermostat Setpoints		Ventilation Dampers
	Cooling	Heating	
Occupied	75.0 F	68.0 F	OPEN
Unoccupied	75.0 F	68.0 F	CLOSED

Weekday	: Occupied Period Begins at	0	; Duration = 24 hrs
Saturday	: Occupied Period Begins at	0	; Duration = 24 hrs
Sunday	: Occupied Period Begins at	0	; Duration = 24 hrs
Design Day	: Occupied Period Begins at	0	; Duration = 24 hrs

4. SUPPLY, VENTILATION, RETURN AIR DATA

SUPPLY AIR

Supply air flow rate = 3500.00 CFM
 Supply temperature control = 1 Constant

VENTILATION AIR

Nominal ventilation flow rate = 3500.00 CFM
 Minimum ventilation flow rate = 3500.00 CFM
 Damper leak rate = 5 % of vent air

RETURN AIR

Zone exhaust air flow rate = 3500.00 CFM
 Zone exhaust fan power = 1.2 kW
 Is a return plenum used ? N

AIR SYSTEM DESCRIPTION

Name : AHU-2 ROOM 118

11-02-90

Carrier Hourly Analysis Program

6022890201

Prepared By : ENGG APPLICATIONS CONSUL

Page 2 of 2

5. FAN DATA

SUPPLY FAN

Type = 2:Forward curved

Static = 1.50 in wg

Efficiency = 65 %

Configuration = 1 Draw-thru

RETURN FAN

Type = 1:(Fan does not exist)

6. ACCESSORY DEVICES AND SYSTEMS

PREHEAT COIL

Setpoint temperature = 42.0 F

OUTDOOR AIR ECONOMIZER CONTROL

(Not used)

VENTILATION AIR RECLAIM

(Not used)

HUMIDITY CONTROL

Upper RH setpoint = 50 %

Lower RH setpoint = 40 %

7. MISCELLANEOUS SYSTEM DATA

Cooling coil bypass factor = 0.050

Type of supplemental heating = 1 Not Used

AIR SYSTEM DESCRIPTION

Name : AHU-3 ROOM 119

01-29-91

Carrier Hourly Analysis Program

6100190202

Prepared By : ENGG APPLICATIONS CONSUL

Page 1 of 2

1. SYSTEM NAME AND TYPE

System Name = AHU-3 ROOM 119
 System Class = Constant Volume
 System Type = (CV/RH) Constant Volume w/ Terminal Reheat
 Number of Zones = 1

2. SPACE SELECTION (see separate printout)

3. THERMOSTAT & EQUIPMENT SCHEDULING DATA

Operation Period	Thermostat Setpoints		Ventilation Dampers
	Cooling	Heating	
Occupied	75.0 F	68.0 F	OPEN
Unoccupied	75.0 F	68.0 F	CLOSED

Weekday	: Occupied Period Begins at	0	; Duration = 24 hrs
Saturday	: Occupied Period Begins at	0	; Duration = 24 hrs
Sunday	: Occupied Period Begins at	0	; Duration = 24 hrs
Design Day	: Occupied Period Begins at	0	; Duration = 24 hrs

4. SUPPLY, VENTILATION, RETURN AIR DATA

SUPPLY AIR

Supply air flow rate = 4200.00 CFM
 Supply temperature control = 1 Constant

VENTILATION AIR

Nominal ventilation flow rate = 4200.00 CFM
 Minimum ventilation flow rate = 4200.00 CFM
 Damper leak rate = 5 % of vent air

RETURN AIR

Zone exhaust air flow rate = 4200.00 CFM
 Zone exhaust fan power = 1.9 kW
 Is a return plenum used ? N

AIR SYSTEM DESCRIPTION

Name : AHU-3 ROOM 119

01-29-91

Carrier Hourly Analysis Program

6100190202

Prepared By : ENGG APPLICATIONS CONSUL

Page 2 of 2

5. FAN DATA

SUPPLY FAN

Type = 2:Forward curved
Static = 1.50 in wg
Efficiency = 65 %
Configuration = 1 Draw-thru

RETURN FAN

Type = 1:(Fan does not exist)

6. ACCESSORY DEVICES AND SYSTEMS

PREHEAT COIL

Setpoint temperature = 42.0 F

OUTDOOR AIR ECONOMIZER CONTROL

(Not used)

VENTILATION AIR RECLAIM

(Not used)

HUMIDITY CONTROL

Upper RH setpoint = 50 %

Lower RH setpoint = 40 %

7. MISCELLANEOUS SYSTEM DATA

Cooling coil bypass factor = 0.050

Type of supplemental heating = 1 Not Used

PLANT DESCRIPTIONS

Plant : #2 OIL FIRED BOILER 01-29-91
 Prepared By : ENGG APPLICATIONS CONSUL 6100190202
 Carrier Hourly Analysis Program Page 1 of 1

1 PLANT NAME AND TYPES

Class = Individual Plants
 Name = #2 OIL FIRED BOILER
 Cooling Plant Type = Air Cooled Reciprocating
 Heating Plant Type = Combustion

2 AIR SYSTEM SELECTION

Air System Name	Mult	Air System Name	Mult
AHU-2 ROOM 118	1	AHU-3 ROOM 119	1

3a COOLING PLANT DATA (Air Cooled Reciprocating)

Estimated maximum cooling coil load = 47.32 Ton
 Is an electronic expansion valve used ? Y
 Capacity at 95.0 F outdoor air = 110.00 Ton
 Input power rate at 95.0 F outdoor air = 1.200 kW/Ton
 Is chilled water reset used ? N
 Design leaving water temperature = 42.0 F
 Is hot gas bypass used ? Y
 Part load % for minimum unloading step = 20 %

3b HEATING PLANT DATA (Combustion)

Estimated maximum heating coil load = 714.98 MBH
 Fuel type = Fuel Oil
 Rated plant output = 1026.0 MBH
 Type of heating = Hydronic
 Is plant efficiency computer generated ? N
 Seasonal plant efficiency = 61 %

4 PUMP SYSTEM DATA

Chilled water pumping system head = 57.00 ft wg
 Chilled water pumping system delta T = 10.00 F
 Hot water pumping system head = 40.00 ft wg
 Hot water pumping system delta T = 20.00 F

BUILDING DESCRIPTION

Building : BUILDING 362 01-29-91
 Prepared By: ENGG APPLICATIONS CONSUL 6100190202
 Carrier Hourly Analysis Program Page 1 of 1

1. BUILDING INPUTS

BUILDING NAME = BUILDING 362

MISCELLANEOUS ELECTRIC

Maximum power = 0.0 kW
 Power schedule = 1

DOMESTIC WATER HEATING

Is a domestic hot water system used ? Y
 Maximum hourly hot water use = 180.0 gal
 Hot water schedule = 4
 Average entering water temperature = 65.0 F
 Average hot water supply temperature = 140.0 F
 Heating plant type = 2 : Combustion
 Fuel type = 2 : Fuel Oil
 Plant capacity = 1026.0 MBH
 Is plant efficiency computer generated ? N
 Annual plant efficiency = 61 %

OTHER INPUTS

Additional building floor area = 0.0 sqft
 Electrical generating efficiency = 100.00 %

2. PLANT SELECTION

Plant Name	Mult	Plant Name	Mult
#2 OIL FIRED BOILER	1		

3. FUEL & ELECTRIC RATE SELECTION

Fuel or Energy	No.	Name of Rate Schedule	Currency
Electric	10	ELECTRIC RATE (GENERIC)	MBTU
Natural Gas	6	NATURAL GAS (GENERIC)	MBTU
Fuel Oil	5	DOMESTIC FUEL OIL #2 (GENERIC)	MBTU
Propane	9	Empty...	MBTU
Remote Source Heating	7	HEAVY FUEL OIL #6 (GENERIC)	MBTU
Remote Source Cooling	9	Empty...	MBTU

FUEL RATE DATA

Fuel Rate : DOMESTIC FUEL OIL #2 (GENERIC)

01-29-91

Prepared By : ENGG APPLICATIONS CONSUL

6100190202

Carrier Hourly Analysis Program

Page 1 of 1

1. FUEL RATE DATA

NAME

Name of rate schedule = DOMESTIC FUEL OIL #2 (GENERIC)

CURRENCY

Currency name = MBTU

Currency symbol = MBTU

BASIC INFORMATION

Units of measurement = Gallon

Conversion factor = 138.70000 kBTU/Gallon

Type of rate schedule = 1 Simple

Flat rate charge = 0.13870 MBTU/Gallon

MONTHLY ENERGY COSTS

Building : BUILDING 362

01-29-91

Site : FT. BELVOIR, VIRGINIA

6100190202

Prepared By : ENGG APPLICATIONS CONSUL

Page 1 of 1

Carrier Hourly Analysis Program

TABLE 1. HVAC COSTS (MBTU)

Month	Electric	Natural Gas	Fuel Oil	Propane	Remote Heating	Remote Cooling
Jan	16	0	459	0	0	0
Feb	14	0	378	0	0	0
Mar	31	0	263	0	0	0
Apr	49	0	114	0	0	0
May	68	0	80	0	0	0
June	79	0	63	0	0	0
July	103	0	61	0	0	0
Aug	95	0	62	0	0	0
Sept	71	0	74	0	0	0
Oct	59	0	102	0	0	0
Nov	34	0	204	0	0	0
Dec	16	0	391	0	0	0
Tot.	636	0	2,251	0	0	0

TABLE 2. NON-HVAC COSTS (MBTU)

Month	Electric	Natural Gas	Fuel Oil	Propane	Remote Heating
Jan	23	0	14	0	0
Feb	21	0	13	0	0
Mar	24	0	15	0	0
Apr	23	0	14	0	0
May	24	0	15	0	0
June	23	0	14	0	0
July	23	0	14	0	0
Aug	25	0	15	0	0
Sept	21	0	13	0	0
Oct	25	0	15	0	0
Nov	23	0	14	0	0
Dec	22	0	14	0	0
Tot.	276	0	170	0	0

FUEL OIL COSTS

Building : BUILDING 362

01-29-91

Site : FT. BELVOIR, VIRGINIA

6100190202

Prepared By : ENGG APPLICATIONS CONSUL

Page 1 of 1

Carrier Hourly Analysis Program

TABLE 1. MONTHLY COMPONENT CHARGES (MBTU)

Month	Energy Charges	Fixed Charges	Taxes	Total Charges
Jan	473	0	0	473
Feb	391	0	0	391
Mar	278	0	0	278
Apr	128	0	0	128
May	94	0	0	94
June	77	0	0	77
July	75	0	0	75
Aug	78	0	0	78
Sept	87	0	0	87
Oct	117	0	0	117
Nov	218	0	0	218
Dec	404	0	0	404
Tot.	2,420	0	0	2,420

TABLE 2. MONTHLY TOTALS

Month	Charges (MBTU)	Energy (Gallon)	Effective Rate (MBTU/Gallon)
Jan	473	3,408	0.13870
Feb	391	2,820	0.13870
Mar	278	2,006	0.13870
Apr	128	924	0.13870
May	94	679	0.13870
June	77	559	0.13870
July	75	540	0.13870
Aug	78	559	0.13870
Sept	87	625	0.13870
Oct	117	845	0.13870
Nov	218	1,571	0.13870
Dec	404	2,914	0.13870
Tot.	2,420	17,450	0.13870

THE SIMULATIONS ESTIMATED HEATING LOAD (714.93 MBH) IS WORST CASE CONDITION AND PROBABLY OCCURES DURING JANUARY. THIS LOAD ONLY REPRESENTS THE SYSTEMS SIMULATED WHICH REQUIRE SUMMER STEAM,

SINCE THE NEW LOCAL BOILER WILL ONLY BE NEEDED FROM MID APRIL THRU MID OCTOBER WE WILL NOT NEED AS LARGE A BOILER LOAD AS INDICATED BY THE COMPUTER SIMULATION.

IF WE TAKE THE AVERAGE MBTU FOR DAYS IN APRIL (WORST CASE) AND ADD 20% AS A SAFETY FACTOR THE RESULTANT LOAD WILL BE SUFFICIENT TO SELECT A LOCAL STEAM BOILER TO ACCOMMODATE THE BUILDINGS STEAM REQUIREMENTS DURING THE SUMMER.

SUMMER STEAM

AVG. MBTU/DAY

↓

APR 4.27 ←
 MAY 3.04
 JUNE 2.57
 JULY 2.42
 AUG. 2.52
 SEPT. 2.9
 OCT. 3.78

$$4.27 / 24 = 178 \text{ MBH} \times 1.20 = 214 \text{ MBH}$$

SELECT: PEERLESS SERIES 7 FDA INDUSTRIAL/COMMERCIAL
 CAST IRON BOILER/BURNER UNIT
 MODEL 704 FDA SU, 13 BHP, 9" Ø VENT, 4 SECTIONS
 OVERALL EFFICIENCY W/PIPING LOSSES & PICKUP = 61 %
 INPUT @ 3.95 GPH #2 = 548 MBH (CORRECTED)
 CORRECTED NET OUTPUT = 331 MBH
 36" L x 35" W x 60" H (2) 4" SUP TAPS (1) 3" RET

COMPUTER SIMULATED MAX. EST. HTG. LOAD
= 714.98 MBH

ENERGY EXPENDED FOR HEATING & DOMESTIC HW. GENERATION

APR MBTU = 128

JAN " = 473

$$\frac{128}{473} = .2706 \times 714.98 = 193.5 \text{ MBH} + \text{DOM HW LOAD}$$

∴ USE 214 MBH FOR BOILER SIZING

TO TAKE LOAD FROM MID-APRIL → MID-OCTOBER

MONTHLY MBTU EXPENDED FOR SUMMER REHEAT AND
DOMESTIC HOT WATER GENERATION AS SIMULATED BY
CARRIER E-20 COMPUTER PROGRAM.

APR.	128 1/2	=	64 MBTU	462 GALS
MAY.		=	94	679
JUNE		=	77	559
JULY		=	75	540
AUG.		=	78	559
SEPT.		=	87	625
OCT.	117 1/2	=	59	433
			<u>534 MBTU</u>	<u>3847 GALS</u>

SELECT : 1000 GAL OIL STORAGE TANK

CONSTRUCTION COST ESTIMATE

DATE PREPARED
FEB 1991

SHEET **OF**

PROJECT
ENERGY SAVINGS OPPORTUNITY SURVEY

LOCATION
FT. BELVOIR, VIRGINIA BLDG 362

ARCHITECT ENGINEER
ENGINEERING APPLICATIONS CONSULTANTS

- BASIS FOR ESTIMATE
- CODE A (No design completed)
 - CODE B (Preliminary design)
 - CODE C (Final design)
 - OTHER (Specify) _____

DRAWING NO.
OIL FIRED LP STEAM BOILER

ESTIMATOR
REF

CHECKED BY
VP

SUMMARY	QUANTITY			LABOR		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	PER UNIT	TOTAL		
OIL FIRED LP STEAM BOILER	1	EA		1525		8,150	9,675	
1000 GAL OIL STORAGE EQUIP.		LS		3250		8,552	11,802	
MISC HOOK-UP COSTS		LS		446		309	755	
VENT CHIMNEY 9"Ø	30	LF	7.30	219	58.30	1749	1968	
FITTINGS, FLASHING, TOP, ETC.		LS		144		1933	2077	
AUTO DRAFT REGULATORS	1	EA		13		53	66	
STEAM PIPING, FITTINGS, VALVES, ETC		LS		1504		813	2317	
CONDENSATE PIPING, TRAPS ETC.		LS		368		859	1227	
RETURN FEEDWATER SYSTEM		LS		508		731	1239	
ELECTRICAL WORK		LS		475		225	700	
SUB-TOTAL				8452		23,374	31,826	
LABOR MARK-UP	21%			1775			1775	
TAXES	4.5%					1,052	1,052	
SUB-TOTAL							34,653	
OVERHEAD	10%						3,465	
SUB-TOTAL							38,118	
PROFIT	10%						3,812	
SUB-TOTAL							41,930	
TOTAL							41,930	

OIL STORAGE

REQD. 1000 GAL. UNDERGROUND, DOUBLE WALL, STEEL
 UL LISTED, W/STI-P3 CORROSION PROTECTION
 & 30 YR WARRANTY

	L	M	T	
182 TANK	190	3200	3390	4' x 10' L
HOLD DNS.	47	270	317	
1" PIPING (30')	3.82	147.41	5.70	
158 INCASED PIPING (36')	7.15	10.15.76	18.06	
FOOT VALVE	12.40	34.50	46.90	
PUMP (2)	59	395	454	
TANK GAGE SYS	79.	715.	794.	
VALVES (2)	1040	50.35	60.65	
SHUT OFFS (2)	22	96	118	
PAD CY (5)	25.	94.	119	
EXCAVATION CY (83)	27	-	-	
	<u>3250</u>	<u>6222</u>	<u>9472</u>	

LEAK DETECTION SYSTEM

CONTROL MASTER W/ALARM	725
PROBES! 4" WELL	760
TANK WALL	650
CABLE	195
	<u>M</u>

OPTIONAL LEAK DETECTION = 2330

$$\underline{3250} + \underline{8552} = 11,802$$

ALL FUEL CHIMNEY, UL LISTED, DOUBLE WALL, 304 INNER - STL OUTER

	L	M	T
(30') STR 9" φ	7.30	58.30	65.60
(2) 45° EL	14.60	195	209.60
90° TEE	16.70	214	230.70
PLT. SUPPORT	17.55	123	140.55
ROOF THIMBLE	17.55	310	327.55
ROOF SUP. ASSEM.	18.45	405	423.45
STACK CAP	8.75	245	253.75
	<u>144</u>	<u>1933</u>	<u>2077</u>

OIL HOOK-UP

	L	M	T
FILTER	9.90	9.95	19.95
VALVE (2)	8.25	4.25	12.50
VALVE (2)	16.50	8.60	25.00
2" VENT CAP	6.20	7.50	13.70
TUBE (15')	3.82	1.88	5.70
2" STL V.P. (35')	6.25	4.08 .67	11.00
LOUVERS	20	8	28
DAMPERS	26	24	50
FILL CAP	6.70	7.50	13.70
	<u>446</u>	<u>309</u>	<u>755</u>

331000/4000 = 117.5 SA 12x18

STEAM VALVES, PIPING, FITTINGS, VALVES ETC.

		L	M	T
132	4" STM. VALVES OS&Y (2)	120	215	335
	BOILER DRAIN	5.80	11.90	17.70
87	4" PIPING (20')	9.60	6.77	11.03
	PIPING ()			17.40
	PIPING ()			
110	4" WN/FLANGE (6)	36	15	51.00
	4" 90° ELL (4)	71	14.90	7.65
	4" TEE (1)	120	27	12.75
	4 WELDING (10)	36	3.82	39.82
	4 INS (30)	2.87	5.71	8.58
		<u>1504</u>	<u>813</u>	<u>2317</u>

CONDENSATE PIPING, TRAPS

		L	M	T
	1 1/2" PIPING (20)	4.68	2.11	.5
203	TRAP ASSEMBLY (2)	90	320	410
	INS (35)	1.72	2.37	4.09
	WELD LABOR (6)	22	2.39	24.39
	MISC 10%	34	78	
		<u>368</u>	<u>859</u>	<u>1227</u>

RETURN FEEDWATER

		L	M	T
	1 1/2 PIPING (20)	4.68	2.16	
	VALVE (2)	18.	140.	
	MISC FITINGS 20%	26	66	
	INS (30)	1.72	2.37	4.09
		<u>207.2</u>	<u>461</u>	<u>669</u>
	CONTROL CHANGES	300	270	570
		<u>508</u>	<u>731</u>	<u>1239</u>

362.25

BUILDING 363

DESIGN PARAMETERS, SHGs

Location : FT. BELVOIR, VIRGINIA
 Prepared By : ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

11-12-90
 6022890201
 Page 1 of 1

DESIGN WEATHER PARAMETERS

City Name.....: FT. BELVOIR
 Location.....: VIRGINIA
 Latitude.....: 38.4 deg
 Elevation.....: 69.0 ft
 Summer Design Dry Bulb Temp.....: 90.0 F
 Summer Design Wet Bulb Temp.....: 75.0 F
 Daily Temperature Range.....: 23.0 F
 Winter Design Dry Bulb Temp.....: 12.0 F
 Atmospheric Clearness Number.....: 1.00

TABLE 1. MAXIMUM SOLAR HEAT GAINS - AVERAGE DAYS
 (BTU/hr/sqft)

Month	NE	E	SE	S	SW	W	NW	N	Hor
Jan	24.2	61.1	97.3	110.1	97.3	61.1	24.2	24.2	80.0
Feb	31.8	74.8	105.7	113.8	105.7	74.8	31.8	31.8	107.2
Mar	40.8	87.0	106.9	108.0	106.9	87.0	40.8	40.8	136.8
Apr	60.0	97.4	104.4	97.2	104.4	97.4	60.0	49.3	164.3
May	74.9	103.0	98.4	84.0	98.4	103.0	74.9	54.9	181.8
Jun	85.1	109.3	97.5	79.2	97.5	109.3	85.1	57.9	195.2
Jul	80.6	106.7	98.1	81.4	98.1	106.7	80.6	56.4	189.3
Aug	69.1	104.1	105.7	94.4	105.7	104.1	69.1	52.2	177.6
Sep	52.3	99.3	114.8	111.6	114.8	99.3	52.3	45.4	158.1
Oct	36.4	88.3	117.7	122.9	117.7	88.3	36.4	36.4	128.2
Nov	26.7	66.5	101.8	113.3	101.8	66.5	26.7	26.7	89.4
Dec	21.4	53.0	87.6	100.9	87.6	53.0	21.4	21.4	68.4

TABLE 2. MAXIMUM SOLAR HEAT GAINS - DESIGN DAYS
 (BTU/hr/sqft)

Month	NE	E	SE	S	SW	W	NW	N	Hor
Jan	20.4	158.9	243.9	253.8	243.9	158.9	20.4	20.4	142.0
Feb	53.0	189.1	246.5	237.5	246.5	189.1	53.0	24.7	187.7
Mar	95.9	219.8	234.5	200.7	234.5	219.8	95.9	29.4	229.0
Apr	141.6	224.4	200.1	146.7	200.1	224.4	141.6	34.1	256.0
May	166.1	220.1	170.7	104.6	170.7	220.1	166.1	37.4	268.0
Jun	173.2	215.4	156.7	87.8	156.7	215.4	173.2	47.4	269.7
Jul	163.7	215.7	166.5	101.4	166.5	215.7	163.7	38.3	264.7
Aug	136.4	216.6	193.1	141.7	193.1	216.6	136.4	35.8	251.3
Sep	90.3	207.2	224.7	194.9	224.7	207.2	90.3	30.6	221.4
Oct	52.0	182.7	238.2	230.6	238.2	182.7	52.0	25.5	184.4
Nov	20.7	156.1	239.8	249.9	239.8	156.1	20.7	20.7	141.3
Dec	18.5	141.9	236.4	254.2	236.4	141.9	18.5	18.5	122.2

MASTER SCHEDULE SUMMARY

Prepared By : ENGG APPLICATIONS CONSUL
Carrier Hourly Analysis Program

11-12-90
6022890201

MASTER SCHEDULE 1. OCCUPANCY Hourly Percentages

Hour ----->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	0	0	0	0	0	0	10	50	100	100	100	100
Saturday	0	0	0	0	0	0	5	5	5	10	10	10
Sunday	0	0	0	0	0	0	0	5	5	5	5	5
DESIGN	0	0	0	0	0	10	20	100	100	100	100	100

Hour ----->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	100	100	100	100	80	50	10	10	5	5	0	0
Saturday	10	10	10	5	5	5	5	5	0	0	0	0
Sunday	5	5	5	5	5	5	0	0	0	0	0	0
DESIGN	100	100	100	100	100	100	100	20	10	0	0	0

MASTER SCHEDULE 2. LIGHTING Hourly Percentages

Hour ----->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	5	5	5	5	5	5	20	80	100	100	100	100
Saturday	5	5	5	5	5	5	15	15	20	40	50	50
Sunday	5	5	5	5	5	5	5	15	20	30	30	30
DESIGN	10	10	10	10	10	20	50	100	100	100	100	100

Hour ----->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	100	100	100	100	90	70	40	30	20	20	5	5
Saturday	50	50	50	50	50	40	30	20	5	5	5	5
Sunday	30	30	30	20	20	20	20	5	5	5	5	5
DESIGN	100	100	100	100	100	100	100	50	20	10	10	10

MASTER SCHEDULE 3. EQUIPMENT Hourly Percentages

Hour ----->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	5	5	5	5	5	5	20	50	100	100	100	100
Saturday	5	5	5	5	5	5	10	10	15	20	20	20
Sunday	5	5	5	5	5	5	5	10	10	10	10	20
DESIGN	10	10	10	10	10	20	40	100	100	100	100	100

Hour ----->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	100	100	100	100	80	50	20	10	5	5	5	5
Saturday	20	20	20	10	10	10	10	10	5	5	5	5
Sunday	20	15	15	10	10	10	10	5	5	5	5	5
DESIGN	100	100	100	100	100	100	100	40	20	10	10	10

MASTER SCHEDULE SUMMARY

Prepared By : ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

11-12-90
 6022890201

MASTER SCHEDULE 4. DOMESTIC HOT WATER Hourly Percentages

Hour ---->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	0	0	0	0	0	5	10	10	20	20	20	80
Saturday	0	0	0	0	0	2	2	2	5	5	5	5
Sunday	0	0	0	0	0	0	0	2	2	2	2	2
DESIGN	0	0	0	0	0	5	5	20	20	20	20	80

Hour ---->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	80	20	20	20	10	10	5	5	5	2	0	0
Saturday	5	5	5	2	2	2	2	2	0	0	0	0
Sunday	2	2	2	2	2	2	0	0	0	0	0	0
DESIGN	80	20	20	20	10	10	5	5	2	2	0	0

DAY TYPE DATA

Prepared By : ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

01-31-91
 6100190202

Month	DAY TYPE 1 Weekday	DAY TYPE 2 Saturday	DAY TYPE 3 Sunday	Total Days/Month
January	21	4	6	31
February	19	4	5	28
March	22	5	4	31
April	21	4	5	30
May	22	4	5	31
June	21	5	4	30
July	21	4	6	31
August	23	4	4	31
September	19	5	6	30
October	23	4	4	31
November	21	4	5	30
December	20	5	6	31

ENGINEERING ANALYSIS

Sheet _____ of _____

By: REF

Calculations for Infiltration

Building 363

Project: ESOS, Fort BELVOIR Date: NOV. 1990

Contract No: DACA-31-89-C=0189 EAC Project No.: 89034.0

Calculations based on ASHRAE 1989 Page F 2.3.14.

Building Leakage Area

	Effective Leakage Area, in ²	Building Component Parameter	Building Leakage Area D _L , in ²
	L ₁	D ₁	L
Sill foundation	0.19/ft. of perimeter	386 ft.	73.3
Joints, ceiling/wall	0.12/ft. of wall	386 ft.	46.3
Windows	0.063/ft ² . of window	2758 ft ² .	173.7
Doors	0.215/ft ² . of doors	237 ft ² .	51.0
Wall - Window frames	0.15/ft ² . of window	2758 ft ² .	413.7
- Door frames	0.072/ft ² . of door	237 ft ² .	17.0
Elec. outlet/switch	0.16/fixture	40 ft.	6.4
Recessed lights	1.6/fixture	20 ft.	32.0
Pipe penetration	1.55/in ² . of pipe,	2 ft.	3.1
Exhaust fans	6.0/fan	40 ft.	240.0
Duct penetration	2.2/SF	42 SF	92.4
FCU openings	x 1/3 (SF/unit) x 2.2/SF		<u>92.4</u>
			1148.9 in ² .

Infiltration Q (cfm) = L x (A Δt + Bv²)^{1/2}

(ASHRAE 1989, P. 23.17, EQ.33)

Winter

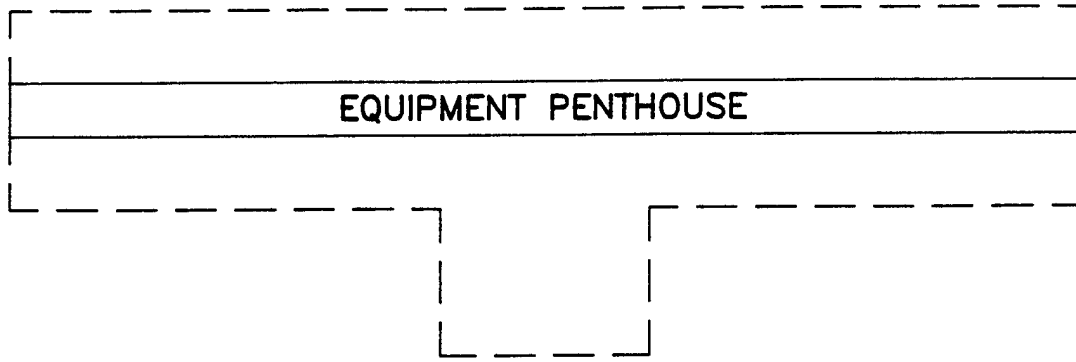
Summer

Q (cfm) =
= L(0.01313 x 51 + 0.0157 x 14²)^{1/2}
= L x 2.2
= 1148.9 x 2.2 = 2527.6 CFM

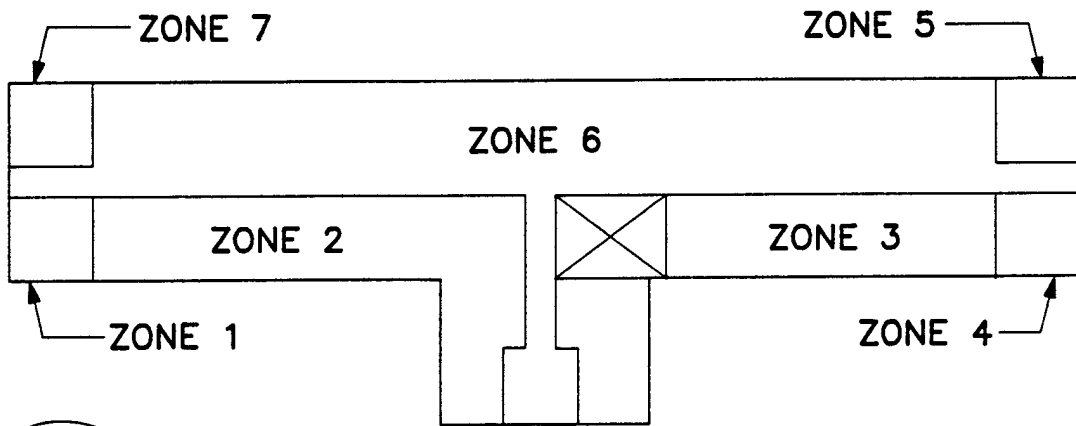
= L(0.0313 x 15 + 0.0157 x 10²)^{1/2}
= L x 1.45
= 1148.9 x 1.45 = 1665.9 CFM

Rate = 2527.6
31,418 = 0.08 CFM/SF

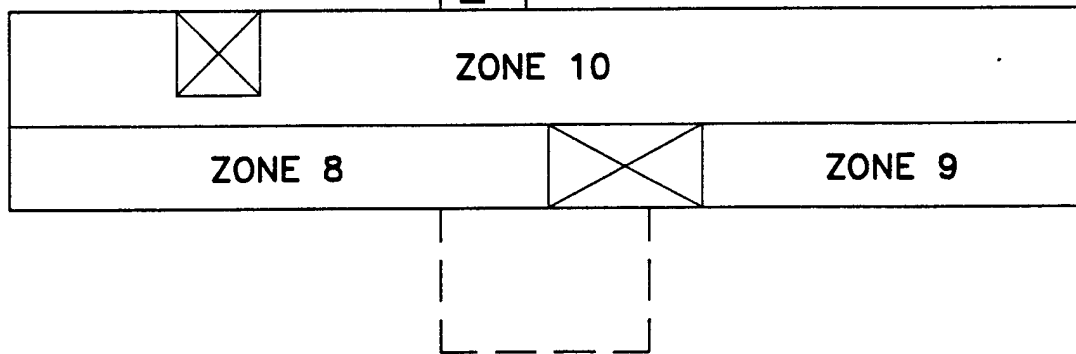
Rate = 1665.9
31,418 = 0.053 CFM/SF



PENTHOUSE PLAN



FIRST FLOOR PLAN



BASEMENT FLOOR PLAN

BUILDING 363 KEY PLAN

SIMPLE SPACE DESCRIPTION

Space Name : 100, 102, 102A NW CORNER 01-31-91
Prepared By : ENGG APPLICATIONS CONSUL 6100190202
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.290 Roof 0.100 Glass 0.580 Building Weight : M
Weight : M Glass Factor : 0.58
Color : D D Internal Shades ? N

People : sqft/person = 605.0 Schedule = 1 Activity Level = 3
Lights : W/sqft = 3.18 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 3 Free-hanging

SPACE NAME = 100, 102, 102A NW CORNER

Exposure : N W Floor Area : 605.0 sqft
Wall Area : 210.0 242.0 Roof Area : 522.0 sqft
Glass Area : 76.0 116.0 Current
Elements : El,Pt,In,Gr

ADDITIONAL ELEMENT - Other Electric

W/sqft = 5.00
Total Watts = 3,025
Schedule No. = 1

ADDITIONAL ELEMENT - Partition

Area = 66.0 sqft Uncond. Space Temp:Cooling = 100.0 %
U-Value = 0.200 BTU/hr/sqft/F Uncond. Space Temp:Heating = 90.0 %

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.05 CFM/sqft = 32 CFM
Heating : 0.08 CFM/sqft = 48 CFM
Typical : 0.08 CFM/sqft = 48 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 0.0 sqft
Perimeter = 50.0 ft
Depth = 0.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : 104

01-31-91

Prepared By : ENGG APPLICATIONS CONSUL

6100190202

Carrier Hourly Analysis Program

Page 1 of 1

	Walls	Roof	Glass		
U-Value :	0.290	0.100	0.580	Building Weight :	M
Weight :	M	M		Glass Factor :	0.58
Color :	D	D		Internal Shades :	? N

People : sqft/person = 352.0 Schedule = 1 Activity Level = 3
 Lights : W/sqft = 3.64 Schedule = 2 Wattage Mult. = 1.20
 : Fixture Type = 3 Free-hanging

SPACE NAME = 104

			Floor Area :	352.0 sqft
Exposure :	N	W	Roof Area :	304.0 sqft
Wall Area :	0.0	132.0	Current	
Glass Area :	0.0	76.0	Elements :	El,Pt,In,Gr

ADDITIONAL ELEMENT - Other Electric

 W/sqft = 5.00
 Total Watts = 1,760
 Schedule No. = 1

ADDITIONAL ELEMENT - Partition

 Area = 48.0 sqft Uncond. Space Temp:Cooling = 100.0 %
 U-Value = 0.200 BTU/hr/sqft/F Uncond. Space Temp:Heating = 90.0 %

ADDITIONAL ELEMENT - Infiltration

 Cooling : 0.05 CFM/sqft = 19 CFM
 Heating : 0.08 CFM/sqft = 28 CFM
 Typical : 0.08 CFM/sqft = 28 CFM

ADDITIONAL ELEMENT - Ground

 Slab Floor Area = 0.0 sqft
 Perimeter = 16.0 ft
 Depth = 0.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : 106 01-31-91
 Prepared By : ENGG APPLICATIONS CONSUL 6100190202
 Carrier Hourly Analysis Program Page 1 of 1

	Walls	Roof	Glass		
U-Value :	0.290	0.100	0.580	Building Weight :	M
Weight :	M	M		Glass Factor :	0.58
Color :	D	D		Internal Shades :	N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 3
 Lights : W/sqft = 3.64 Schedule = 2 Wattage Mult. = 1.20
 : Fixture Type = 3 Free-hanging

 SPACE NAME = 106

		Floor Area :	352.0 sqft
Exposure :	N	W Roof Area :	304.0 sqft
Wall Area :	0.0	Current	
Glass Area :	0.0	76.0 Elements :	El,Pt,In,Gr

ADDITIONAL ELEMENT - Other Electric

 W/sqft = 5.00
 Total Watts = 1,760
 Schedule No. = 1

ADDITIONAL ELEMENT - Partition

 Area = 48.0 sqft Uncond. Space Temp:Cooling = 100.0 %
 U-Value = 0.200 BTU/hr/sqft/F Uncond. Space Temp:Heating = 90.0 %

ADDITIONAL ELEMENT - Infiltration

 Cooling : 0.05 CFM/sqft = 19 CFM
 Heating : 0.08 CFM/sqft = 28 CFM
 Typical : 0.08 CFM/sqft = 28 CFM

ADDITIONAL ELEMENT - Ground

 Slab Floor Area = 0.0 sqft
 Perimeter = 16.0 ft
 Depth = 0.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : 108, 110, 112, 112A 01-31-91
Prepared By : ENGG APPLICATIONS CONSUL 6100190202
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.290 Roof 0.100 Glass 0.580 Building Weight : M
Weight : M M Glass Factor : 0.58
Color : D D Internal Shades ? N

People : sqft/person = 396.0 Schedule = 1 Activity Level = 3
Lights : W/sqft = 2.83 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 3 Free-hanging

SPACE NAME = 108, 110, 112, 112A

Exposure : N W Floor Area : 792.0 sqft
Wall Area : 0.0 276.0 Roof Area : 684.0 sqft
Glass Area : 0.0 192.0 Current
Elements : El,Pt,In,Gr

ADDITIONAL ELEMENT - Other Electric

W/sqft = 5.00
Total Watts = 3,960
Schedule No. = 1

ADDITIONAL ELEMENT - Partition

Area = 108.0 sqft Uncond. Space Temp:Cooling = 100.0 %
U-Value = 0.200 BTU/hr/sqft/F Uncond. Space Temp:Heating = 90.0 %

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.05 CFM/sqft = 42 CFM
Heating : 0.08 CFM/sqft = 63 CFM
Typical : 0.08 CFM/sqft = 63 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 0.0 sqft
Perimeter = 36.0 ft
Depth = 0.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : 112B, 112C, 114, 114A 01-31-91
Prepared By : ENGG APPLICATIONS CONSUL 6100190202
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.290 Roof 0.100 Glass 0.580 Building Weight : M
Weight : M M Glass Factor : 0.58
Color : D D Internal Shades ? N

People : sqft/person = 242.0 Schedule = 1 Activity Level = 3
Lights : W/sqft = 1.28 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 3 Free-hanging

SPACE NAME = 112B, 112C, 114, 114A

Exposure : N W Floor Area : 484.0 sqft
Wall Area : 0.0 193.0 Roof Area : 418.0 sqft
Glass Area : 0.0 35.0 Current
Elements : El,Pt,In,Gr

ADDITIONAL ELEMENT - Other Electric

W/sqft = 4.40
Total Watts = 2,130
Schedule No. = 1

ADDITIONAL ELEMENT - Partition

Area = 63.0 sqft Uncond. Space Temp:Cooling = 100.0 %
U-Value = 0.200 BTU/hr/sqft/F Uncond. Space Temp:Heating = 90.0 %

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.05 CFM/sqft = 26 CFM
Heating : 0.08 CFM/sqft = 39 CFM
Typical : 0.08 CFM/sqft = 39 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 0.0 sqft
Perimeter = 18.0 ft
Depth = 0.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : 116, 121A, 121 01-31-91
Prepared By : ENGG APPLICATIONS CONSUL 6100190202
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.290 Roof 0.100 Glass 0.580 Building Weight : M
Weight : M M Glass Factor : 0.58
Color : D D Internal Shades ? N

People : sqft/person = 252.0 Schedule = 1 Activity Level = 3
Lights : W/sqft = 2.47 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 3 Free-hanging

SPACE NAME = 116, 121A, 121

Exposure : N W Floor Area : 1,263.0 sqft
Wall Area : 354.0 221.0 Roof Area : 1,210.0 sqft
Glass Area : 153.0 0.0 Current
Elements : El,Pt,In,Gr

ADDITIONAL ELEMENT - Other Electric

W/sqft = 4.40
Total Watts = 5,557
Schedule No. = 1

ADDITIONAL ELEMENT - Partition

Area = 63.0 sqft Uncond. Space Temp:Cooling = 100.0 %
U-Value = 0.200 BTU/hr/sqft/F Uncond. Space Temp:Heating = 90.0 %

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.05 CFM/sqft = 67 CFM
Heating : 0.08 CFM/sqft = 101 CFM
Typical : 0.08 CFM/sqft = 101 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 0.0 sqft
Perimeter = 56.0 ft
Depth = 0.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : LOBBY & CORRIDOR 01-31-91
Prepared By : ENGG APPLICATIONS CONSUL 6100190202
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.290 Roof 0.100 Glass 0.580 Building Weight : M
Weight : M M Glass Factor : 0.58
Color : D D Internal Shades ? N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 3
Lights : W/sqft = 1.36 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 1 Recessed, not vented

SPACE NAME = LOBBY & CORRIDOR

Exposure : N W Floor Area : 3,024.0 sqft
Wall Area : 98.0 345.0 Roof Area : 2,288.0 sqft
Glass Area : 6.0 6.0 Current
Elements : Rf,Gl,Wl,In,Gr

ADDITIONAL ELEMENT - Roof

Weight = M (lb/sqft) Color = D
U-Value = 0.100 BTU/hr/sqft/F Area = 760.0 sqft

ADDITIONAL ELEMENT - Glass

U-Value = 0.580 BTU/hr/sqft/F Exposure = S
Glass Factor = 0.90 Area = 6.0 sqft
Internal Shades ? N

ADDITIONAL ELEMENT - Wall

Weight = M (lb/sqft) Exposure = S
Color = D Net Area = 98.0 sqft
U-Value = 0.290 BTU/hr/sqft/F

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.05 CFM/sqft = 160 CFM
Heating : 0.08 CFM/sqft = 242 CFM
Typical : 0.08 CFM/sqft = 242 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 0.0 sqft
Perimeter = 50.0 ft
Depth = 0.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : 116, 118, 120

01-31-91

Prepared By : ENGG APPLICATIONS CONSUL

6100190202

Carrier Hourly Analysis Program

Page 1 of 1

	Walls	Roof	Glass		
U-Value :	0.290	0.100	0.580	Building Weight	: M
Weight :	M	M		Glass Factor	: 0.58
Color :	D	D		Internal Shades	? N

People : sqft/person = 191.0 Schedule = 1 Activity Level = 3
 Lights : W/sqft = 1.88 Schedule = 2 Wattage Mult. = 1.20
 : Fixture Type = 3 Free-hanging

SPACE NAME = 116, 118, 120

			Floor Area	:	765.0 sqft	
Exposure	:	W	S	Roof Area	:	765.0 sqft
Wall Area	:	234.0	354.0	Current		
Glass Area	:	0.0	153.0	Elements	:	El, In, Gr

ADDITIONAL ELEMENT - Other Electric

W/sqft	=	4.40
Total Watts	=	3,366
Schedule No.	=	1

ADDITIONAL ELEMENT - Infiltration

Cooling	:	0.05 CFM/sqft	=	41 CFM
Heating	:	0.08 CFM/sqft	=	61 CFM
Typical	:	0.08 CFM/sqft	=	61 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area	=	0.0 sqft
Perimeter	=	57.0 ft
Depth	=	0.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : 124 01-31-91
Prepared By : ENGG APPLICATIONS CONSUL 6100190202
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.290 Roof 0.100 Glass 0.580 Building Weight : M
Weight : M M Glass Factor : 0.58
Color : D D Internal Shades ? N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 3
Lights : W/sqft = 2.30 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 3 Free-hanging

SPACE NAME = 124

Exposure : W S Floor Area : 418.0 sqft
Wall Area : 170.0 0.0 Roof Area : 352.0 sqft
Glass Area : 78.0 0.0 Current
Glass Area : 78.0 0.0 Elements : El,Pt,In,Gr

ADDITIONAL ELEMENT - Other Electric

W/sqft = 5.00
Total Watts = 2,090
Schedule No. = 1

ADDITIONAL ELEMENT - Partition

Area = 48.0 sqft Uncond. Space Temp:Cooling = 100.0 %
U-Value = 0.200 BTU/hr/sqft/F Uncond. Space Temp:Heating = 90.0 %

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.05 CFM/sqft = 22 CFM
Heating : 0.08 CFM/sqft = 33 CFM
Typical : 0.08 CFM/sqft = 33 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 0.0 sqft
Perimeter = 16.0 ft
Depth = 0.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : 124A, 126 01-31-91
Prepared By : ENGG APPLICATIONS CONSUL 6100190202
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.290 Roof 0.100 Glass 0.580 Building Weight : M
Weight : M Glass Factor : 0.58
Color : D Internal Shades ? N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 3
Lights : W/sqft = 2.72 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 3 Free-hanging

SPACE NAME = 124A, 126

Exposure : W S Floor Area : 412.0 sqft
Wall Area : 210.0 Roof Area : 364.0 sqft
Glass Area : 76.0 Current 0.0 Elements : El,Pt,In,Gr

ADDITIONAL ELEMENT - Other Electric

W/sqft = 5.00
Total Watts = 2,060
Schedule No. = 1

ADDITIONAL ELEMENT - Partition

Area = 48.0 sqft Uncond. Space Temp:Cooling = 100.0 %
U-Value = 0.200 BTU/hr/sqft/F Uncond. Space Temp:Heating = 90.0 %

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.05 CFM/sqft = 22 CFM
Heating : 0.08 CFM/sqft = 33 CFM
Typical : 0.08 CFM/sqft = 33 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 0.0 sqft
Perimeter = 16.0 ft
Depth = 0.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : 128 01-31-91
Prepared By : ENGG APPLICATIONS CONSUL 6100190202
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.290 Roof 0.100 Glass 0.580 Building Weight : M
Weight : M M Glass Factor : 0.58
Color : D D Internal Shades ? N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 3
Lights : W/sqft = 2.65 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 3 Free-hanging

SPACE NAME = 128

Floor Area : 242.0 sqft
Exposure : W S Roof Area : 209.0 sqft
Wall Area : 105.0 0.0 Current
Glass Area : 38.0 0.0 Elements : El,Pt,In,Gr

ADDITIONAL ELEMENT - Other Electric

W/sqft = 7.00
Total Watts = 1,694
Schedule No. = 1

ADDITIONAL ELEMENT - Partition

Area = 33.0 sqft Uncond. Space Temp:Cooling = 100.0 %
U-Value = 0.200 BTU/hr/sqft/F Uncond. Space Temp:Heating = 90.0 %

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.05 CFM/sqft = 13 CFM
Heating : 0.08 CFM/sqft = 19 CFM
Typical : 0.08 CFM/sqft = 19 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 0.0 sqft
Perimeter = 11.0 ft
Depth = 0.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : 130

01-31-91

Prepared By : ENGG APPLICATIONS CONSUL

6100190202

Carrier Hourly Analysis Program

Page 1 of 1

	Walls	Roof	Glass		
U-Value :	0.290	0.100	0.580	Building Weight :	M
Weight :	M	M		Glass Factor :	0.58
Color :	D	D		Internal Shades :	? N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 3
 Lights : W/sqft = 2.65 Schedule = 2 Wattage Mult. = 1.20
 : Fixture Type = 3 Free-hanging

SPACE NAME = 130

		Floor Area :	242.0 sqft
Exposure :	W	S Roof Area :	209.0 sqft
Wall Area :	105.0	0.0 Current	
Glass Area :	38.0	0.0 Elements :	El,Pt,In,Gr

ADDITIONAL ELEMENT - Other Electric

 W/sqft = 7.00
 Total Watts = 1,694
 Schedule No. = 1

ADDITIONAL ELEMENT - Partition

 Area = 33.0 sqft Uncond. Space Temp:Cooling = 100.0 %
 U-Value = 0.200 BTU/hr/sqft/F Uncond. Space Temp:Heating = 90.0 %

ADDITIONAL ELEMENT - Infiltration

 Cooling : 0.05 CFM/sqft = 13 CFM
 Heating : 0.08 CFM/sqft = 19 CFM
 Typical : 0.08 CFM/sqft = 19 CFM

ADDITIONAL ELEMENT - Ground

 Slab Floor Area = 0.0 sqft
 Perimeter = 11.0 ft
 Depth = 0.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : 132, 132A, 130A, 134A
Prepared By : ENGG APPLICATIONS CONSUL
Carrier Hourly Analysis Program

01-31-91
6100190202
Page 1 of 1

U-Value :	Walls	Roof	Glass	Building Weight	: M
Weight :	M	M	0.580	Glass Factor	: 0.58
Color :	D	D		Internal Shades	? N

People : sqft/person = 145.0 Schedule = 1 Activity Level = 3
 Lights : W/sqft = 2.20 Schedule = 2 Wattage Mult. = 1.20
 : Fixture Type = 3 Free-hanging

SPACE NAME = 132, 132A, 130A, 134A

Exposure :	W	S	Floor Area :	506.0 sqft
Wall Area :	223.0	0.0	Roof Area :	437.0 sqft
Glass Area :	76.0	0.0	Current	
			Elements :	El,Pt,Li,In,Gr

ADDITIONAL ELEMENT - Other Electric

 W/sqft = 4.40
 Total Watts = 2,226
 Schedule No. = 1

ADDITIONAL ELEMENT - Partition

 Area = 69.0 sqft Uncond. Space Temp:Cooling = 100.0 %
 U-Value = 0.200 BTU/hr/sqft/F Uncond. Space Temp:Heating = 90.0 %

ADDITIONAL ELEMENT - Lights

 W/sqft = 0.40 Schedule No. = 2
 Total Watts = 200 Wattage Multiplier = 1.00
 Fixture Type = 1 (Recessed, not vented)

ADDITIONAL ELEMENT - Infiltration

 Cooling : 0.05 CFM/sqft = 27 CFM
 Heating : 0.08 CFM/sqft = 40 CFM
 Typical : 0.08 CFM/sqft = 40 CFM

ADDITIONAL ELEMENT - Ground

 Slab Floor Area = 0.0 sqft
 Perimeter = 23.0 ft
 Depth = 0.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : 134, 134B, 136

01-31-91

Prepared By : ENGG APPLICATIONS CONSUL

6100190202

Carrier Hourly Analysis Program

Page 1 of 1

	Walls	Roof	Glass		
U-Value :	0.290	0.100	0.580	Building Weight	: M
Weight :	M	M		Glass Factor	: 0.58
Color :	D	D		Internal Shades	? N

People : sqft/person = 145.0 Schedule = 1 Activity Level = 3
 Lights : W/sqft = 2.20 Schedule = 2 Wattage Mult. = 1.20
 : Fixture Type = 3 Free-hanging

SPACE NAME = 134, 134B, 136

		Floor Area	:	594.0 sqft
Exposure	:	W	S	Roof Area
Wall Area	:	275.0	247.0	Current
Glass Area	:	76.0	39.0	Elements
				: El,Pt,In,Gr

ADDITIONAL ELEMENT - Other Electric

W/sqft = 5.00
 Total Watts = 2,970
 Schedule No. = 1

ADDITIONAL ELEMENT - Partition

Area = 81.0 sqft Uncond. Space Temp:Cooling = 100.0 %
 U-Value = 0.200 BTU/hr/sqft/F Uncond. Space Temp:Heating = 90.0 %

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.05 CFM/sqft = 31 CFM
 Heating : 0.08 CFM/sqft = 48 CFM
 Typical : 0.08 CFM/sqft = 48 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 0.0 sqft
 Perimeter = 49.0 ft
 Depth = 0.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : 101 NE CORNER 01-31-91
Prepared By : ENGG APPLICATIONS CONSUL 6100190202
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.290 Roof 0.100 Glass 0.580 Building Weight : M
Weight : M M Glass Factor : 0.58
Color : D D Internal Shades ? N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 3
Lights : W/sqft = 2.65 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 3 Free-hanging

SPACE NAME = 101 NE CORNER

Floor Area : 484.0 sqft
Exposure : E N Roof Area : 418.0 sqft
Wall Area : 210.0 210.0 Current
Glass Area : 76.0 76.0 Elements : El,Pt,In,Gr

ADDITIONAL ELEMENT - Other Electric

W/sqft = 7.00
Total Watts = 3,388
Schedule No. = 1

ADDITIONAL ELEMENT - Partition

Area = 66.0 sqft Uncond. Space Temp:Cooling = 100.0 %
U-Value = 0.200 BTU/hr/sqft/F Uncond. Space Temp:Heating = 90.0 %

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.05 CFM/sqft = 26 CFM
Heating : 0.08 CFM/sqft = 39 CFM
Typical : 0.08 CFM/sqft = 39 CFM

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 0.0 sqft
Perimeter = 44.0 ft
Depth = 0.0 ft

SIMPLE SPACE DESCRIPTION

Space Name : 103 01-31-91
Prepared By : ENGG APPLICATIONS CONSUL 6100190202
Carrier Hourly Analysis Program Page 1 of 1

Walls Roof Glass
U-Value : 0.290 0.100 0.580 Building Weight : M
Weight : M M Glass Factor : 0.58
Color : D D Internal Shades ? N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 3
Lights : W/sqft = 3.97 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 3 Free-hanging

SPACE NAME = 103

Floor Area : 242.0 sqft
Exposure : E N Roof Area : 209.0 sqft
Wall Area : 105.0 0.0 Current
Glass Area : 38.0 0.0 Elements : El,Pt,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 7.00
Total Watts = 1,694
Schedule No. = 1

ADDITIONAL ELEMENT - Partition

Area = 33.0 sqft Uncond. Space Temp:Cooling = 100.0 %
U-Value = 0.200 BTU/hr/sqft/F Uncond. Space Temp:Heating = 90.0 %

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.05 CFM/sqft = 13 CFM
Heating : 0.08 CFM/sqft = 19 CFM
Typical : 0.08 CFM/sqft = 19 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 105

01-31-91

Prepared By : ENGG APPLICATIONS CONSUL

6100190202

Carrier Hourly Analysis Program

Page 1 of 1

	Walls	Roof	Glass		
U-Value :	0.290	0.100	0.580	Building Weight :	M
Weight :	M	M		Glass Factor :	0.58
Color :	D	D		Internal Shades :	N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 3
 Lights : W/sqft = 3.97 Schedule = 2 Wattage Mult. = 1.20
 : Fixture Type = 3 Free-hanging

SPACE NAME = 105

		Floor Area :	242.0 sqft
Exposure :	E	N Roof Area :	209.0 sqft
Wall Area :	105.0	0.0 Current	
Glass Area :	38.0	0.0 Elements :	El,Pt,In

ADDITIONAL ELEMENT - Other Electric

 W/sqft = 7.00
 Total Watts = 1,694
 Schedule No. = 1

ADDITIONAL ELEMENT - Partition

 Area = 33.0 sqft Uncond. Space Temp:Cooling = 100.0 %
 U-Value = 0.200 BTU/hr/sqft/F Uncond. Space Temp:Heating = 90.0 %

ADDITIONAL ELEMENT - Infiltration

 Cooling : 0.05 CFM/sqft = 13 CFM
 Heating : 0.08 CFM/sqft = 19 CFM
 Typical : 0.08 CFM/sqft = 19 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 107, 107A, 109 01-31-91
 Prepared By : ENGG APPLICATIONS CONSUL 6100190202
 Carrier Hourly Analysis Program Page 1 of 1

	Walls	Roof	Glass		
U-Value :	0.290	0.100	0.580	Building Weight :	M
Weight :	M	M		Glass Factor :	0.58
Color :	D	D		Internal Shades :	? N

People : sqft/person = 594.0 Schedule = 1 Activity Level = 3
 Lights : W/sqft = 3.23 Schedule = 2 Wattage Mult. = 1.20
 : Fixture Type = 3 Free-hanging

 SPACE NAME = 107, 107A, 109

		Floor Area :	594.0 sqft
Exposure :	E	N Roof Area :	513.0 sqft
Wall Area :	275.0	0.0 Current	
Glass Area :	76.0	0.0 Elements :	El,Pt,Li,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 5.00
 Total Watts = 2,970
 Schedule No. = 1

ADDITIONAL ELEMENT - Partition

Area = 81.0 sqft Uncond. Space Temp:Cooling = 100.0 %
 U-Value = 0.200 BTU/hr/sqft/F Uncond. Space Temp:Heating = 90.0 %

ADDITIONAL ELEMENT - Lights

W/sqft = 0.17 Schedule No. = 2
 Total Watts = 100 Wattage Multiplier = 1.00
 Fixture Type = 3 (Free-hanging)

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.05 CFM/sqft = 31 CFM
 Heating : 0.08 CFM/sqft = 48 CFM
 Typical : 0.08 CFM/sqft = 48 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 111 01-31-91
Prepared By : ENGG APPLICATIONS CONSUL 6100190202
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.290 Roof 0.100 Glass 0.580 Building Weight : M
Weight : M M Glass Factor : 0.58
Color : D D Internal Shades ? N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 3
Lights : W/sqft = 2.73 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 3 Free-hanging

SPACE NAME = 111

Exposure : E N Floor Area : 363.0 sqft
Wall Area : 132.0 0.0 Roof Area : 314.0 sqft
Glass Area : 76.0 0.0 Current
Elements : El,Pt,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 7.00
Total Watts = 2,541
Schedule No. = 1

ADDITIONAL ELEMENT - Partition

Area = 49.0 sqft Uncond. Space Temp:Cooling = 100.0 %
U-Value = 0.200 BTU/hr/sqft/F Uncond. Space Temp:Heating = 90.0 %

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.05 CFM/sqft = 19 CFM
Heating : 0.08 CFM/sqft = 29 CFM
Typical : 0.08 CFM/sqft = 29 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 113 01-31-91
Prepared By : ENGG APPLICATIONS CONSUL 6100190202
Carrier Hourly Analysis Program Page 1 of 1

Walls Roof Glass
U-Value : 0.290 0.100 0.580 Building Weight : M
Weight : M M Glass Factor : 0.58
Color : D D Internal Shades ? N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 3
Lights : W/sqft = 2.73 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 3 Free-hanging

SPACE NAME = 113

Floor Area : 363.0 sqft
Exposure : E N Roof Area : 314.0 sqft
Wall Area : 132.0 0.0 Current
Glass Area : 76.0 0.0 Elements : El,Pt,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 7.00
Total Watts = 2,541
Schedule No. = 1

ADDITIONAL ELEMENT - Partition

Area = 49.0 sqft Uncond. Space Temp:Cooling = 100.0 %
U-Value = 0.200 BTU/hr/sqft/F Uncond. Space Temp:Heating = 90.0 %

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.05 CFM/sqft = 19 CFM
Heating : 0.08 CFM/sqft = 29 CFM
Typical : 0.08 CFM/sqft = 29 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 115 01-31-91
 Prepared By : ENGG APPLICATIONS CONSUL 6100190202
 Carrier Hourly Analysis Program Page 1 of 1

	Walls	Roof	Glass		
U-Value :	0.290	0.100	0.580	Building Weight	: M
Weight :	M	M		Glass Factor	: 0.58
Color :	D	D		Internal Shades	? N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 3
 Lights : W/sqft = 2.23 Schedule = 2 Wattage Mult. = 1.20
 : Fixture Type = 3 Free-hanging

 SPACE NAME = 115

		Floor Area	:	1,079.0 sqft
Exposure	:	E	N	Roof Area
Wall Area	:	485.0	0.0	Current
Glass Area	:	152.0	0.0	Elements
				: El,Pt,In

ADDITIONAL ELEMENT - Other Electric

W/sqft	=	7.00
Total Watts	=	7,553
Schedule No.	=	1

ADDITIONAL ELEMENT - Partition

Area	=	147.0 sqft	Uncond. Space Temp:Cooling	=	100.0 %
U-Value	=	0.200 BTU/hr/sqft/F	Uncond. Space Temp:Heating	=	90.0 %

ADDITIONAL ELEMENT - Infiltration

Cooling	:	0.05 CFM/sqft	=	57 CFM
Heating	:	0.08 CFM/sqft	=	86 CFM
Typical	:	0.08 CFM/sqft	=	86 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 115B 01-31-91
Prepared By : ENGG APPLICATIONS CONSUL 6100190202
Carrier Hourly Analysis Program Page 1 of 1

Walls Roof Glass
U-Value : 0.290 0.100 0.580 Building Weight : M
Weight : M M Glass Factor : 0.58
Color : D D Internal Shades ? N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 3
Lights : W/sqft = 2.73 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 3 Free-hanging

SPACE NAME = 115B

Floor Area : 264.0 sqft
Exposure : E N Roof Area : 264.0 sqft
Wall Area : 210.0 0.0 Current
Glass Area : 76.0 0.0 Elements : El,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 7.00
Total Watts = 1,848
Schedule No. = 1

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.05 CFM/sqft = 14 CFM
Heating : 0.08 CFM/sqft = 21 CFM
Typical : 0.08 CFM/sqft = 21 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 115A, 123, 129 01-31-91
Prepared By : ENGG APPLICATIONS CONSUL 6100190202
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.290 Roof 0.100 Glass 0.580 Building Weight : M
Weight : M M Glass Factor : 0.58
Color : D D Internal Shades ? N

People : sqft/person = 230.0 Schedule = 1 Activity Level = 3
Lights : W/sqft = 1.57 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 3 Free-hanging

SPACE NAME = 115A, 123, 129

Exposure : E N Floor Area : 460.0 sqft
Wall Area : 0.0 0.0 Roof Area : 332.0 sqft
Glass Area : 0.0 0.0 Current
Elements : El,Li,Pt,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 4.40
Total Watts = 2,024
Schedule No. = 1

ADDITIONAL ELEMENT - Lights

W/sqft = 2.17 Schedule No. = 2
Total Watts = 1,000 Wattage Multiplier = 1.00
Fixture Type = 1 (Recessed, not vented)

ADDITIONAL ELEMENT - Partition

Area = 138.0 sqft Uncond. Space Temp:Cooling = 100.0 %
U-Value = 0.200 BTU/hr/sqft/F Uncond. Space Temp:Heating = 90.0 %

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.05 CFM/sqft = 24 CFM
Heating : 0.08 CFM/sqft = 37 CFM
Typical : 0.08 CFM/sqft = 37 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 125, 127, 131A, 131,
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Carrier Hourly Analysis Program

01-31-91
6100190202
Page 1 of 1

```

*****
Walls      Roof      Glass
U-Value : 0.290  0.100  0.580  Building Weight : M
Weight : M      M      Glass Factor : 0.58
Color : D      D      Internal Shades ? N

```

```

People : sqft/person = 316.0  Schedule = 1  Activity Level = 3
Lights : W/sqft      = 2.79   Schedule = 2  Wattage Mult. = 1.20
       : Fixture Type = 3 Free-hanging

```

SPACE NAME = 125, 127, 131A, 131,

```

Floor Area : 632.0 sqft
Exposure : E      N Roof Area : 599.0 sqft
Wall Area : 407.0 0.0 Current
Glass Area : 152.0 0.0 Elements : El,Pt,In

```

ADDITIONAL ELEMENT - Other Electric

```

-----
W/sqft = 4.40
Total Watts = 2,781
Schedule No. = 1

```

ADDITIONAL ELEMENT - Partition

```

-----
Area = 33.0 sqft Uncond. Space Temp:Cooling = 100.0 %
U-Value = 0.200 BTU/hr/sqft/F Uncond. Space Temp:Heating = 90.0 %

```

ADDITIONAL ELEMENT - Infiltration

```

-----
Cooling : 0.05 CFM/sqft = 33 CFM
Heating : 0.08 CFM/sqft = 51 CFM
Typical : 0.08 CFM/sqft = 51 CFM

```

SIMPLE SPACE DESCRIPTION

Space Name : 133

01-31-91

Prepared By : ENGG APPLICATIONS CONSUL

6100190202

Carrier Hourly Analysis Program

Page 1 of 1

	Walls	Roof	Glass			
U-Value :	0.290	0.100	0.580	Building Weight	:	M
Weight :	M	M		Glass Factor	:	0.58
Color :	D	D		Internal Shades	?	N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 3
 Lights : W/sqft = 2.43 Schedule = 2 Wattage Mult. = 1.20
 : Fixture Type = 3 Free-hanging

SPACE NAME = 133

			Floor Area	:	594.0 sqft	
Exposure	:	E	N	Roof Area	:	513.0 sqft
Wall Area	:	275.0	0.0	Current		
Glass Area	:	76.0	0.0	Elements	:	El,Pt,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 4.40
 Total Watts = 2,614
 Schedule No. = 1

ADDITIONAL ELEMENT - Partition

Area = 33.0 sqft Uncond. Space Temp:Cooling = 100.0 %
 U-Value = 0.200 BTU/hr/sqft/F Uncond. Space Temp:Heating = 90.0 %

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.05 CFM/sqft = 31 CFM
 Heating : 0.08 CFM/sqft = 48 CFM
 Typical : 0.08 CFM/sqft = 48 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 135 01-31-91
 Prepared By : ENGG APPLICATIONS CONSUL 6100190202
 Carrier Hourly Analysis Program Page 1 of 1

	Walls	Roof	Glass		
U-Value :	0.290	0.100	0.580	Building Weight	: M
Weight :	M	M		Glass Factor	: 0.58
Color :	D	D		Internal Shades	? N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 3
 Lights : W/sqft = 3.53 Schedule = 2 Wattage Mult. = 1.20
 : Fixture Type = 3 Free-hanging

 SPACE NAME = 135

		Floor Area	:	363.0 sqft
Exposure	:	E	N	Roof Area
Wall Area	:	139.0	0.0	Current
Glass Area	:	76.0	0.0	Elements
				: El,Pt,In

 ADDITIONAL ELEMENT - Other Electric

W/sqft	=	7.00
Total Watts	=	2,541
Schedule No.	=	1

 ADDITIONAL ELEMENT - Partition

Area	=	50.0 sqft	Uncond. Space Temp:Cooling	=	100.0 %
U-Value	=	0.200 BTU/hr/sqft/F	Uncond. Space Temp:Heating	=	90.0 %

 ADDITIONAL ELEMENT - Infiltration

Cooling	:	0.05 CFM/sqft	=	19 CFM
Heating	:	0.08 CFM/sqft	=	29 CFM
Typical	:	0.08 CFM/sqft	=	29 CFM

SIMPLE SPACE DESCRIPTION

Space Name : 137

01-31-91

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6100190202

Carrier Hourly Analysis Program

Page 1 of 1

	Walls	Roof	Glass		
U-Value :	0.290	0.100	0.580	Building Weight	: M
Weight :	M	M		Glass Factor	: 0.58
Color :	D	D		Internal Shades	? N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 3
 Lights : W/sqft = 2.65 Schedule = 2 Wattage Mult. = 1.20
 : Fixture Type = 3 Free-hanging

SPACE NAME = 137

		Floor Area	:	484.0 sqft
Exposure	:	S	E	Roof Area
				: 418.0 sqft
Wall Area	:	209.0	210.0	Current
Glass Area	:	77.0	78.0	Elements
				: El,Pt,In

ADDITIONAL ELEMENT - Other Electric

 W/sqft = 7.00
 Total Watts = 3,388
 Schedule No. = 1

ADDITIONAL ELEMENT - Partition

 Area = 66.0 sqft Uncond. Space Temp:Cooling = 100.0 %
 U-Value = 0.200 BTU/hr/sqft/F Uncond. Space Temp:Heating = 90.0 %

ADDITIONAL ELEMENT - Infiltration

 Cooling : 0.05 CFM/sqft = 26 CFM
 Heating : 0.08 CFM/sqft = 39 CFM
 Typical : 0.08 CFM/sqft = 39 CFM

SIMPLE SPACE DESCRIPTION

Space Name : B121 NW CORNER 01-31-91
Prepared By : ENGG APPLICATIONS CONSUL 6100190202
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.290 Roof 0.100 Glass 0.580 Building Weight : M
Weight : M M Glass Factor : 0.58
Color : D D Internal Shades ? N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 3
Lights : W/sqft = 2.75 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 3 Free-hanging

SPACE NAME = B121 NW CORNER

Floor Area : 266.0 sqft
Exposure : N W Roof Area : 0.0 sqft
Wall Area : 91.0 35.0 Current
Glass Area : 0.0 0.0 Elements : El,Gr,Pt,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 4.40
Total Watts = 1,170
Schedule No. = 1

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 266.0 sqft
Perimeter = 7.0 ft
Depth = 8.0 ft

ADDITIONAL ELEMENT - Partition

Area = 390.0 sqft Uncond. Space Temp:Cooling = 100.0 %
U-Value = 0.300 BTU/hr/sqft/F Uncond. Space Temp:Heating = 90.0 %

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.05 CFM/sqft = 14 CFM
Heating : 0.08 CFM/sqft = 21 CFM
Typical : 0.08 CFM/sqft = 21 CFM

SIMPLE SPACE DESCRIPTION

Space Name : B119 01-31-91
 Prepared By : ENGG APPLICATIONS CONSUL 6100190202
 Carrier Hourly Analysis Program Page 1 of 1

	Walls	Roof	Glass		
U-Value :	0.290	0.100	0.580	Building Weight :	M
Weight :	M	M		Glass Factor :	0.58
Color :	D	D		Internal Shades ?	N

People : sqft/person = 484.0 Schedule = 1 Activity Level = 3
 Lights : W/sqft = 2.75 Schedule = 2 Wattage Mult. = 1.20
 : Fixture Type = 3 Free-hanging

 SPACE NAME = B119

		Floor Area :	484.0 sqft
Exposure :	N	W Roof Area :	0.0 sqft
Wall Area :	0.0	44.0 Current	
Glass Area :	0.0	0.0 Elements :	El,Gr,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 5.00
 Total Watts = 2,420
 Schedule No. = 1

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 484.0 sqft
 Perimeter = 22.0 ft
 Depth = 11.0 ft

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.05 CFM/sqft = 26 CFM
 Heating : 0.08 CFM/sqft = 39 CFM
 Typical : 0.08 CFM/sqft = 39 CFM

SIMPLE SPACE DESCRIPTION

Space Name : B117 01-31-91
Prepared By : ENGG APPLICATIONS CONSUL 6100190202
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.290 Roof 0.100 Glass 0.580 Building Weight : M
Weight : M M Glass Factor : 0.58
Color : D D Internal Shades ? N

People : sqft/person = 242.0 Schedule = 1 Activity Level = 3
Lights : W/sqft = 2.75 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 3 Free-hanging

SPACE NAME = B117

Exposure : N W Floor Area : 242.0 sqft
Wall Area : 0.0 22.0 Roof Area : 0.0 sqft
Glass Area : 0.0 0.0 Current Elements : El,Gr,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 5.00
Total Watts = 1,210
Schedule No. = 1

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 242.0 sqft
Perimeter = 11.0 ft
Depth = 11.0 ft

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.05 CFM/sqft = 13 CFM
Heating : 0.08 CFM/sqft = 19 CFM
Typical : 0.08 CFM/sqft = 19 CFM

SIMPLE SPACE DESCRIPTION

Space Name : B115

01-31-91

Prepared By : ENGG APPLICATIONS CONSUL

6100190202

Carrier Hourly Analysis Program

Page 1 of 1

	Walls	Roof	Glass		
U-Value :	0.290	0.100	0.580	Building Weight :	M
Weight :	M	M		Glass Factor :	0.58
Color :	D	D		Internal Shades ?	N

People : sqft/person = 880.0 Schedule = 1 Activity Level = 3
 Lights : W/sqft = 2.75 Schedule = 2 Wattage Mult. = 1.20
 : Fixture Type = 3 Free-hanging

SPACE NAME = B115

			Floor Area :	880.0 sqft
Exposure :	N	W	Roof Area :	0.0 sqft
Wall Area :	0.0	80.0	Current	
Glass Area :	0.0	0.0	Elements :	El,Gr,In

ADDITIONAL ELEMENT - Other Electric

 W/sqft = 7.00
 Total Watts = 6,160
 Schedule No. = 1

ADDITIONAL ELEMENT - Ground

 Slab Floor Area = 880.0 sqft
 Perimeter = 40.0 ft
 Depth = 11.0 ft

ADDITIONAL ELEMENT - Infiltration

 Cooling : 0.05 CFM/sqft = 47 CFM
 Heating : 0.08 CFM/sqft = 70 CFM
 Typical : 0.08 CFM/sqft = 70 CFM

SIMPLE SPACE DESCRIPTION

Space Name : B113 01-31-91
Prepared By : ENGG APPLICATIONS CONSUL 6100190202
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.290 Roof 0.100 Glass 0.580 Building Weight : M
Weight : M Glass Factor : 0.58
Color : D D Internal Shades ? N

People : sqft/person = 308.0 Schedule = 1 Activity Level = 3
Lights : W/sqft = 2.75 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 3 Free-hanging

SPACE NAME = B113

Floor Area : 308.0 sqft
Exposure : N W Roof Area : 0.0 sqft
Wall Area : 0.0 149.0 Current
Glass Area : 0.0 0.0 Elements : El,Gr,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 5.00
Total Watts = 1,540
Schedule No. = 1

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 308.0 sqft
Perimeter = 3.0 ft
Depth = 11.0 ft

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.05 CFM/sqft = 16 CFM
Heating : 0.08 CFM/sqft = 25 CFM
Typical : 0.08 CFM/sqft = 25 CFM

SIMPLE SPACE DESCRIPTION

Space Name : B111 01-31-91
Prepared By : ENGG APPLICATIONS CONSUL 6100190202
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.290 Roof 0.100 Glass 0.580 Building Weight : M
Weight : M M Glass Factor : 0.58
Color : D D Internal Shades ? N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 3
Lights : W/sqft = 2.75 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 3 Free-hanging

SPACE NAME = B111

Floor Area : 638.0 sqft
Exposure : N W Roof Area : 0.0 sqft
Wall Area : 0.0 65.0 Current
Glass Area : 0.0 0.0 Elements : El,Gr,Pt,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 5.00
Total Watts = 3,190
Schedule No. = 1

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 638.0 sqft
Perimeter = 29.0 ft
Depth = 11.0 ft

ADDITIONAL ELEMENT - Partition

Area = 174.0 sqft Uncond. Space Temp:Cooling = 85.0 F
U-Value = 0.300 BTU/hr/sqft/F Uncond. Space Temp:Heating = 60.0 F

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.05 CFM/sqft = 34 CFM
Heating : 0.08 CFM/sqft = 51 CFM
Typical : 0.08 CFM/sqft = 51 CFM

SIMPLE SPACE DESCRIPTION

Space Name : B105 01-31-91
 Prepared By : ENGG APPLICATIONS CONSUL 6100190202
 Carrier Hourly Analysis Program Page 1 of 1

	Walls	Roof	Glass		
U-Value :	0.290	0.100	0.580	Building Weight :	M
Weight :	M	M		Glass Factor :	0.58
Color :	D	D		Internal Shades :	? N

People : sqft/person = 242.0 Schedule = 1 Activity Level = 3
 Lights : W/sqft = 2.75 Schedule = 2 Wattage Mult. = 1.20
 : Fixture Type = 3 Free-hanging

 SPACE NAME = B105

		Floor Area :	242.0 sqft
Exposure :	N	W Roof Area :	0.0 sqft
Wall Area :	0.0	Current	
Glass Area :	0.0	38.0 Elements :	El,Gr,Pt,In

ADDITIONAL ELEMENT - Other Electric

W/sqft	=	4.40
Total Watts	=	1,065
Schedule No.	=	1

ADDITIONAL ELEMENT - Ground

Slab Floor Area	=	242.0 sqft
Perimeter	=	3.0 ft
Depth	=	11.0 ft

ADDITIONAL ELEMENT - Partition

Area =	286.0 sqft	Uncond. Space Temp:Cooling =	85.0 F
U-Value =	0.300 BTU/hr/sqft/F	Uncond. Space Temp:Heating =	60.0 F

ADDITIONAL ELEMENT - Infiltration

Cooling	:	0.05 CFM/sqft =	13 CFM
Heating	:	0.08 CFM/sqft =	19 CFM
Typical	:	0.08 CFM/sqft =	19 CFM

SIMPLE SPACE DESCRIPTION

Space Name : B103 01-31-91
Prepared By : ENGG APPLICATIONS CONSUL 6100190202
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.290 Roof 0.100 Glass 0.580 Building Weight : M
Weight : M M Glass Factor : 0.58
Color : D D Internal Shades ? N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 3
Lights : W/sqft = 2.75 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 3 Free-hanging

SPACE NAME = B103

Floor Area : 484.0 sqft
Exposure : N W Roof Area : 0.0 sqft
Wall Area : 0.0 144.0 Current
Glass Area : 0.0 76.0 Elements : El,Gr,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 7.00
Total Watts = 3,388
Schedule No. = 1

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 484.0 sqft
Perimeter = 6.0 ft
Depth = 11.0 ft

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.05 CFM/sqft = 26 CFM
Heating : 0.08 CFM/sqft = 39 CFM
Typical : 0.08 CFM/sqft = 39 CFM

SIMPLE SPACE DESCRIPTION

Space Name : B101

01-31-91

Prepared By : ENGG APPLICATIONS CONSUL

6100190202

Carrier Hourly Analysis Program

Page 1 of 1

	Walls	Roof	Glass		
U-Value :	0.290	0.100	0.580	Building Weight :	M
Weight :	M	M		Glass Factor :	0.58
Color :	D	D		Internal Shades ?	N

People : sqft/person = 484.0 Schedule = 1 Activity Level = 3
 Lights : W/sqft = 2.75 Schedule = 2 Wattage Mult. = 1.20
 : Fixture Type = 3 Free-hanging

SPACE NAME = B101

		Floor Area :	484.0 sqft
Exposure :	N	W Roof Area :	0.0 sqft
Wall Area :	0.0	44.0 Current	
Glass Area :	0.0	0.0 Elements :	El,Gr,In

ADDITIONAL ELEMENT - Other Electric

 W/sqft = 5.00
 Total Watts = 2,420
 Schedule No. = 1

ADDITIONAL ELEMENT - Ground

 Slab Floor Area = 484.0 sqft
 Perimeter = 22.0 ft
 Depth = 11.0 ft

ADDITIONAL ELEMENT - Infiltration

 Cooling : 0.05 CFM/sqft = 26 CFM
 Heating : 0.08 CFM/sqft = 39 CFM
 Typical : 0.08 CFM/sqft = 39 CFM

SIMPLE SPACE DESCRIPTION

Space Name : B100 01-31-91
Prepared By : ENGG APPLICATIONS CONSUL 6100190202
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.290 Roof 0.100 Glass 0.580 Building Weight : M
Weight : M Glass Factor : 0.58
Color : D D Internal Shades ? N

People : sqft/person = 968.0 Schedule = 1 Activity Level = 3
Lights : W/sqft = 2.75 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 3 Free-hanging

SPACE NAME = B100

Exposure : W S Floor Area : 968.0 sqft
Wall Area : 88.0 44.0 Roof Area : 0.0 sqft
Glass Area : 0.0 0.0 Current Elements : El,Gr,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 5.00
Total Watts = 4,840
Schedule No. = 1

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 968.0 sqft
Perimeter = 66.0 ft
Depth = 11.0 ft

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.05 CFM/sqft = 51 CFM
Heating : 0.08 CFM/sqft = 77 CFM
Typical : 0.08 CFM/sqft = 77 CFM

SIMPLE SPACE DESCRIPTION

Space Name : B118A 01-31-91
Prepared By : ENGG APPLICATIONS CONSUL 6100190202
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.290 Roof 0.100 Glass 0.580 Building Weight : M
Weight : M Glass Factor : 0.58
Color : D Internal Shades ? N

People : sqft/person = 462.0 Schedule = 1 Activity Level = 3
Lights : W/sqft = 2.75 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 3 Free-hanging

SPACE NAME = B118A

Floor Area : 462.0 sqft
Exposure : E S Roof Area : 0.0 sqft
Wall Area : 158.0 0.0 Current
Glass Area : 10.0 0.0 Elements : El,Gr,Gr,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 7.00
Total Watts = 3,234
Schedule No. = 1

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 462.0 sqft
Perimeter = 22.0 ft
Depth = 13.0 ft

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 105.0 sqft
Perimeter = 21.0 ft
Depth = 5.0 ft

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.05 CFM/sqft = 24 CFM
Heating : 0.08 CFM/sqft = 37 CFM
Typical : 0.08 CFM/sqft = 37 CFM

SIMPLE SPACE DESCRIPTION

Space Name : B118 01-31-91
Prepared By : ENGG APPLICATIONS CONSUL 6100190202
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.290 Roof 0.100 Glass 0.580 Building Weight : M
Weight : M M Glass Factor : 0.58
Color : D D Internal Shades ? N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 3
Lights : W/sqft = 2.75 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 3 Free-hanging

SPACE NAME = B118

Floor Area : 484.0 sqft
Exposure : E S Roof Area : 0.0 sqft
Wall Area : 166.0 0.0 Current
Glass Area : 10.0 0.0 Elements : El,Gr,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 5.00
Total Watts = 2,420
Schedule No. = 1

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 484.0 sqft
Perimeter = 22.0 ft
Depth = 5.0 ft

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.05 CFM/sqft = 26 CFM
Heating : 0.08 CFM/sqft = 39 CFM
Typical : 0.08 CFM/sqft = 39 CFM

SIMPLE SPACE DESCRIPTION

Space Name : B114 AHU-3 01-31-91
Prepared By : ENGG APPLICATIONS CONSUL 6100190202
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.290 Roof 0.100 Glass 0.580 Building Weight : M
Weight : M M Glass Factor : 0.58
Color : D D Internal Shades ? N

People : sqft/person = 484.0 Schedule = 1 Activity Level = 3
Lights : W/sqft = 2.75 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 3 Free-hanging

SPACE NAME = B114 AHU-3

Exposure : E S Floor Area : 484.0 sqft
Wall Area : 156.0 0.0 Roof Area : 0.0 sqft
Glass Area : 20.0 0.0 Current Elements : El,Gr,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 5.00
Total Watts = 2,420
Schedule No. = 1

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 484.0 sqft
Perimeter = 22.0 ft
Depth = 5.0 ft

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.05 CFM/sqft = 26 CFM
Heating : 0.08 CFM/sqft = 39 CFM
Typical : 0.08 CFM/sqft = 39 CFM

SIMPLE SPACE DESCRIPTION

Space Name : B112, B110 01-31-91
Prepared By : ENGG APPLICATIONS CONSUL 6100190202
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.290 Roof 0.100 Glass 0.580 Building Weight : M
Weight : M M Glass Factor : 0.58
Color : D D Internal Shades ? N

People : sqft/person = 484.0 Schedule = 1 Activity Level = 3
Lights : W/sqft = 2.75 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 3 Free-hanging

SPACE NAME = B112, B110

Exposure : E S Floor Area : 968.0 sqft
Wall Area : 312.0 0.0 Roof Area : 0.0 sqft
Glass Area : 40.0 0.0 Current Elements : El,Gr,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 7.00
Total Watts = 6,776
Schedule No. = 1

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 968.0 sqft
Perimeter = 44.0 ft
Depth = 5.0 ft

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.05 CFM/sqft = 51 CFM
Heating : 0.08 CFM/sqft = 77 CFM
Typical : 0.08 CFM/sqft = 77 CFM

SIMPLE SPACE DESCRIPTION

Space Name : B108 01-31-91
Prepared By : ENGG APPLICATIONS CONSUL 6100190202
Carrier Hourly Analysis Program Page 1 of 1

Walls Roof Glass
U-Value : 0.290 0.100 0.580 Building Weight : M
Weight : M M Glass Factor : 0.58
Color : D D Internal Shades ? N

People : sqft/person = 379.0 Schedule = 1 Activity Level = 3
Lights : W/sqft = 2.75 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 3 Free-hanging

SPACE NAME = B108

Floor Area : 759.0 sqft
Exposure : E S Roof Area : 0.0 sqft
Wall Area : 234.0 0.0 Current
Glass Area : 42.0 0.0 Elements : El,Gr,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 7.00
Total Watts = 5,313
Schedule No. = 1

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 759.0 sqft
Perimeter = 34.5 ft
Depth = 5.0 ft

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.05 CFM/sqft = 40 CFM
Heating : 0.08 CFM/sqft = 61 CFM
Typical : 0.08 CFM/sqft = 61 CFM

SIMPLE SPACE DESCRIPTION

Space Name : B108A CORRIDOR 01-31-91
Prepared By : ENGG APPLICATIONS CONSUL 6100190202
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.290 Roof 0.100 Glass 0.580 Building Weight : M
Weight : M Glass Factor : 0.58
Color : D D Internal Shades ? N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 3
Lights : W/sqft = 2.00 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 3 Free-hanging

SPACE NAME = B108A CORRIDOR

Exposure : E S Floor Area : 1,936.0 sqft
Wall Area : 98.0 0.0 Roof Area : 0.0 sqft
Glass Area : 6.0 0.0 Current Elements : El,Gr,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 0.00
Total Watts = 0
Schedule No. = 1

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 1,936.0 sqft
Perimeter = 0.0 ft
Depth = 0.0 ft

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.05 CFM/sqft = 103 CFM
Heating : 0.08 CFM/sqft = 155 CFM
Typical : 0.08 CFM/sqft = 155 CFM

SIMPLE SPACE DESCRIPTION

Space Name : B106 01-31-91
Prepared By : ENGG APPLICATIONS CONSUL 6100190202
Jarrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.290 Roof 0.100 Glass 0.580 Building Weight : M
Weight : M M Glass Factor : 0.58
Color : D D Internal Shades ? N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 3
Lights : W/sqft = 2.75 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 3 Free-hanging

SPACE NAME = B106

Floor Area : 242.0 sqft
Exposure : E S Roof Area : 0.0 sqft
Wall Area : 122.0 0.0 Current
Glass Area : 21.0 0.0 Elements : El,Gr,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 7.00
Total Watts = 1,694
Schedule No. = 1

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 242.0 sqft
Perimeter = 11.0 ft
Depth = 0.0 ft

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.05 CFM/sqft = 13 CFM
Heating : 0.08 CFM/sqft = 19 CFM
Typical : 0.08 CFM/sqft = 19 CFM

SIMPLE SPACE DESCRIPTION

Space Name : B104, B104A 01-31-91
 Prepared By : ENGG APPLICATIONS CONSUL 6100190202
 Carrier Hourly Analysis Program Page 1 of 1

	Walls	Roof	Glass		
U-Value :	0.290	0.100	0.580	Building Weight :	M
Weight :	M	M		Glass Factor :	0.58
Color :	D	D		Internal Shades :	N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 3
 Lights : W/sqft = 2.75 Schedule = 2 Wattage Mult. = 1.20
 : Fixture Type = 3 Free-hanging

 SPACE NAME = B104, B104A

		Floor Area :	715.0 sqft
Exposure :	E	S Roof Area :	0.0 sqft
Wall Area :	360.0	0.0 Current	
Glass Area :	63.0	0.0 Elements :	El,Gr,In

ADDITIONAL ELEMENT - Other Electric

W/sqft	=	5.00
Total Watts	=	3,575
Schedule No.	=	1

ADDITIONAL ELEMENT - Ground

Slab Floor Area	=	715.0 sqft
Perimeter	=	32.0 ft
Depth	=	0.0 ft

ADDITIONAL ELEMENT - Infiltration

Cooling	:	0.05 CFM/sqft	=	38 CFM
Heating	:	0.08 CFM/sqft	=	57 CFM
Typical	:	0.08 CFM/sqft	=	57 CFM

SIMPLE SPACE DESCRIPTION

Space Name : DELIVERY 01-31-91
Prepared By : ENGG APPLICATIONS CONSUL 6100190202
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.290 Roof 0.100 Glass 0.580 Building Weight : M
Weight : M M Glass Factor : 0.58
Color : D D Internal Shades ? N

People : sqft/person = 0.0 Schedule = 1 Activity Level = 3
Lights : W/sqft = 2.00 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 3 Free-hanging

SPACE NAME = DELIVERY

Exposure : E S Floor Area : 264.0 sqft
Wall Area : 66.0 0.0 Roof Area : 0.0 sqft
Glass Area : 0.0 0.0 Current
Elements : El,Gr,Pt,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 0.00
Total Watts = 0
Schedule No. = 1

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 264.0 sqft
Perimeter = 12.0 ft
Depth = 0.0 ft

ADDITIONAL ELEMENT - Partition

Area = 90.0 sqft Uncond. Space Temp:Cooling = 100.0 %
U-Value = 0.890 BTU/hr/sqft/F Uncond. Space Temp:Heating = 100.0 %

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.05 CFM/sqft = 14 CFM
Heating : 0.08 CFM/sqft = 21 CFM
Typical : 0.08 CFM/sqft = 21 CFM

SIMPLE SPACE DESCRIPTION

Space Name : B102 01-31-91
Prepared By : ENGG APPLICATIONS CONSUL 6100190202
Carrier Hourly Analysis Program Page 1 of 1

U-Value : Walls 0.290 Roof 0.100 Glass 0.580 Building Weight : M
Weight : M M Glass Factor : 0.58
Color : D D Internal Shades ? N

People : sqft/person = 704.0 Schedule = 1 Activity Level = 3
Lights : W/sqft = 2.75 Schedule = 2 Wattage Mult. = 1.20
: Fixture Type = 3 Free-hanging

SPACE NAME = B102

Exposure : E S Floor Area : 704.0 sqft
Wall Area : 364.0 0.0 Roof Area : 0.0 sqft
Glass Area : 0.0 0.0 Current Elements : El,Gr,In

ADDITIONAL ELEMENT - Other Electric

W/sqft = 7.00
Total Watts = 4,928
Schedule No. = 1

ADDITIONAL ELEMENT - Ground

Slab Floor Area = 704.0 sqft
Perimeter = 32.0 ft
Depth = 0.0 ft

ADDITIONAL ELEMENT - Infiltration

Cooling : 0.05 CFM/sqft = 37 CFM
Heating : 0.08 CFM/sqft = 56 CFM
Typical : 0.08 CFM/sqft = 56 CFM

SIMPLE SPACE DESCRIPTION

Space Name : B100 01-31-91
 Prepared By : ENGG APPLICATIONS CONSUL 6100190202
 Carrier Hourly Analysis Program Page 1 of 1

	Walls	Roof	Glass		
U-Value :	0.290	0.100	0.580	Building Weight :	M
Weight :	M	M		Glass Factor :	0.58
Color :	D	D		Internal Shades ?	N

People : sqft/person = 1320.0 Schedule = 1 Activity Level = 3
 Lights : W/sqft = 2.75 Schedule = 2 Wattage Mult. = 1.20
 : Fixture Type = 3 Free-hanging

 SPACE NAME = B100

		Floor Area :	1,320.0 sqft
Exposure :	E	S Roof Area :	0.0 sqft
Wall Area :	430.0	Current	
Glass Area :	0.0	Elements :	El,Gr,Gr,In

ADDITIONAL ELEMENT - Other Electric

 W/sqft = 7.00
 Total Watts = 9,240
 Schedule No. = 1

ADDITIONAL ELEMENT - Ground

 Slab Floor Area = 1,320.0 sqft
 Perimeter = 44.0 ft
 Depth = 3.0 ft

ADDITIONAL ELEMENT - Ground

 Slab Floor Area = 0.0 sqft
 Perimeter = 30.0 ft
 Depth = 4.0 ft

ADDITIONAL ELEMENT - Infiltration

 Cooling : 0.05 CFM/sqft = 70 CFM
 Heating : 0.08 CFM/sqft = 106 CFM
 Typical : 0.08 CFM/sqft = 106 CFM

AIR SYSTEM DESCRIPTION

Name : AHU-1 & AHU-2 BLDG #363 01-31-91
 Carrier Hourly Analysis Program 6100190202
 Prepared By : E A C, PC BURKE, VA. Page 1 of 2

1. SYSTEM NAME AND TYPE

System Name = AHU-1 & AHU-2 BLDG #363
 System Class = Variable Volume
 System Type = (VAV/RH) VAV Reheat
 Number of Zones = 10

2. SPACE SELECTION (see separate printout)

3. THERMOSTAT & EQUIPMENT SCHEDULING DATA

Operation Period	Thermostat Setpoints		Ventilation Dampers
	Cooling	Heating	
Occupied	75.0 F	68.0 F	OPEN
Unoccupied	75.0 F	68.0 F	CLOSED

 Weekday : Occupied Period Begins at 0 ; Duration = 24 hrs
 Saturday : Occupied Period Begins at 0 ; Duration = 24 hrs
 Sunday : Occupied Period Begins at 0 ; Duration = 24 hrs
 Design Day : Occupied Period Begins at 0 ; Duration = 24 hrs

4. SUPPLY, VENTILATION, RETURN AIR DATA

SUPPLY AIR

Design cooling supply temperature = 55.0 F
 Minimum terminal air flow rate = 44 %
 Type of supply air reset = 1 Reset Not Used

VENTILATION AIR

Nominal ventilation flow rate = 16960.00 CFM
 Minimum ventilation flow rate = 8480.00 CFM
 Damper leak rate = 5 % of vent air

RETURN AIR

Zone exhaust air flow rate = 8480.00 CFM
 Zone exhaust fan power = 0.0 kW
 Is a return plenum used ? N

AIR SYSTEM DESCRIPTION

Name : AHU-1 & AHU-2 BLDG #363

01-31-91

Carrier Hourly Analysis Program

6100190202

Prepared By : E A C, PC BURKE, VA.

Page 2 of 2

5. FAN DATA

SUPPLY FAN

Type = 7:Backward inclined or air foil
Static = 6.00 in wg
Efficiency = 54 %
Configuration = 1 Draw-thru

RETURN FAN

Type = 7:Backward inclined or air foil
Static = 4.00 in wg
Efficiency = 54 %

6. ACCESSORY DEVICES AND SYSTEMS

PREHEAT COIL

Setpoint temperature = 40.0 F

OUTDOOR AIR ECONOMIZER CONTROL

Type = 3:Integrated dry-bulb
Upper cutoff point = 60.0 F
Lower cutoff point = -60.0 F

VENTILATION AIR RECLAIM

(Not used)

HUMIDITY CONTROL

(Not available)

7. MISCELLANEOUS SYSTEM DATA

Cooling coil bypass factor = 0.050
Type of supplemental heating = 1 Not Used

PLANT DESCRIPTIONS

Plant : #2 OIL FIRED BOILER 11-27-90
 Prepared By : ENGG APPLICATIONS CONSUL 6100190202
 Carrier Hourly Analysis Program Page 1 of 1

1 PLANT NAME AND TYPES

Class = Individual Plants
 Name = #2 OIL FIRED BOILER
 Cooling Plant Type = Air Cooled Reciprocating
 Heating Plant Type = Combustion

2 AIR SYSTEM SELECTION

Air System Name	Mult	Air System Name	Mult
AHU-1 & AHU-2 BLDG #363	1		

3a COOLING PLANT DATA (Air Cooled Reciprocating)

Estimated maximum cooling coil load = 181.66 Ton
 Is an electronic expansion valve used ? N
 Capacity at 95.0 F outdoor air = 242.00 Ton
 Input power rate at 95.0 F outdoor air = 1.670 kW/Ton
 Type of cooling = Hydronic
 Is chilled water reset used ? N
 Is hot gas bypass used ? N
 One compressor per condenser circuit ? Y
 Are compressors cycled ? N

3b HEATING PLANT DATA (Combustion)

Estimated maximum heating coil load = 836.76 MBH
 Fuel type = Fuel Oil
 Rated plant output = 2400.0 MBH
 Type of heating = Hydronic
 Is plant efficiency computer generated ? N
 Seasonal plant efficiency = 65 %

4 PUMP SYSTEM DATA

Chilled water pumping system head = 40.00 ft wg
 Chilled water pumping system delta T = 14.40 F
 Hot water pumping system head = 65.00 ft wg
 Hot water pumping system delta T = 20.00 F

BUILDING DESCRIPTION

Building : BUILDING 363
 Prepared By: E A C, PC BURKE, VA.
 Carrier Hourly Analysis Program

01-31-91
 6100190202
 Page 1 of 1

1. BUILDING INPUTS

BUILDING NAME = BUILDING 363

MISCELLANEOUS ELECTRIC

Maximum power = 0.0 kW
 Power schedule = 1

DOMESTIC WATER HEATING

Is a domestic hot water system used ? Y
 Maximum hourly hot water use = 200.0 gal
 Hot water schedule = 4
 Average entering water temperature = 65.0 F
 Average hot water supply temperature = 140.0 F
 Heating plant type = 2 : Combustion
 Fuel type = 2 : Fuel Oil
 Plant capacity = 2400.0 MBH
 Is plant efficiency computer generated ? N
 Annual plant efficiency = 65 %

OTHER INPUTS

Additional building floor area = 2046.0 sqft
 Electrical generating efficiency = 100.00 %

2. PLANT SELECTION

Plant Name	Mult	Plant Name	Mult
#2 OIL FIRED BOILER	1		

3. FUEL & ELECTRIC RATE SELECTION

Fuel or Energy	No.	Name of Rate Schedule	Currency
Electric	10	ELECTRIC RATE (GENERIC)	MBTU
Natural Gas	5	NATURAL GAS (GENERIC)	MBTU
Fuel Oil	4	DOMESTIC FUEL OIL #2 (GENERIC)	MBTU
Propane	10	Empty...	MBTU
Remote Source Heating	10	Empty...	MBTU
Remote Source Cooling	10	Empty...	MBTU

FUEL RATE DATA

Fuel Rate : DOMESTIC FUEL OIL #2 (GENERIC)

01-31-91

Prepared By : E A C, PC BURKE, VA.

6100190202

Carrier Hourly Analysis Program

Page 1 of 1

1. FUEL RATE DATA

NAME

Name of rate schedule = DOMESTIC FUEL OIL #2 (GENERIC)

CURRENCY

Currency name = MBTU

Currency symbol = MBTU

BASIC INFORMATION

Units of measurement = Gallon

Conversion factor = 138.70000 kBTU/Gallon

Type of rate schedule = 1 Simple

Flat rate charge = 0.13870 MBTU/Gallon

MONTHLY ENERGY COSTS

Building : BUILDING 363
 Site : FT. BELVOIR, VIRGINIA
 repaired By : E A C, PC BURKE, VA.
 Carrier Hourly Analysis Program

01-31-91
 6100190202

TABLE 1. HVAC COSTS (MBTU)

Month	Electric	Natural Gas	Fuel Oil	Propane	Remote Heating	Remote Cooling
Jan	206	0	369	0	0	0
Feb	185	0	301	0	0	0
Mar	222	0	249	0	0	0
Apr	298	0	155	0	0	0
May	434	0	91	0	0	0
June	528	0	42	0	0	0
July	609	0	30	0	0	0
Aug	596	0	35	0	0	0
Sept	479	0	75	0	0	0
Oct	335	0	152	0	0	0
Nov	222	0	245	0	0	0
Dec	206	0	350	0	0	0
Tot.	4,319	0	2,094	0	0	0

TABLE 2. NON-HVAC COSTS (MBTU)

Month	Electric	Natural Gas	Fuel Oil	Propane	Remote Heating
Jan	191	0	15	0	0
Feb	173	0	13	0	0
Mar	199	0	15	0	0
Apr	190	0	15	0	0
May	198	0	15	0	0
June	191	0	15	0	0
July	191	0	15	0	0
Aug	205	0	16	0	0
Sept	177	0	13	0	0
Oct	205	0	16	0	0
Nov	190	0	15	0	0
Dec	185	0	14	0	0
Tot.	2,297	0	177	0	0

FUEL OIL COSTS

Building : BUILDING 363

01-31-91

Site : FT. BELVOIR, VIRGINIA

6100190202

prepared By : E A C, PC BURKE, VA.

Carrier Hourly Analysis Program

Page 1 of 1

TABLE 1. MONTHLY COMPONENT CHARGES (MBTU)

Month	Energy Charges	Fixed Charges	Taxes	Total Charges
Jan	383	0	0	383
Feb	315	0	0	315
Mar	265	0	0	265
Apr	169	0	0	169
May	106	0	0	106
June	56	0	0	56
July	45	0	0	45
Aug	51	0	0	51
Sept	89	0	0	89
Oct	168	0	0	168
Nov	260	0	0	260
Dec	364	0	0	364
Tot.	2,271	0	0	2,271

TABLE 2. MONTHLY TOTALS

Month	Charges (MBTU)	Energy (Gallon)	Effective Rate (MBTU/Gallon)
Jan	383	2,764	0.13870
Feb	315	2,269	0.13870
Mar	265	1,907	0.13870
Apr	169	1,220	0.13870
May	106	766	0.13870
June	56	406	0.13870
July	45	323	0.13870
Aug	51	370	0.13870
Sept	89	640	0.13870
Oct	168	1,211	0.13870
Nov	260	1,875	0.13870
Dec	364	2,625	0.13870
Tot.	2,271	16,375	0.13870

MONTHLY MBTU EXPENDED FOR SUMMER REHEAT AND
DOMESTIC HOT WATER GENERATION AS SIMULATED BY
CARRIER E-20 COMPUTER PROGRAM.

APR.	169/2	=	85 MBTU	610	GALS
MAY.		=	106	766	
JUNE		=	56	406	
JULY		=	45	323	
AUG.		=	51	370	
SEPT.		=	89	640	
OCT.	168/2	=	84	606	
			<hr/>	<hr/>	
			516 MBTU	4237	GALS

PROCESS STEAM LOAD FROM DRAWINGS = 1500 lbs/HR MAX.

CONVERSATION WITH BUILDING PERSONNEL INDICATES THAT NOMINAL OPERATION OF PROCESS STEAM EQUIPMENT WOULD BE 2-3 HOURS PER DAY, 3 DAYS / WEEK.

IF WE ASSUME FULL CAPACITY FOR THIS OPERATING TIME WE GET 9,000 lbs / WEEK OR 1800 lbs / DAY FROM MID-APRIL THRU MID-OCTOBER.

COMPUTER SIMULATED MAX. EST. HTG. LOAD
= 836.76 MBH

JAN MBTU = 383 MBH

APR MBTU = 169 MBH

HTG = $169/383 = .4412 \times 836.76 = 369.22$

SAY = 370 MBH

PROCESS LOAD =

1758

DOM & LAB HW. GENERATION =

194

MAX TOT BOILER LOAD = 2322 MBH
(FROM MID APR THRU MID OCT.)

SELECT :

SAY PEERLESS 724 FDA SU 91 BHP 2370 CORR. = 2349 MBH
 26.5 GPH
 16" ϕ VENT (2) 4" ϕ (2) 3" SUPS
 OR (5) 3' RETS
 126⁵/₈ x 35 x 60
 11' x 3' x 5'

HB SMITH MODEL 28-A-13 92 BHP 3096 GROSS OUT
 27 GPH 16" ϕ VENT 2403.7 NET OUT
 106¹/₄ x 30" x 66" (3) 5" SUPS
 (1) 5" RET

ESTIMATE OF PROCESS STEAM USED BY MONTH

MID APRIL → MID OCTOBER

PROCESS
OUTPUT

$$\text{APR } 11 \times 1800 = 19,800 \text{ lbs} = 36.256 \text{ MBTU} = 262 \text{ GAL}$$

$$\text{MAY } 22 = 39,600 = 72.512 = 523$$

$$\text{JUNE } 21 = 37,800 = 69.216 = 499$$

$$\text{JULY } 21 = 37,800 = 69.216 = 499$$

$$\text{AUG } 23 = 41,400 = 75.808 = 547$$

$$\text{SEPT } 19 = 34,200 = 62.623 = 452$$

$$\text{OCT } 11 = 19,800 = \underline{36.256} = \underline{262}$$

421.887 MBTU

3044 GALS

PROCESS STEAM + HEATING & HOT WATER ENERGY

	MBTU	GALS
APR	121.26	872
MAY	178.52	1289
JUNE	125.22	905
JULY	114.22	822
AUG	126.81	917
SEPT	151.63	1092
OCT	120.26	<u>868</u>

6765 GALS

SELECT: 2000 GAL OIL STORAGE TANK 5'-4" ϕ x 12' L

OIL STORAGE

REQD. 2000 GAL. UNDERGROUND, DOUBLE WALL, STEEL
 UL LISTED, W/STI-P3 CORROSION PROTECTION
 & 30 YR WARRANTY

		L	M	T	
182	TANK	250	4200	4450	5'4" Ø x 12' L
	HOLD DNS.	47	270	317	
	2" PIPING (30')	5.85	2.68 .63	9.16	
	INCASED PIPING (75')	8.50	12.70 .91	22.11	
158	2" FOOT VALVE	18	69	87	
	PUMP (2)	59	400	459	
	TANK GAGE SYS	79.	715.	794.	
	VALVES (2)	8.25	7.75	16.	
	SHUT OFFS (4)	19.80	11.75	31.55	
	FAD CY (7)	25.	94.	119	
	EXCAVATION CY (60)	15 .27.	-	-	
		<u>3216</u>	<u>7895</u>	<u>11,111</u>	

LEAK DETECTION SYSTEM

CONTROL MASTER W/ALARM 725

PROBES: 4" WELL 760

TANK WALL 650

CABLE 195

M

OPTIONAL LEAK DETECTION = 2330

$$\underline{3216} + \underline{10,225} = 13,441$$

ALL FUEL CHIMNEY, UL LISTED, DOUBLE WALL, 304 INNER - STL OUTER

	L	M	T
(40) STR 16" ϕ	8.75	84.60	93.35
(2) 45° EL	17.55	280	297.55
90° TEE	22	315	337
PLT. SUPPORT (3)	22	161	183
ROOF THIMBLE	22	360	362
ROOF SUP. ASSEM.	23	515	538
STACK CAP	9.75	365	374.75
	<u>178</u>	<u>2598</u>	<u>2776</u>

OIL HOOK-UP

	L	M	T
FILTER	11.00	28.00	37.00
VALVE	8.25	4.25	12.50
VALVE (2)	33.00	178.	211.
2" VENT CAP	6.20	7.50	13.70
2" TUBE (10)	5.85	2.68 63	9.16
2" STL V.P. (35')	6.25	4.08 67	11.00
LOUVERS (2)	8.65	29.	37.65
DAMPERS (2)	30	34.	64.
FILL CAP	<u>6.70</u>	<u>7.50</u>	<u>13.70</u>
	<u>514</u>	<u>725</u>	<u>1239</u>

$2322000 / 4000 = 580 \times 1.5 = 64$

STEAM VALVES, PIPING, FITTINGS, VALVES ETC.

		L	M	T
132	5" STM. VALVES OS&Y (2)	165	355	520
	BOILER DRAIN	5.80	11.90	17.70
87	5" PIPING (20')	11.10	11.83 1.19	23.62
	4" PIPING (75')	9.60	6.77 1.03	17.40
	PIPING ()			
110	5" WN/FLANGE (7)	44	24 4.78	72.78
	5" 90° ELL (2)	26	91 7.65	124.65
	5" TEE (2)	50	185 12.75	247.75
	4" 90° ELL (4)	71	14.90 7.65	93.55
	4" WELD JOINTS (10)	36	3.82	37.82
	5" " " (10)	40 ^{2.58}	4.24	44.24
	5" INS 2" (30)	2.65	5.07	7.72
	4" INS 2" (90)	2.87	5.71	8.58
		<u>3120</u>	<u>3189</u>	<u>6309</u>

CONDENSATE PIPING, TRAPS

		L	M	T
	2" PIPING (40)	6.25	3.30 .67	10.22
203	TRAP ASSEMBLY (2)	90	320	410
	INS (50)	1.82	2.57	4.39
	WELD LABOR (8)	22	2.39	24.39
	MISC 10%	<u>70</u>	<u>95</u>	<u>165</u>
		767	1042	1809

RETURN FEEDWATER

		L	M	T
	3" PIPING (80')	8.25	4.69 .89	13.83
	3" VALVE (2)	79	150	229
	MISC FITTINGS 20%	45	150	
	WELD LABOR (16)	30	3.18	33.18
	CONTROL CHANGES	300	270	570
	3" INS (100)	<u>2.03</u>	<u>2.92</u>	<u>4.95</u>
		1252	1510	2762

BUILDING 365

DESIGN PARAMETERS, SHGs

Location : FT. BELVOIR, VIRGINIA
 Prepared By : ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

11-23-90
 6100190202
 Page 1 of 1

DESIGN WEATHER PARAMETERS

City Name.....: FT. BELVOIR
 Location.....: VIRGINIA
 Latitude.....: 38.4 deg
 Elevation.....: 69.0 ft
 Summer Design Dry Bulb Temp.....: 90.0 F
 Summer Design Wet Bulb Temp.....: 75.0 F
 Daily Temperature Range.....: 23.0 F
 Winter Design Dry Bulb Temp.....: 12.0 F
 Atmospheric Clearness Number.....: 1.00

TABLE 1. MAXIMUM SOLAR HEAT GAINS - AVERAGE DAYS
 (BTU/hr/sqft)

Month	NE	E	SE	S	SW	W	NW	N	Hor
Jan	24.2	61.1	97.3	110.1	97.3	61.1	24.2	24.2	80.0
Feb	31.8	74.8	105.7	113.8	105.7	74.8	31.8	31.8	107.2
Mar	40.8	87.0	106.9	108.0	106.9	87.0	40.8	40.8	136.8
Apr	60.0	97.4	104.4	97.2	104.4	97.4	60.0	49.3	164.3
May	74.9	103.0	98.4	84.0	98.4	103.0	74.9	54.9	181.8
Jun	85.1	109.3	97.5	79.2	97.5	109.3	85.1	57.9	195.2
Jul	80.6	106.7	98.1	81.4	98.1	106.7	80.6	56.4	189.3
Aug	69.1	104.1	105.7	94.4	105.7	104.1	69.1	52.2	177.6
Sep	52.3	99.3	114.8	111.6	114.8	99.3	52.3	45.4	158.1
Oct	36.4	88.3	117.7	122.9	117.7	88.3	36.4	36.4	128.2
Nov	26.7	66.5	101.8	113.3	101.8	66.5	26.7	26.7	89.4
Dec	21.4	53.0	87.6	100.9	87.6	53.0	21.4	21.4	68.4

TABLE 2. MAXIMUM SOLAR HEAT GAINS - DESIGN DAYS
 (BTU/hr/sqft)

Month	NE	E	SE	S	SW	W	NW	N	Hor
Jan	20.4	158.9	243.9	253.8	243.9	158.9	20.4	20.4	142.0
Feb	53.0	189.1	246.5	237.5	246.5	189.1	53.0	24.7	187.7
Mar	95.9	219.8	234.5	200.7	234.5	219.8	95.9	29.4	229.0
Apr	141.6	224.4	200.1	146.7	200.1	224.4	141.6	34.1	256.0
May	166.1	220.1	170.7	104.6	170.7	220.1	166.1	37.4	268.0
Jun	173.2	215.4	156.7	87.8	156.7	215.4	173.2	47.4	269.7
Jul	163.7	215.7	166.5	101.4	166.5	215.7	163.7	38.3	264.7
Aug	136.4	216.6	193.1	141.7	193.1	216.6	136.4	35.8	251.3
Sep	90.3	207.2	224.7	194.9	224.7	207.2	90.3	30.6	221.4
Oct	52.0	182.7	238.2	230.6	238.2	182.7	52.0	25.5	184.4
Nov	20.7	156.1	239.8	249.9	239.8	156.1	20.7	20.7	141.3
Dec	18.5	141.9	236.4	254.2	236.4	141.9	18.5	18.5	122.2

MASTER SCHEDULE SUMMARY

Prepared By : ENGG APPLICATIONS CONSUL

11-23-90

Carrier Hourly Analysis Program

6100190202

MASTER SCHEDULE 1. OCCUPANCY

Hourly Percentages

Hour ----->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	0	0	0	0	0	0	10	50	100	100	100	100
Saturday	0	0	0	0	0	0	5	5	5	10	10	10
Sunday	0	0	0	0	0	0	0	5	5	5	5	5
DESIGN	0	0	0	0	0	10	20	100	100	100	100	100

Hour ----->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	100	100	100	100	80	50	10	10	5	5	0	0
Saturday	10	10	10	5	5	5	5	5	0	0	0	0
Sunday	5	5	5	5	5	5	0	0	0	0	0	0
DESIGN	100	100	100	100	100	100	100	20	10	0	0	0

MASTER SCHEDULE 2. LIGHTING

Hourly Percentages

Hour ----->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	5	5	5	5	5	5	20	80	100	100	100	100
Saturday	5	5	5	5	5	5	15	15	20	40	50	50
Sunday	5	5	5	5	5	5	5	15	20	30	30	30
DESIGN	10	10	10	10	10	20	50	100	100	100	100	100

Hour ----->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	100	100	100	100	90	70	40	30	20	20	5	5
Saturday	50	50	50	50	50	40	30	20	5	5	5	5
Sunday	30	30	30	20	20	20	20	5	5	5	5	5
DESIGN	100	100	100	100	100	100	100	50	20	10	10	10

MASTER SCHEDULE 3. EQUIPMENT

Hourly Percentages

Hour ----->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	5	5	5	5	5	5	20	50	100	100	100	100
Saturday	5	5	5	5	5	5	10	10	15	20	20	20
Sunday	5	5	5	5	5	5	5	10	10	10	10	20
DESIGN	10	10	10	10	10	20	40	100	100	100	100	100

Hour ----->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	100	100	100	100	80	50	20	10	5	5	5	5
Saturday	20	20	20	10	10	10	10	10	5	5	5	5
Sunday	20	15	15	10	10	10	10	5	5	5	5	5
DESIGN	100	100	100	100	100	100	100	40	20	10	10	10

MASTER SCHEDULE SUMMARY

Prepared By : ENGG APPLICATIONS CONSUL

11-23-90

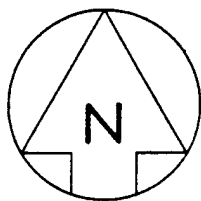
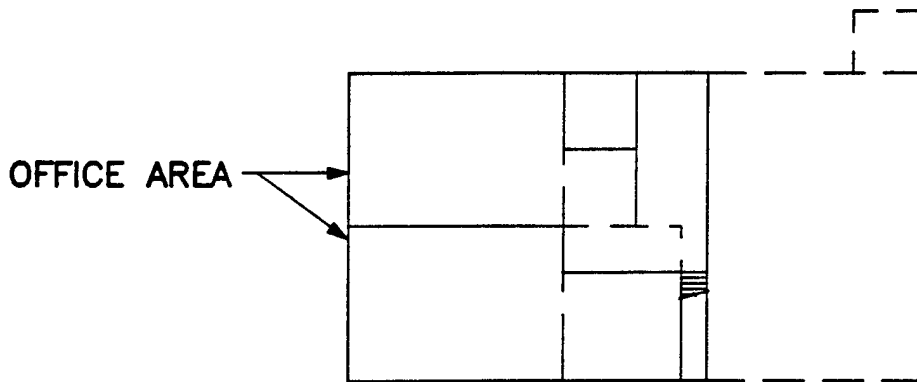
Carrier Hourly Analysis Program

6100190202

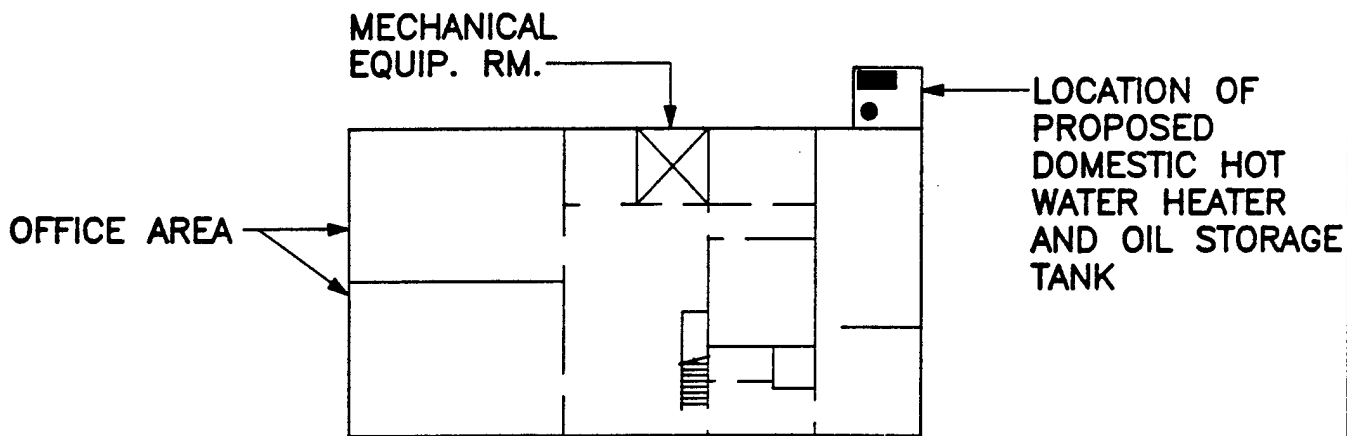
MASTER SCHEDULE 4. DOMESTIC HOT WATER Hourly Percentages

Hour ----->	0	1	2	3	4	5	6	7	8	9	10	11
Weekday	0	0	0	0	0	5	10	10	20	20	20	80
Saturday	0	0	0	0	0	2	2	2	5	5	5	5
Sunday	0	0	0	0	0	0	0	2	2	2	2	2
DESIGN	0	0	0	0	0	5	5	20	20	20	20	80

Hour ----->	12	13	14	15	16	17	18	19	20	21	22	23
Weekday	80	20	20	20	10	10	5	5	5	2	0	0
Saturday	5	5	5	2	2	2	2	2	0	0	0	0
Sunday	2	2	2	2	2	2	0	0	0	0	0	0
DESIGN	80	20	20	20	10	10	5	5	2	2	0	0



MEZZANINE FLOOR PLAN



FIRST FLOOR PLAN

BUILDING 365 KEY PLAN

FUEL RATE DATA

Fuel Rate : DOMESTIC FUEL OIL #2
Prepared By : ENGG APPLICATIONS CONSUL
Carrier Hourly Analysis Program

11-23-90
6100190202
Page 1 of 1

1. FUEL RATE DATA

NAME
Name of rate schedule = DOMESTIC FUEL OIL #2
CURRENCY
Currency name = Dollars
Currency symbol = \$
BASIC INFORMATION
Units of measurement = gallon
Conversion factor = 138.70000 kBTU/gallon
Type of rate schedule = 1 Simple
Flat rate charge = 1.03000 \$/gallon

BUILDING DESCRIPTION

Building : BUILDING 365 (#2 OIL) M
 Prepared By: ENGG APPLICATIONS CONSUL
 Carrier Hourly Analysis Program

11-08-90
 6022890201
 Page 1 of 1

1. BUILDING INPUTS

BUILDING NAME = BUILDING 365 (#2 OIL) M

MISCELLANEOUS ELECTRIC

Maximum power = 0.0 kW
 Power schedule = 1

DOMESTIC WATER HEATING

Is a domestic hot water system used ? Y
 Maximum hourly hot water use = 100.0 gal
 Hot water schedule = 4
 Average entering water temperature = 65.0 F
 Average hot water supply temperature = 140.0 F
 Heating plant type = 2 : Combustion
 Fuel type = 2 : Fuel Oil
 Plant capacity = 230.5 MBH
 Is plant efficiency computer generated ? N
 Annual plant efficiency = 65 %

OTHER INPUTS

Additional building floor area = 0.0 sqft
 Electrical generating efficiency = 100.00 %

2. PLANT SELECTION

Plant Name	Mult	Plant Name	Mult
#2 Oil Fired Boiler	1		

3. FUEL & ELECTRIC RATE SELECTION

Fuel or Energy	No.	Name of Rate Schedule	Currency
Electric	10	ELECTRIC RATE (GENERIC)	MBTU
Natural Gas	5	NATURAL GAS (GENERIC)	MBTU
Fuel Oil	4	DOMESTIC FUEL OIL #2 (GENERIC)	MBTU
Propane	9	Empty...	MBTU
Remote Source Heating	6	HEAVY FUEL OIL #6 (GENERIC)	MBTU
Remote Source Cooling	9	Empty...	MBTU

MONTHLY ENERGY COSTS

Building : BUILDING 365 (#2 OIL) M

11-08-90

Site : FT. BELVOIR, VIRGINIA

6022890201

Prepared By : ENGG APPLICATIONS CONSUL

Page 1 of 1

Carrier Hourly Analysis Program

TABLE 1. HVAC COSTS (MBTU)

Month	Electric	Natural Gas	Fuel Oil	Propane	Remote Heating	Remote Cooling
Jan	0	0	0	0	0	0
Feb	0	0	0	0	0	0
Mar	0	0	0	0	0	0
Apr	0	0	0	0	0	0
May	0	0	0	0	0	0
June	0	0	0	0	0	0
July	0	0	0	0	0	0
Aug	0	0	0	0	0	0
Sept	0	0	0	0	0	0
Oct	0	0	0	0	0	0
Nov	0	0	0	0	0	0
Dec	0	0	0	0	0	0
Tot.	0	0	0	0	0	0

TABLE 2. NON-HVAC COSTS (MBTU)

Month	Electric	Natural Gas	Fuel Oil	Propane	Remote Heating
Jan	0	0	7	0	0
Feb	0	0	7	0	0
Mar	0	0	8	0	0
Apr	0	0	7	0	0
May	0	0	8	0	0
June	0	0	7	0	0
July	0	0	7	0	0
Aug	0	0	8	0	0
Sept	0	0	7	0	0
Oct	0	0	8	0	0
Nov	0	0	7	0	0
Dec	0	0	7	0	0
Tot.	0	0	88	0	0

FUEL OIL COSTS

Building : BUILDING 365 (#2 OIL) M

11-08-90

Site : FT. BELVOIR, VIRGINIA

6022890201

Prepared By : ENGG APPLICATIONS CONSUL

Page 1 of 1

Carrier Hourly Analysis Program

TABLE 1. MONTHLY COMPONENT CHARGES (MBTU)

Month	Energy Charges	Fixed Charges	Taxes	Total Charges
Jan	7	0	0	7
Feb	7	0	0	7
Mar	8	0	0	8
Apr	7	0	0	7
May	8	0	0	8
June	7	0	0	7
July	7	0	0	7
Aug	8	0	0	8
Sept	7	0	0	7
Oct	8	0	0	8
Nov	7	0	0	7
Dec	7	0	0	7
Tot.	88	0	0	88

TABLE 2. MONTHLY TOTALS

Month	Charges (MBTU)	Energy (gallon)	Effective Rate (MBTU/gallon)
Jan	7	53	0.13870
Feb	7	48	0.13870
Mar	8	55	0.13870
Apr	7	53	0.13870
May	8	55	0.13870
June	7	53	0.13870
July	7	53	0.13870
Aug	8	58	0.13870
Sept	7	49	0.13870
Oct	8	58	0.13870
Nov	7	53	0.13870
Dec	7	51	0.13870
Tot.	88	638	0.13870

APR	7/2	=	3.5 MBTU	27	GALS
MAY		=	8	55	
JUNE		=	7	53	
JULY		=	7	53	
AUG		=	8	58	
SEPT		=	7	49	
OCT	8/2	=	4	29	
			<u>44.5 MBTU</u>	<u>324</u>	GALS

$$8000000 / 31 = 258.06 \text{ MBH} / 24 = 10.75 \text{ MBH AVG}$$

$$\begin{aligned} \text{SAY ALL ENERGY IS EXPENDED WITHIN A 10HR PERIOD} &= 25.8 \text{ MBH} \\ \text{DOUBLE THIS FOR PIPING LOSSES \& SAFETY FACTOR} &= 51.6 \text{ MBH} \\ \text{SLY} &= 52 \text{ MBH} \end{aligned}$$

$$\begin{aligned} \text{WORST CASE MAX BASED ON} & \\ \text{SELECTED UNIT INPUT MBH} &= 152 \text{ MBH} \end{aligned}$$

BASED ON OIL FIRED DOMESTIC HOT WATER HEATER

SELECT:

BOCK WATER HEATERS, INC. MODEL 51E

50 GAL STORAGE 152 MBH INPUT 138 GPH @ 100° 1.1 GPH #2
120V, 60 HZ 1" 1/8 HP 2" FIBERGLASS INS.
364 LBS MEET ASHRAE 90 A, 6" VENT, 59" H x 24" W
10 YR LIMITED WARRANTY, GLASS LINED, TURBOFLUE DESIGN,
MAGNESIUM ANODES

COST QUOTE: R.E. MICHEL CO. INC., E. VIENNA, 698-6244 \$600

OIL STORAGE TANK

SELECT: 275 GAL STD. INDOOR TANK

CONSTRUCTION COST ESTIMATE

DATE PREPARED

FEB 1991

SHEET

OF

PROJECT

ENERGY SAVINGS OPPORTUNITY SURVEY

BASIS FOR ESTIMATE

- CODE A (No design completed)
- CODE B (Preliminary design)
- CODE C (Final design)
- OTHER (Specify)

LOCATION

FT. BELVOIR, VIRGINIA BLDG 365

ARCHITECT ENGINEER

ENGINEERING APPLICATIONS CONSULTANTS

DRAWING NO.

OIL FIRED DOM. H.W. HEATING

ESTIMATOR

REF

CHECKED BY

VP

SUMMARY	QUANTITY		LABOR		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	PER UNIT	TOTAL	
OIL FIRED HW HEATER	1	EA		250		600	850
275 GAL. DOM. OIL STORAGE TANK	1	EA		71		225	296
OIL LINE & HOOK-UP	1	LS		152		103	255
VENT CHIMNEY	16	LF	5.85	93.60	3.96	63.40	157
FITTINGS, FLASHING, TOP		LS		80.		73.	153
AUTO VENT DAMPER	1	EA		16.		137.	153
COMBUSTION AIR VENTS	2	EA	4.55	9.10	8.45	16.90	26
MANUAL DAMPERS	2	EA	9.30	18.60	8.20	16.40	35
ELECTRICAL WORK		LS		100.		300.	400
BUILDING ADDITION	72	SF	23.	1656	14.	1008	2664
SUB-TOTAL				2,446.		2543.	4,989.
LABOR MARKUP 21%				514.			514
TAXES 4.5%						114.	114
SUB-TOTAL							5617
OVERHEAD 10%							562
SUB-TOTAL							6179
PROFIT 10%							618
SUB-TOTAL							6797
TOTAL							\$ 6800.

