TECHNICAL REPORT 2

Building and Plant Energy Analysis
Northfield Mental Healthcare Center
Northfield, Ohio

Ji Won Park
Mechanical Option
Faculty Consultant: Dr. Stephen Treado
Date Submitted: 10/17/2012

Table of Contents

Executive Summary

This report contains the building and plant energy analysis on the Northfield Mental Healthcare Center. Trane Trace 700 modeling software was used for the analysis. Due to a large net floor area, the block load calculation method was used. The rooms were bounded together into zones in accordance of their functions and locations.

The purpose of this report is to evaluate the HVAC loads, energy consumption, utility cost, and emissions and to compare the outputs with the designed values. Both the existing conditions and newly designed conditions were considered, since the project is both renovation and expansion. The parts of the buildings where would be renovated and expended are separated into 98 zones in order to perform a block analysis, and the zone conditions were simplified for this model.

Total airflow load were calculated after all the zone types, occupancy types, the occupancy density, miscellaneous density, and minimum ventilation rates were assumed based on the ASHRAE Standard 62.1 and ASHRAE 170 and inserted into the model. According to the outputs of the energy analysis, approximately 38,000 CFM of outside air, 110,000 CFM of cooling air, and 32,000 CFM of heating air are needed for the building. Total about 180,000 CFM of air are needed for the building, while the designed value is much higher than the calculated value which is approximately 233,000 CFM. 24% of theoretical errors were found, and the errors occurred due to inaccuracies of assumptions.

Total 6 air handling units serve the renovated and expended zones. Those air handlers possess different systems, but it was assumed that all of the air handlers have bypass VAV systems with reheat coils. Data for chillers and boilers were also inputted into the model in order

to calculate cooling load and heating load. According to the outputs of the model, about 2,600,000 Btu/hr of cooling coil load and 1,600,000 Btu/hr of heating coil load were calculated. The cooling load dominates this building because there would be 26 of unit heaters serving multiple spaces. Since there is no cooling coil load and heating coil load calculated by the designer, the model outputs were not able to be compared. Some of HVAC systems were not taken account into the model, so the designed values are expected to be much higher than the outputs from this model.

Energy consumptions were also estimated in this report. Simple summer demand rate which is already drafted into the TRACE program was used for the calculation for simplicity. Total 1,023,000 kWh were expected to be consumed per a year, and about $56,000 bill would be expected for electricity and gas. Those values are not accurate because some of the HVAC equipment was omitted for the analysis.

Project background

The Northfield Mental Healthcare center is located on the Northfield, Ohio. The building is a five story mental clinic building, and the project is renovation of three existing buildings and expansion of the existing facilities. Approximately 200,000 square feet would be added to the existing buildings, and the new portions of the buildings would be patient wings, administration, gym, and clinic. The new buildings were designed to provide better quality of building, safety of patients and staff, and aesthetically pleasing environment. The face brick walls were mainly used for the exterior walls, and smooth CMU, texted CMU, and curtain walls were also used to highlight freshness of new design. The building is not yet constructed but still in design process.

The total estimated project cost is approximately $62.5 million, including 10.3 million of HVAC and fire protection equipment cost.

Mechanical summary

10 different air handling units are equipped in the Northfield Mental Healthcare Center including two existing air handlers. The two patient wings are served by two of 65,000 CFM rooftop air handlers. Clinic and administration areas are served by 7,950 CFM rooftop air handler. The gym area and dietary areas are served by 3,700 CFM indoor air handler and 8,400 CFM indoor air handler respectively. Boiler plant, chiller plant and electrical room are served by the other three indoor air handlers which have maximum capacity of 5,000 CFM, 5,000 CFM, and 6,000 CFM respectively.

Two 450 tons of centrifugal chillers are located on the chiller plant and connected to a 2-cell-cooling tower which is located outside of the energy center. Chilled water is supplied to each air handling equipment and served to the entire building. Each chiller consists of two chilled water pumps: primary and secondary chilled water pump. The secondary chilled water pump is aligned with the primary chilled water pump but used for a backup only.

Six of 113.5 horsepower condensing boilers are located on the boiler plant and serve heated water. Each boiler consists of primary heating water pump and two of secondary heating water pumps are connected to the two of expansion tanks. Variable frequency drive devices are used for most of the HVAC equipment including heating water pumps, chilled water pumps, chillers, and cooling towers. In addition, the building uses efficient equipment, highly insulated exterior envelope, programmable temperature controls, and occupancy sensors.

Load calculation

The building load and energy simulation program Trane Air Conditioning Economics 700 (TRACE) was used to evaluate the ventilation loads, heating loads and cooling loads and to estimate annual energy consumption and operating cost of the Northfield Mental Healthcare Center.

Design Conditions

The Northfield Mental Healthcare Center is located in Northfield, OH. Since the Northfield area is not listed in the ASHRAE Fundamental 2009, the nearest big city, Cleveland, was used for the analysis. The table below shows the weather data inputs that were used for the analysis. The weather data from the ASHRAE Fundamental 2009 is described in Appendix A as well.

Cleveland, OH	
Latitude	41.4N
Longitude	81.85W
Elevation	804
Heating DB (99.6%)	2.5F
Cooling DB (0.4%)	89.4F

Table 1. Weather Conditions

Model Design

Zones were separated by room characteristics. Restrooms and small storages were neglected. Existing zones that would not be changed during construction were also neglected. Only newly designed zones and zones that would be renovated in the future were taken an account for this analysis. Due to the building's size, block analysis method was used for the model design, but there are still 98 different zones. Following pictures show how the rooms are bounded as zones or separated.

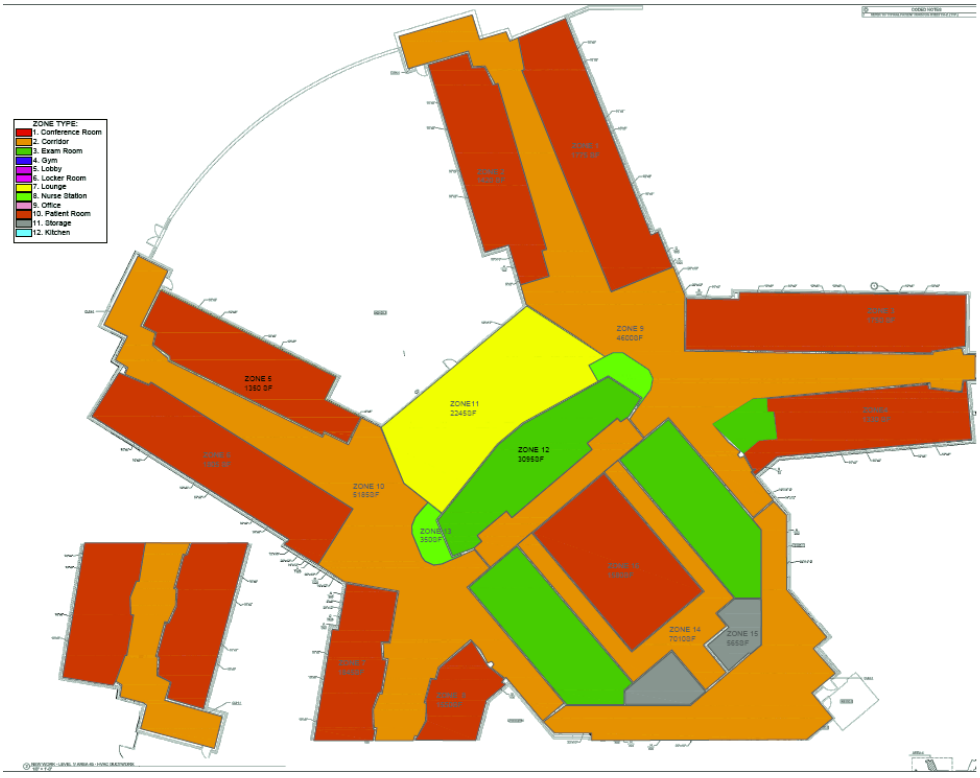


Figure 1. zone 1- 16

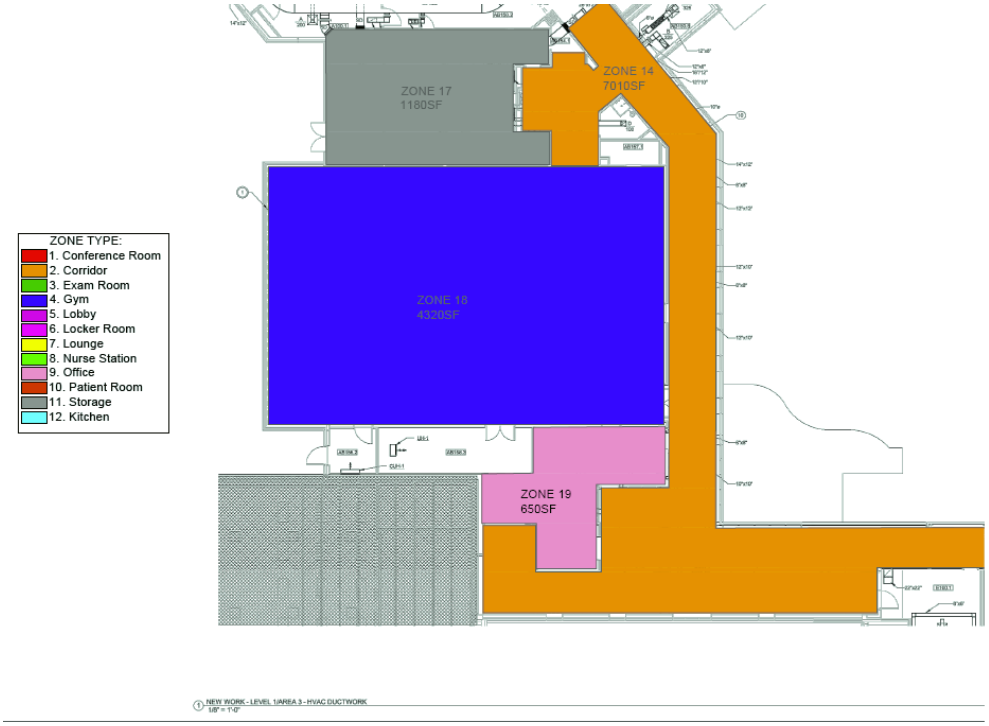


Figure 2. zone 17- 19

Figure 3. zone 20 – 35

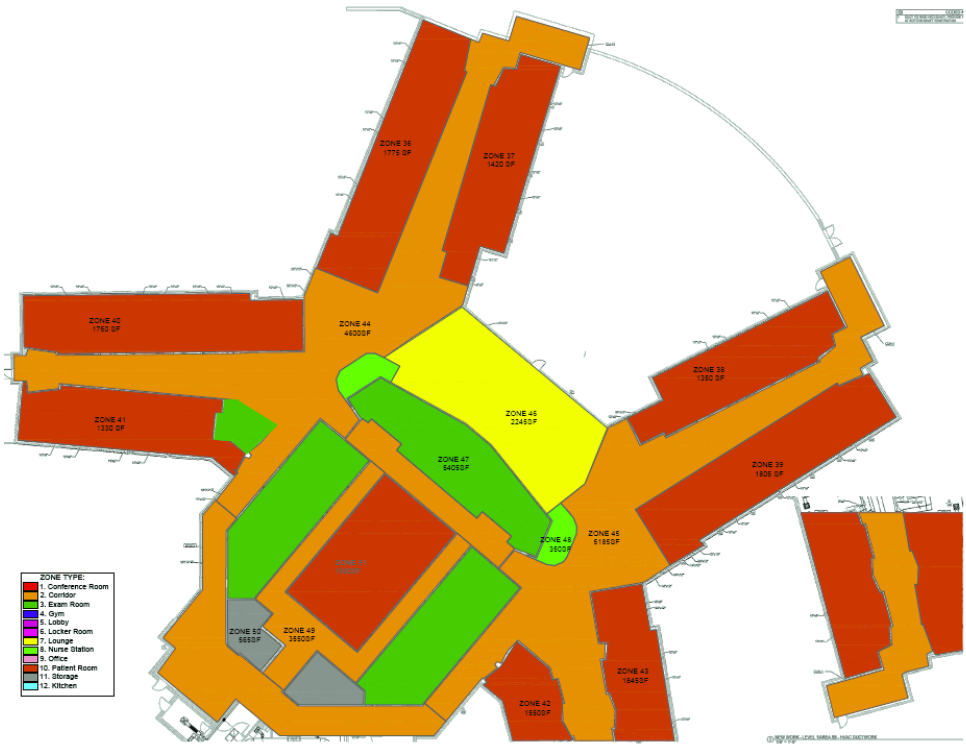


Figure 4. zone 36 – 51

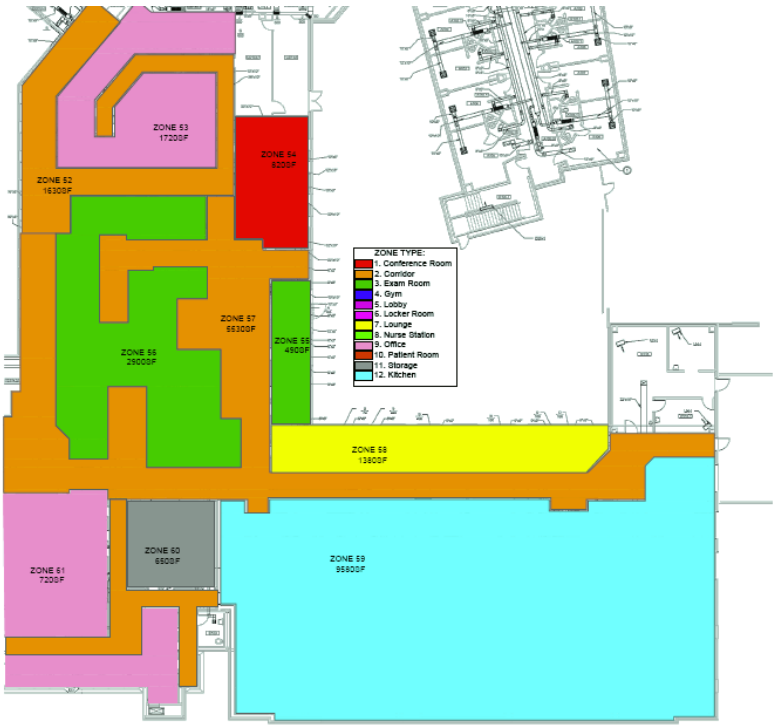


Figure 5. zone 52 – 62

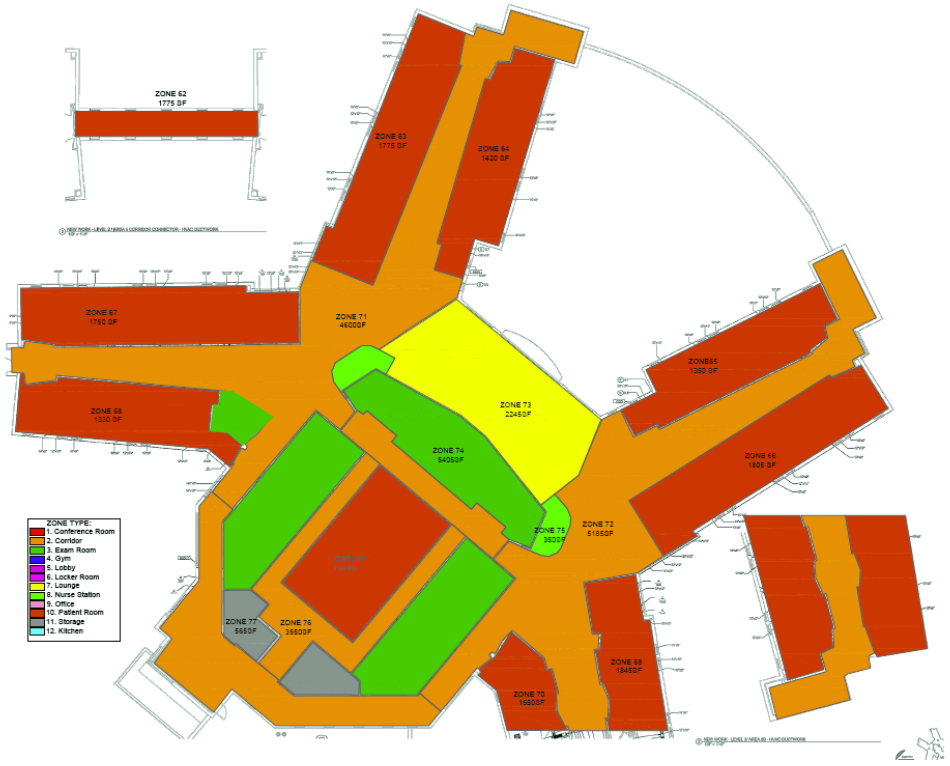


Figure 6. zone 63-78

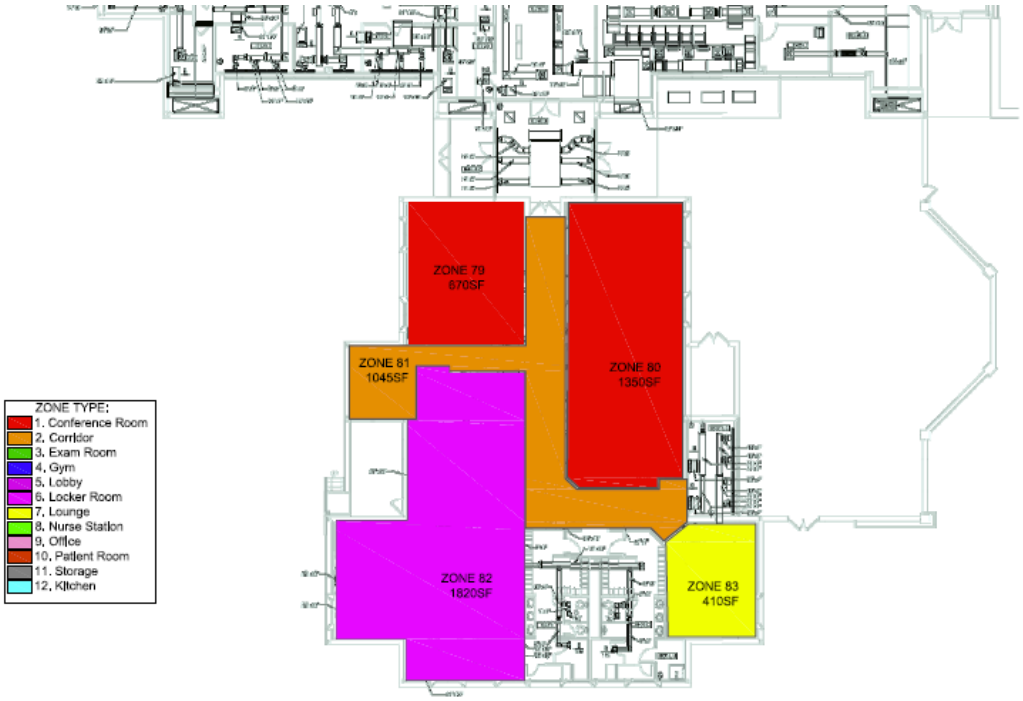


Figure 7. zone 79-83

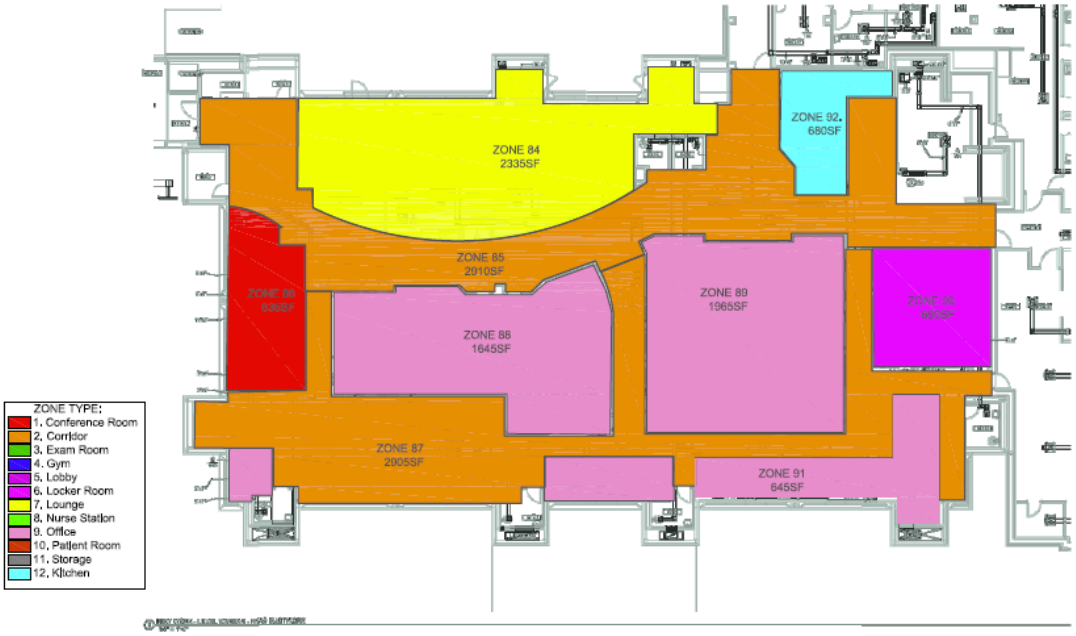


Figure 8. zone 84-92

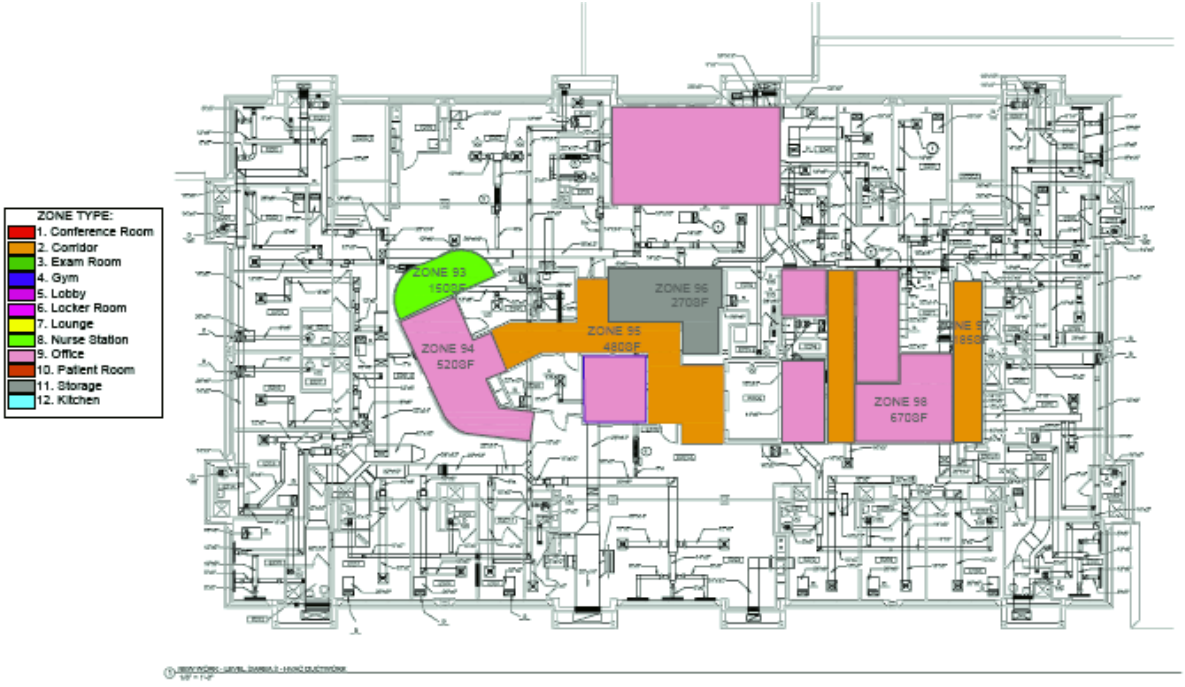


Figure 9. zone 93-98

Lighting and Equipment Electrical Load Assumptions

12 different templates were created for each of various space types with assumed lighting power density values and miscellaneous equipment power density. The assumptions on lighting power density were taken from ASHRAE Standard 90.1-2007. The assumptions on miscellaneous equipment power density are based on nameplate rating from electrical equipment.

Space Type	LPD (W/SF)	Miscellaneous Loads (W)
Conference Room	1.23	300
Corridor	0.89	0
Exam Room	1.66	150
Gym	0.72	0
Kitchen	0.99	5 W/SF
Lobby	0.9	0
Locker Room	0.75	0
Lounge	1.07	350
Nurse Station	0.87	350
Office	1.11	350
Patient Room	0.62	150
Storage	0.63	0

Table 2. Lighting and Miscellaneous Loads

Occupancy Assumptions

The number of occupants per square feet is based on the Table 6-1 of ASHRAE 62.1-2007. The occupancy densities that were not listed in the Table 6-1 were estimated based on number of furniture.

Space Type	Occupancy Density (#/1000SF)	(SF/#)
Conference Room	50	20
Corridor	0	0
Exam Room	25	2 people
Gym	30	33
Kitchen	20	50
Lobby	30	33
Locker Room		6 people
Lounge	25	40
Nurse Station	30	3 people
Office	5	200
Patient Room	10	100
Storage	0	0

Table 3. Occupancy Density

Airflow Assumptions

The amount of airflow for hospital spaces can be found in ASHHRAE Standard 170. However the general areas' minimum ventilation rates were obtained from ASHRAE Standard

62.1.The minimum ventilation rate based on number of people, the minimum ventilation rate based on square feet, and infiltration values are listed below.

Space Type	Minimum Ventilation Rates (CFM/#)	Minimum Ventilation Rates (CFM/SF)	Infiltration (ACH)
Conference Room	5	0.06	0.6
Corridor	2 CFM	2 CFM	0.6
Exam Room	2 CFM	2 CFM	0.3
Gym	0	0.3	0.6
Kitchen	7.5	0.12	0.6
Lobby	5	0.06	0.6
Locker Room	4 CFM	4 CFM	0.6
Lounge	5	0.06	0.6
Nurse Station	2 CFM	2 CFM	0.6
Office	5	0.06	0.6
Patient Room	25	0.25	0.3
Storage	0	0.12	0.6

Table 4. Minimum Ventilation Rates and Infiltration

Construction

The Northfield Mental Healthcare Center is designed with four different wall types and one roof type. However, for the simplification, only one type of wall, roof, and window were used for the analysis. U-values for the walls, roof, and windows were taken from construction documents and listed below.

Walls	R-value	Thicknes	Conductivity
Surface Air Film (Vertical)	0.680		
Common 4" Brick	0.799	0.333	0.4167
Air Layer 3/4" to 4" (Vertical)	0.980		
2" Insulation	6.680	0.167	0.025
1/2" Gypsum or Plaster Board	0.454	0.042	0.0926
Mineral Wool/Fiber, Batt, R-21	22.611	0.511	0.0226
5/8" Gypsum or Plaster Board	0.562	0.052	0.0926
Overall R-Value	32.765		
Overall U-Value	**0.031**		

Table 5. U-value (Wall)

Roof	R-value
Outside Film	0.250
3 1/2" Polyiso Rigid	21.700
1" Spray Fire Proof	1.500
Inside Film	0.680
Overall R-Value	24.130
Overall U-Value	**0.041**

Table 6. U-value (Roof)

Windows	
Overall U-Value	**0.280**
SHGC	0.440
Shading Coefficient	0.505

Table 7. U-Value (Windows)

Calculated Load vs. Design Load Analysis

The engineer of the Northfield Mental Healthcare Center created an energy modeling using CHVAC program and evaluated only new rooms and rooms that would be renovated in the future. The energy model was evaluated by using room by room analysis which is much more accurate than the block analysis that is represented in this report. Table 8 and 9 show the airflow load, cooling coil load, and heating coil load that are the outputs of the TRACE program. The table 10 shows load comparisons between designed values and the TRACE outputs.

The most error was found in air handler 5 which serves dietary area. The miscellaneous load on this area was assumed to be 5W/SF which was already over-designed. The air handler 4 which serves administration and clinic areas is calculated pretty accurately within 1%. The overall calculated load is almost 50,000 CFM less than designed value. The designed values contain the processes of reheat, while the TRACE program did not take an account for the reheat system. Various errors were created by simplifying zones, different miscellaneous load assumptions, inaccurate equipment data inputs, and so on. Most of the zones were supplied 0.6 CFM/ SF which seemed reasonable for a hospital.

Load Summary	Air Flow				
	Outside Air (CFM)	Cooling Air (CFM)	Heating Air (CFM)	Return Air (CFM)	Exhaust Air (CFM)
AHU-1	15393	41,448	12,434	45,814	12,434
AHU-2	15391	36,245	10,874	40,745	10,874
AHU-3	1493	2,452	736	2,944	736
AHU-4	803	6,154	1,846	7,286	1,846
AHU-5	2587	10,818	3,245	11,585	3,245
AHU-6	2030	9,499	2,850	11,257	2,850
Total	37,697	106,616	31,985	119,631	31,985

Table 8. Airflow Load Summary

Load Summary	Cooling Coil (Btu/hr)		Heating Coil (Btu/hr)
	Envelope	Internal	Envelope
AHU-1	488,619	395,688	554,732
AHU-2	478,602	266,385	566,586
AHU-3	31,117	59,063	53,168
AHU-4	107,058	90,756	134,561
AHU-5	57,616	244,945	81,334
AHU-6	125,989	191,365	162,218
Total	1,289,001	1,248,202	1,552,599

Table 9. Cooling Coil & Heating Coil Loads

Load Summary	Designed values (CFM)	Trace (CFM)	Error (%)
AHU-1	65,000	69,275	7
AHU-2	65,000	62,510	4
AHU-3	3,025	4,681	35
AHU-4	7,950	8,803	11
AHU-5	7,350	16,650	56
AHU-6	84,000	14,379	83
Total	232,325	176,298	24

Table 10. Load Comparisons

Energy calculation and operating cost

Energy Consumption

The total energy consumption was also calculated using Trane TRACE model based on the outputs of the program. Some of the heating units were not taken an account into the TRACE model, so the heating usage in reality would be much more than calculated value. Some of small HVAC equipment's electricity loads were omitted as well. It was assumed that the building would be continuously operated, but in reality the lighting load would be less than the calculated value.

The tables below describe annual energy usage by breaking down the total usage into several usage types. The total annual utility cost was calculated to be 55,697 dollars, and the utility cost per square feet was calculated to be 0.14 dollars. The figure 10 shows the monthly

utility costs from the model. As expected, the utility cost meets the peak value on July of which has extreme weather data in the Cleveland.

	Energy Usage (kBtu/yr)	
	Elect. (kWh)	Gas. (kBtu)
Heating	39,420	8,256,875
Cooling	308,520	
Lighting	632,674	
Auxiliary	41,723	
Total	1,022,337	8,256,875

Table 11. Energy Usage

	Cost ($/yr)	Cost ($/SF)
Elect. ($)	51,117	
Gas. ($)	4580	
Total	55,697	0.14

Table 12. Yearly Cost

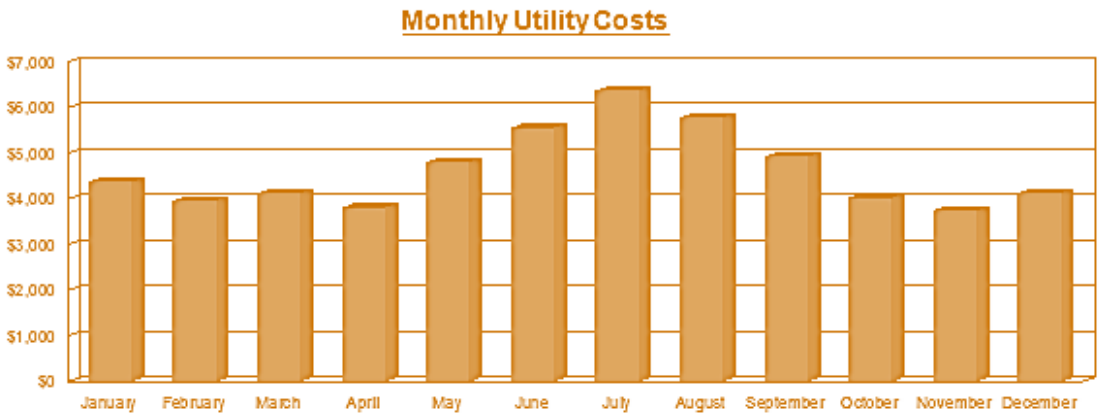


Figure 10. Montly Utility Costs

Energy Comparison & Cost Analysis

The energy analysis was not performed by the mechanical designer of the Northfield Mental Healthcare Center, so the energy comparison cannot be done. The table below shows HVAC equipment's energy consumption rate. The energy consumption by chiller is much higher than boiler as expected.

Cooling Plant	Energy Consumption (kWh)
Water Cooled Chiller (EACH)	254,200
Condenser Fan	42,942
Var Vol Chill Water Pump	2,267
Var Vol Cond Water Pump	2,617
Misc. Accessory	8,760
Heating Plant	**Energy Consumption (kWh)**
Boiler (EACH)	82,568 (Therms)
Water Pump	39,455
Boiler Forced Draft Fan	35,040
Misc. Accessory	4,380

Table 13. Equipment Energy Consumption

Emissions

Emissions from the energy usage were calculated using emission factors from Regional Grid Emissions Factors 2007 file. The table below shows mass of each pollutant produced by electricity usage for this building. Since the amount of pollutant calculation did not take an account of on-site combustion and pre-combustion, the total values were much lower than

outputs from TRACE model. Table 14 shows the emission calculation using the Regional Grid Emissions factors 2007 database, and table 15 shows the emission outputs from TRACE Model. The Regional Grid Emissions factors 2007 data are referenced in the Appendix C.

	Factor	Elec	Mass of Pollutant
Pollutant	lb/ kWh	kWh	lb
CO2e	2.20E+00	1022337	2.25E+06
CO2	2.10E+00	1022337	2.15E+06
CH4	3.71E-03	1022337	3.79E+03
N2O	4.73E-05	1022337	4.84E+01
NOx	4.14E-03	1022337	4.23E+03
SOx	1.19E-02	1022337	1.22E+04
CO	6.38E-04	1022337	6.52E+02
TNMOC	5.41E-05	1022337	5.53E+01
Lead	1.76E-07	1022337	1.80E-01
Mercury	3.59E-08	1022337	3.67E-02
PM10	9.87E-05	1022337	1.01E+02
Solid Waste	2.49E-01	1022337	2.55E+05

Table 14. Emission Calculation

Enviornmental Impact Analysis	
CO2	110,445,176 lbm/yr
SO2	766,471 gm/yr
NOX	191,528 gm/yr

Table 15. Emission Calculation from TRACE Model

Appendix A

Figure 11. Weather Data from ASHRAE 90.1

2009 ASHRAE Handbook - Fundamentals (IP)

CLEVELAND HOPKINS INTL AP, OH, USA

WMO#: **725240**

Lat: **41.41N** Long: **81.85W** Elev: **804** StdP: **14.27** Time Zone: **-5.00 (NAE)** Period: **82-06** WBAN: **14820**

Annual Heating and Humidification Design Conditions

Coldest Month	Heating DB		Humidification DP/MCDB and HR						Coldest month WS/MCDB				MCWS/PCWD to 99.6% DB	
	99.6%	99%	99.6%			99%			0.4%		1%			
			DP	HR	MCDB	DP	HR	MCDB	WS	MCDB	WS	MCDB	MCWS	PCWD
1	2.5	8.5	-4.9	4.4	4.0	0.5	5.8	10.0	28.6	28.4	26.3	28.6	10.5	230

Annual Cooling, Dehumidification, and Enthalpy Design Conditions

Hottest Month	Hottest Month DB Range	Cooling DB/MCWB						Evaporation WB/MCDB						MCWS/PCWD to 0.4% DB	
		0.4%		1%		2%		0.4%		1%		2%			
		DB	MCWB	DB	MCWB	DB	MCWB	WB	MCDB	WB	MCDB	WB	MCDB	MCWS	PCWD
7	17.6	89.4	73.9	86.7	72.5	84.1	71.1	76.3	85.6	74.7	83.1	73.2	81.1	11.3	230

Dehumidification DP/MCDB and HR									Enthalpy/MCDB						Hours
0.4%			1%			2%			0.4%		1%		2%		8 to 4 &
DP	HR	MCDB	DP	HR	MCDB	DP	HR	MCDB	Enth	MCDB	Enth	MCDB	Enth	MCDB	55/69
73.3	127.4	81.4	71.9	121.6	79.6	70.5	115.6	78.1	40.1	85.6	38.6	83.2	37.2	81.3	687

Extreme Annual Design Conditions

Extreme Annual WS			Extreme Max WB	Extreme Annual DB				n-Year Return Period Values of Extreme DB							
				Mean		Standard deviation		n=5 years		n=10 years		n=20 years		n=50 years	
1%	2.5%	5%		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
24.7	21.0	19.0	84.0	-4.0	93.4	7.9	3.3	-9.7	95.8	-14.3	97.7	-18.8	99.6	-24.5	102.0

Monthly Climatic Design Conditions

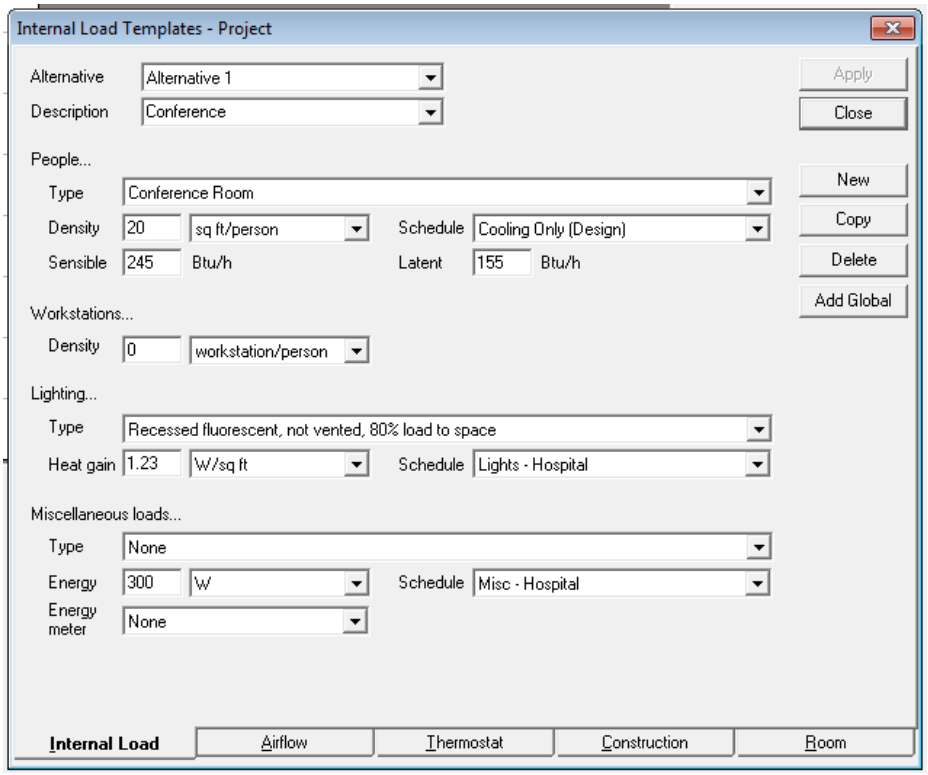
			Annual	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperatures, Degree-Days and Degree-Hours		Tavg	50.9	27.8	30.5	37.6	48.8	59.1	68.4	72.9	71.2	64.2	53.2	43.3	32.1
		Sd		11.52	10.29	11.10	9.91	8.49	7.28	5.46	5.54	7.32	8.14	9.23	11.03
		HDD50	2679	690	550	414	141	14	0	0	0	2	60	243	565
		HDD65	5904	1152	966	851	495	226	49	4	11	102	376	651	1021
		CDD50	2992	3	4	30	104	297	551	711	656	427	158	42	9
		CDD65	743	0	0	2	8	43	150	251	202	77	9	1	0
		CDH74	5970	0	0	12	86	412	1264	2126	1499	516	54	1	0
		CDH80	1745	0	0	0	12	95	400	700	422	113	3	0	0
Monthly Design Dry Bulb and	0.4%	DB		60.6	63.2	75.6	81.9	86.5	91.4	93.6	91.6	87.6	79.8	71.1	65.0
		MCWB		55.2	53.3	60.6	65.1	70.2	71.9	76.0	76.0	72.6	66.8	60.0	57.3
	2%	DB		54.8	55.9	67.9	76.0	82.7	87.9	89.8	88.0	83.2	74.6	65.6	57.9
		MCWB		50.8	49.5	55.8	62.0	68.2	72.2	74.7	74.2	70.4	63.1	57.8	53.4

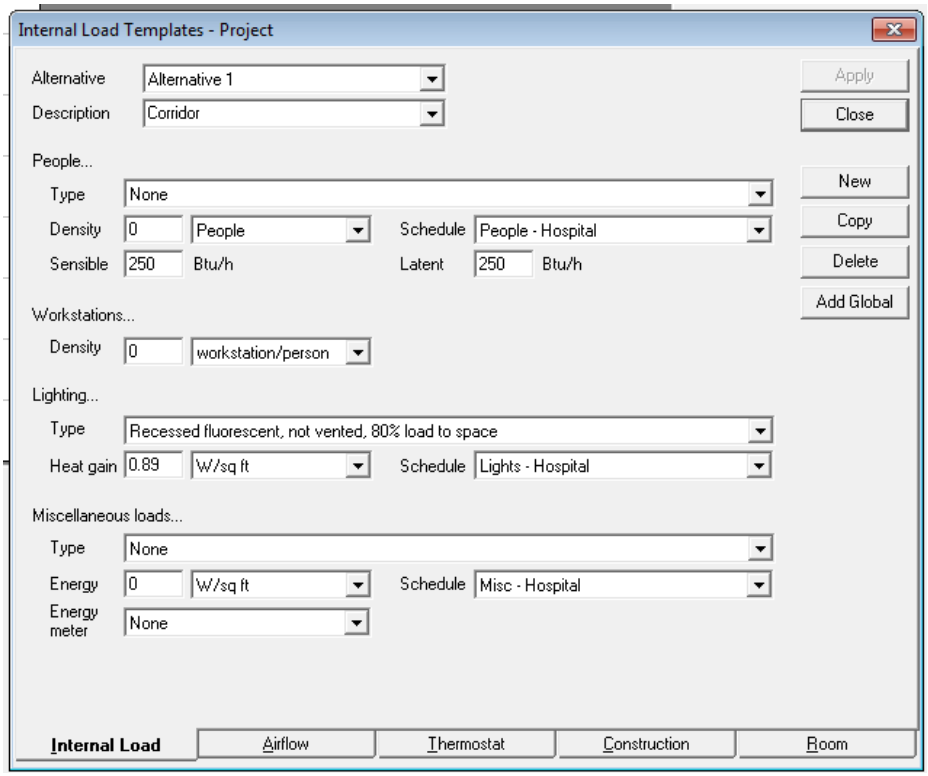
Mean Coincident Wet Bulb Temperatures	5%	DB	48.5	49.7	61.9	71.1	79.1	84.8	86.9	84.5	79.8	70.4	62.1	52.0
		MCWB	44.1	43.8	53.1	58.5	66.2	70.8	73.0	72.0	68.4	61.2	55.7	47.7
	10%	DB	42.9	44.8	55.6	65.8	74.4	81.4	83.9	81.8	76.4	66.5	58.1	46.3
		MCWB	39.2	40.2	49.2	56.0	64.0	69.2	71.5	70.8	66.9	58.9	52.2	42.3
Monthly Design Wet Bulb and Mean Coincident Dry Bulb Temperatures	0.4%	WB	56.0	56.0	62.0	67.9	73.9	76.3	78.5	78.3	74.9	68.8	63.0	59.0
		MCDB	59.4	61.1	71.8	76.9	82.3	86.1	88.7	88.6	82.7	76.4	68.0	63.9
	2%	WB	51.3	50.2	57.6	63.9	70.9	74.4	76.8	75.8	72.6	65.3	59.4	54.0
		MCDB	54.5	54.9	65.7	73.9	79.5	84.0	86.8	84.1	80.1	72.0	64.5	57.5
	5%	WB	44.4	45.1	53.7	60.3	68.3	72.7	74.9	74.3	70.6	62.8	56.5	48.2
		MCDB	47.5	49.4	60.7	69.1	76.2	81.7	83.5	81.6	76.9	68.6	61.2	51.6
	10%	WB	39.2	40.4	49.2	56.8	65.2	70.9	73.3	72.5	68.7	60.2	52.8	42.6
		MCDB	42.9	44.6	56.3	64.7	72.9	78.8	81.2	79.4	74.6	65.6	57.4	46.0
Mean Daily Temperature Range		MDBR	12.8	13.9	15.9	18.0	18.8	18.2	17.6	17.2	17.5	16.6	13.6	12.0
	5% DB	MCDBR	17.9	20.7	25.5	25.5	24.0	21.4	21.0	20.2	21.2	21.8	19.0	17.5
		MCWBR	15.4	16.1	16.8	15.6	12.9	10.1	9.5	9.8	11.1	13.2	14.2	14.6
	5% WB	MCDBR	17.1	19.4	23.2	23.2	20.9	18.7	18.1	17.5	17.3	18.2	17.9	17.2
		MCWBR	15.8	16.2	16.5	15.3	12.6	10.1	9.1	9.5	10.4	12.5	14.9	15.7
Clear Sky Solar Irradiance	taub		0.308	0.368	0.435	0.427	0.464	0.488	0.471	0.455	0.413	0.364	0.338	0.313
	taud		2.337	2.023	1.852	1.960	1.897	1.886	1.988	2.035	2.147	2.269	2.295	2.339
	Ebn,noon		266	260	254	267	260	253	256	256	260	261	251	253
	Edh,noon		30	46	59	56	61	62	56	52	44	35	31	29

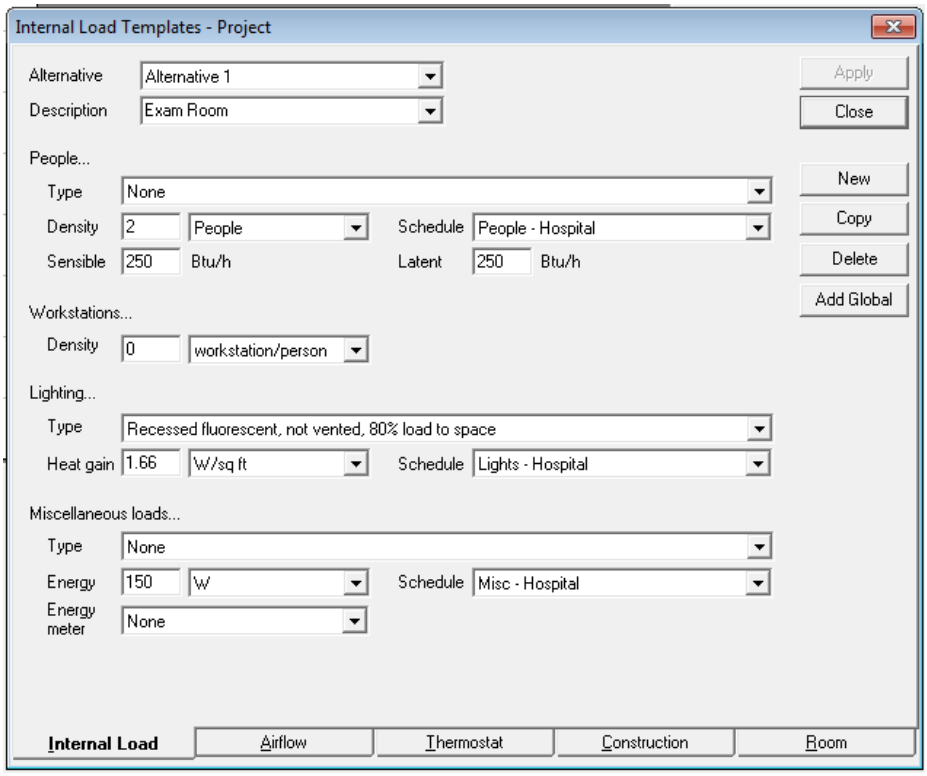
CDD*n* Cooling degree-days base n°F, °F-day
CDH*n* Cooling degree-hours base n°F, °F-hour
DB Dry bulb temperature, °F
DP Dew point temperature, °F
Ebn,noon } Clear sky beam normal and diffuse hori-
Edh,noon } zontal irradiances at solar noon, Btu/h/ft2
Elev Elevation, ft
Enth Enthalpy, Btu/lb
HDD*n* Heating degree-days base n°F, °F-day
Hours 8/4 & 55/69 Number of hours between 8 a.m. and 4 p.m with DB between 55 and 69 °F
HR Humidity ratio, grains of moisture per lb of dry air
Lat Latitude, °
Long Longitude, °
MCDB Mean coincident dry bulb temperature, °F
MCDBR Mean coincident dry bulb temp. range, °F
MCDP Mean coincident dew point temperature, °F
MCWB Mean coincident wet bulb temperature, °F
MCWBR Mean coincident wet bulb temp. range, °F
MCWS Mean coincident wind speed, mph
MDBR Mean dry bulb temp. range, °F
PCWD Prevailing coincident wind direction, °, 0 = North, 90 = East
Period Years used to calculate the design conditions
Sd Standard deviation of daily average temperature, °F
StdP Standard pressure at station elevation, psi
taub Clear sky optical depth for beam irradiance
taud Clear sky optical depth for diffuse irradiance
Tavg Average temperature, °F
Time Zone Hours ahead or behind UTC, and time zone code
WB Wet bulb temperature, °F
WBAN Weather Bureau Army Navy number
WMO# World Meteorological Organization number
WS Wind speed, mph

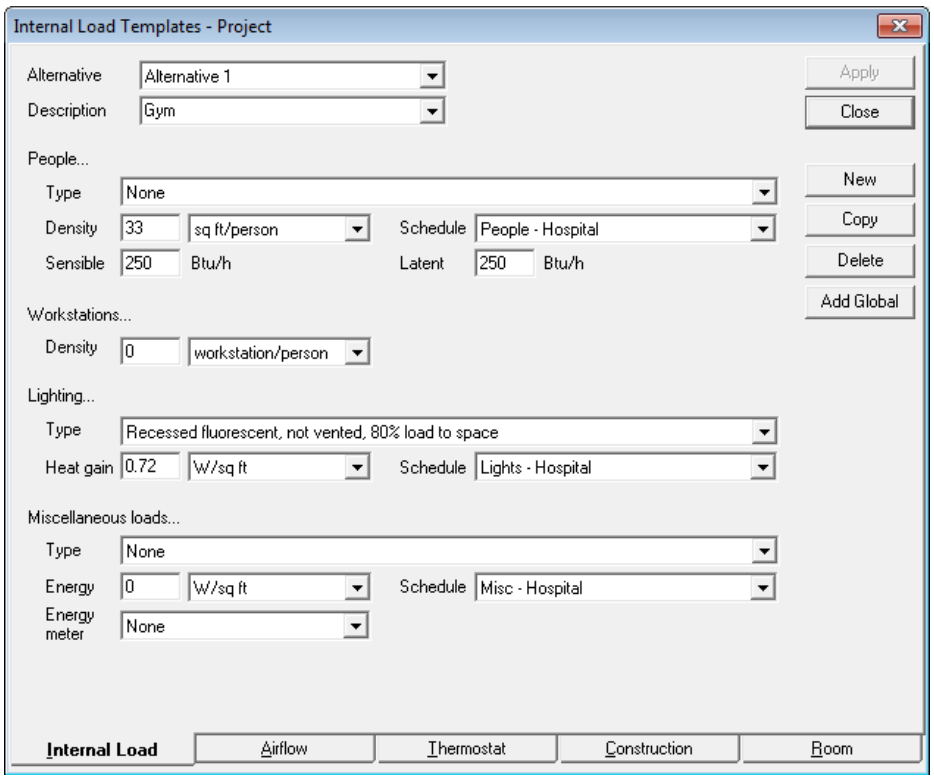
Appendix B

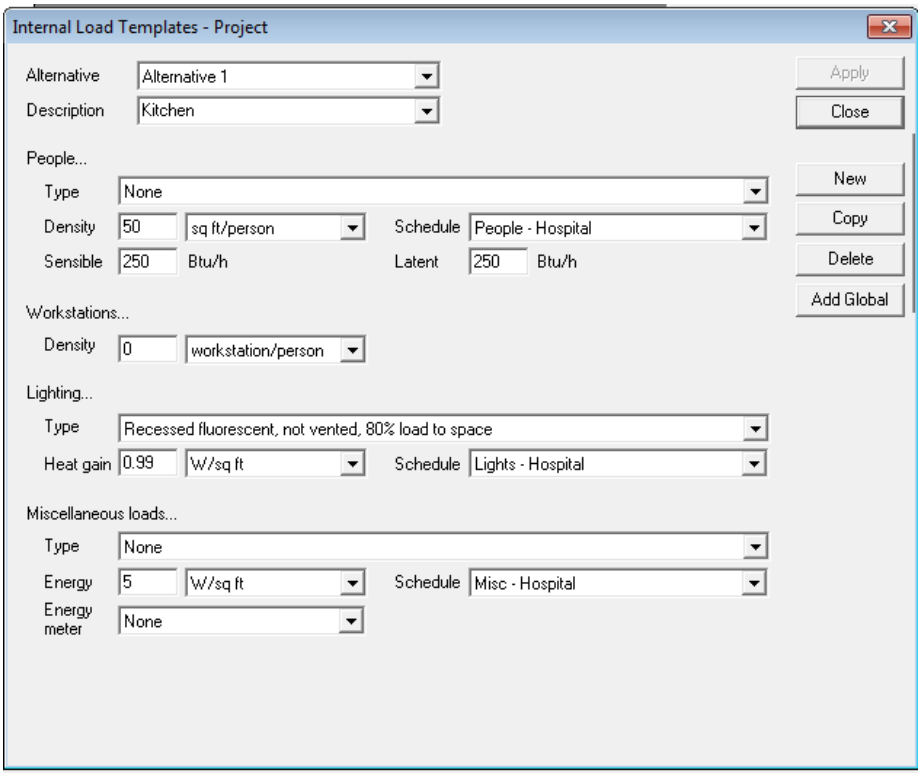
Figure 12. Internal Load Templates and Airflow Templates

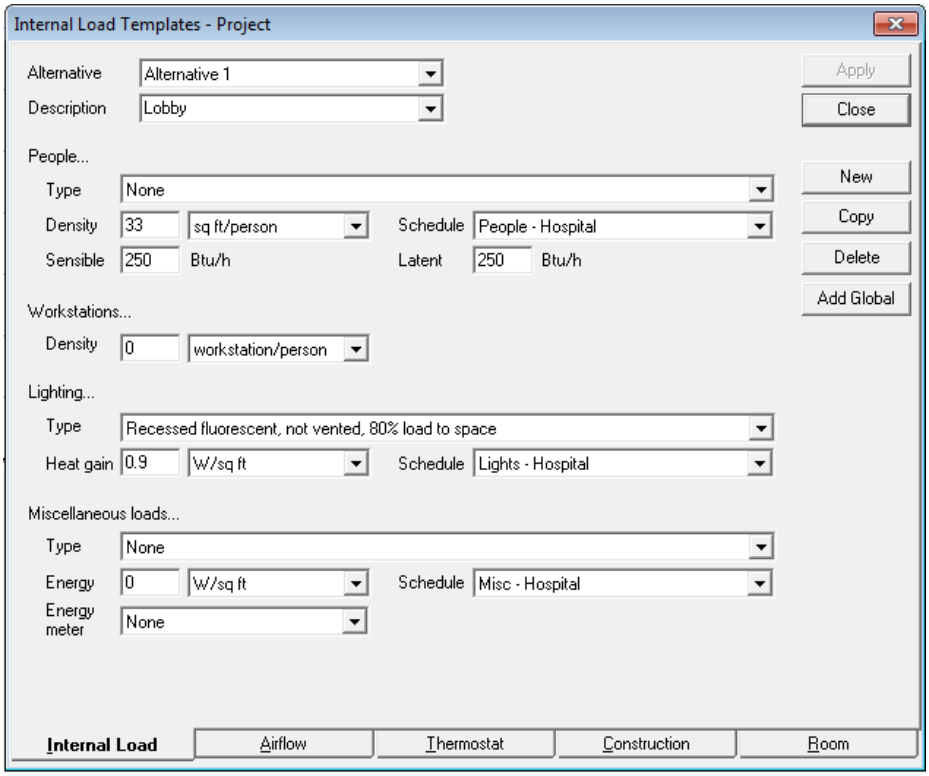


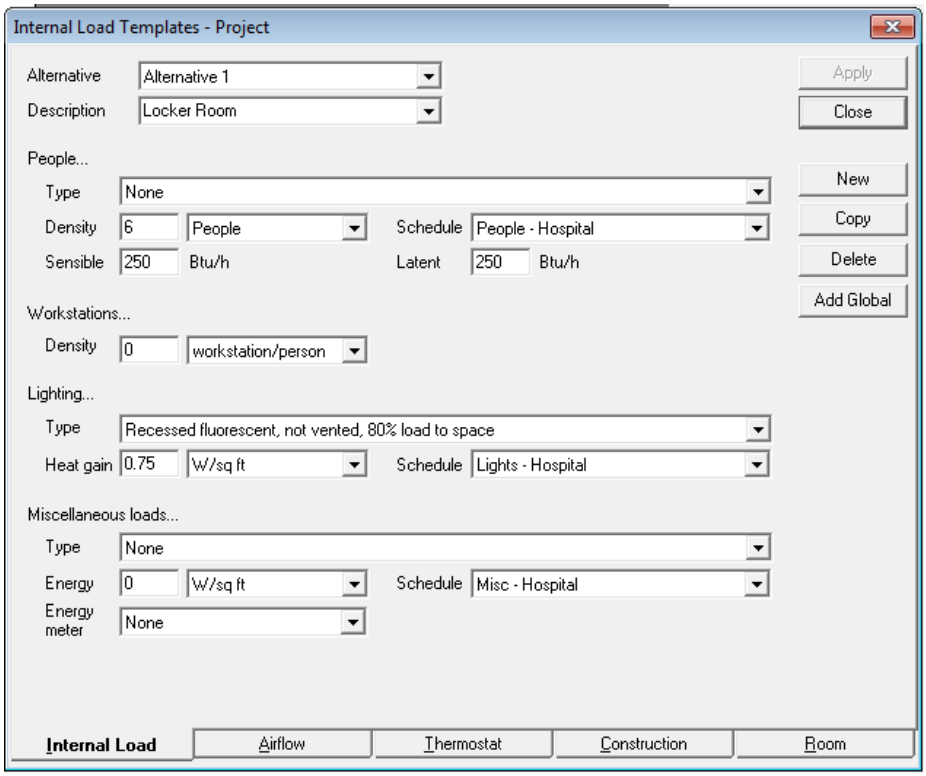

Internal Load Templates - Project
Alternative
Alternative 1
Description
Corridor
Apply
Close
People...
Type
None
Density
0
People
Schedule
People - Hospital
Sensible
250
Btu/h
Latent
250
Btu/h
New
Copy
Delete
Add Global
Workstations...
Density
0
workstation/person
Lighting...
Type
Recessed fluorescent, not vented, 80% load to space
Heat gain
0.89
W/sq ft
Schedule
Lights - Hospital
Miscellaneous loads...
Type
None
Energy
0
W/sq ft
Schedule
Misc - Hospital
Energy meter
None
Internal Load
Airflow
Thermostat
Construction
Room

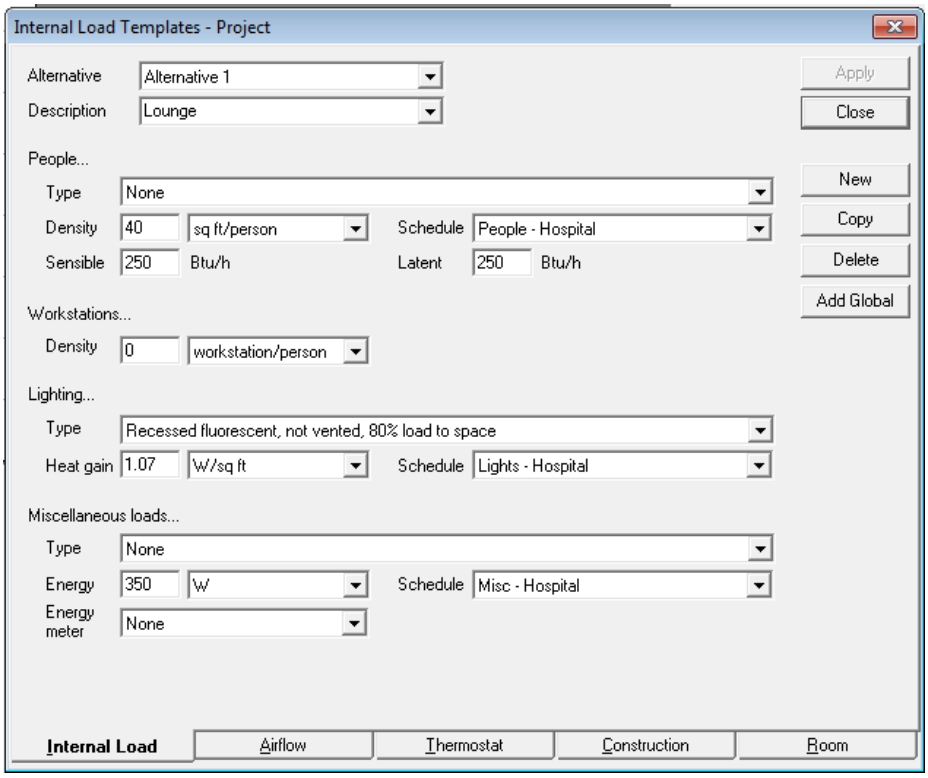

Internal Load Templates - Project
Alternative
Alternative 1
Description
Exam Room
Apply
Close
People...
Type
None
Density
2
People
Schedule
People - Hospital
Sensible
250
Btu/h
Latent
250
Btu/h
New
Copy
Delete
Add Global
Workstations...
Density
0
workstation/person
Lighting...
Type
Recessed fluorescent, not vented, 80% load to space
Heat gain
1.66
W/sq ft
Schedule
Lights - Hospital
Miscellaneous loads...
Type
None
Energy
150
W
Schedule
Misc - Hospital
Energy meter
None
Internal Load
Airflow
Thermostat
Construction
Room

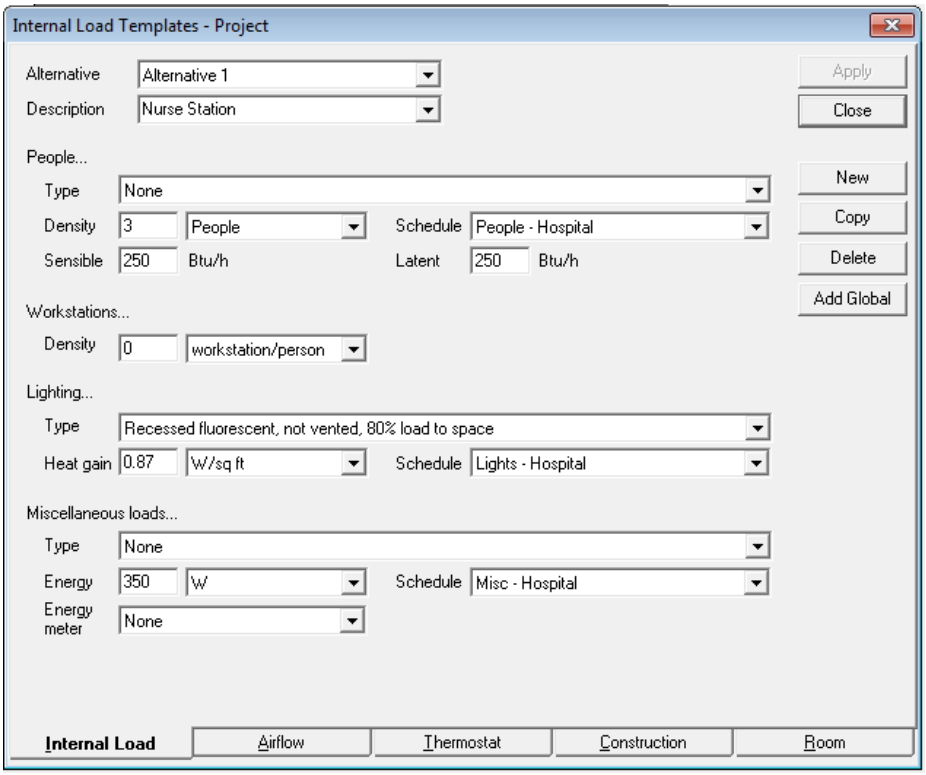

Internal Load Templates - Project
Alternative
Alternative 1
Description
Gym
Apply
Close
People...
Type
None
Density
33
sq ft/person
Schedule
People - Hospital
Sensible
250
Btu/h
Latent
250
Btu/h
New
Copy
Delete
Add Global
Workstations...
Density
0
workstation/person
Lighting...
Type
Recessed fluorescent, not vented, 80% load to space
Heat gain
0.72
W/sq ft
Schedule
Lights - Hospital
Miscellaneous loads...
Type
None
Energy
0
W/sq ft
Schedule
Misc - Hospital
Energy meter
None
Internal Load
Airflow
Thermostat
Construction
Room

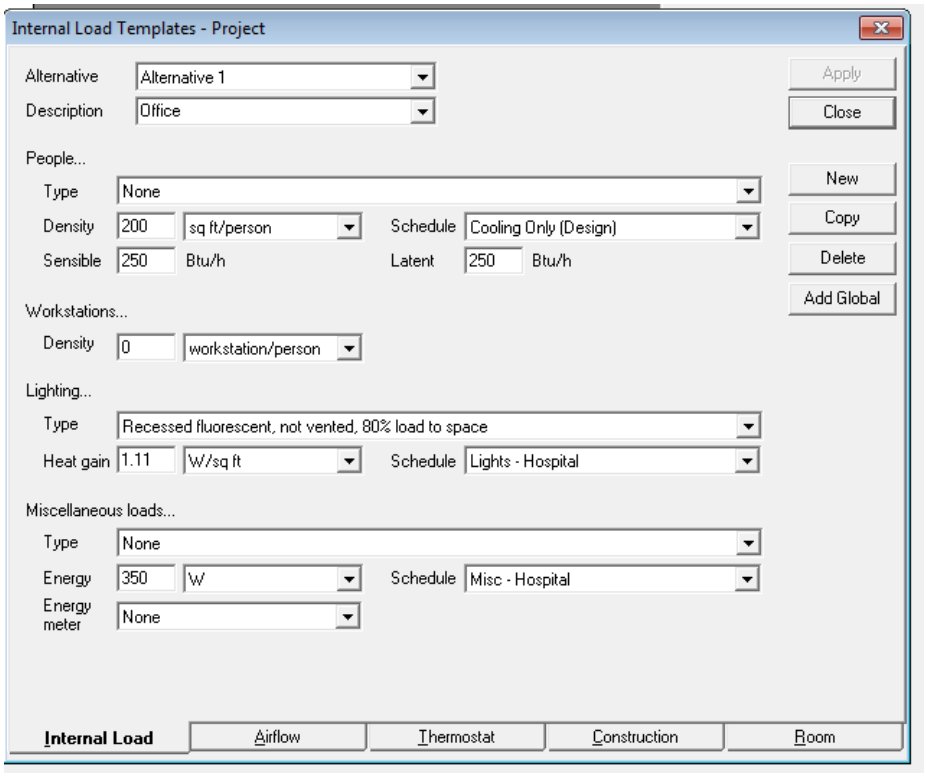

Internal Load Templates - Project
Alternative
Alternative 1
Description
Kitchen
Apply
Close
People...
Type
None
Density
50
sq ft/person
Schedule
People - Hospital
Sensible
250
Btu/h
Latent
250
Btu/h
New
Copy
Delete
Add Global
Workstations...
Density
0
workstation/person
Lighting...
Type
Recessed fluorescent, not vented, 80% load to space
Heat gain
0.99
W/sq ft
Schedule
Lights - Hospital
Miscellaneous loads...
Type
None
Energy
5
W/sq ft
Schedule
Misc - Hospital
Energy meter
None

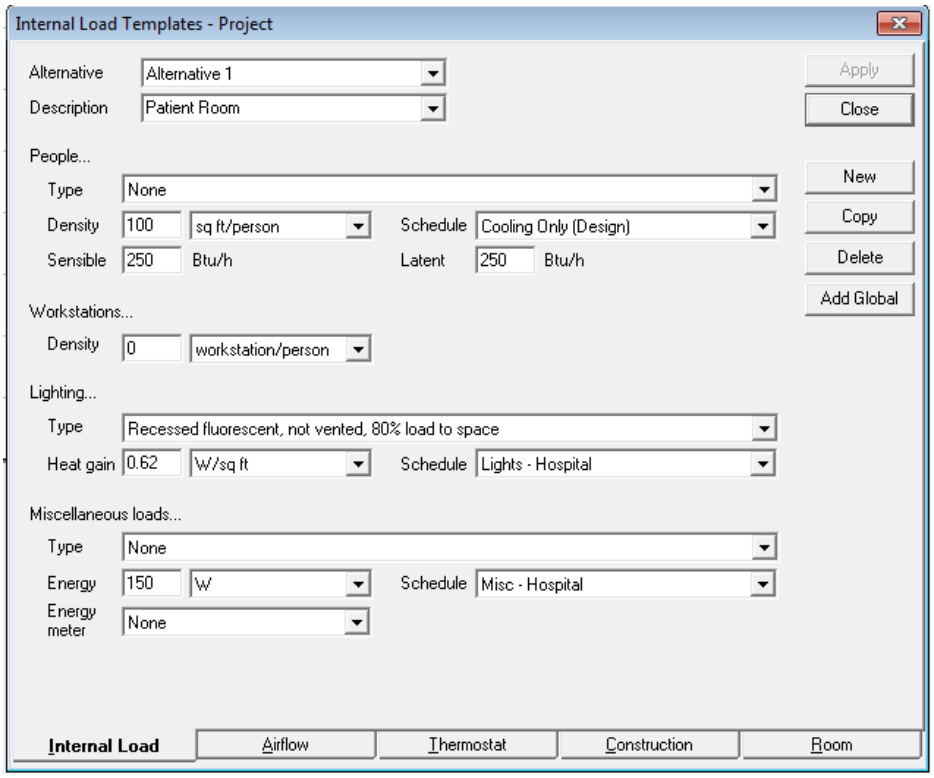

Internal Load Templates - Project
Alternative
Alternative 1
Description
Lobby
Apply
Close
People...
Type
None
Density
33
sq ft/person
Schedule
People - Hospital
Sensible
250
Btu/h
Latent
250
Btu/h
New
Copy
Delete
Add Global
Workstations...
Density
0
workstation/person
Lighting...
Type
Recessed fluorescent, not vented, 80% load to space
Heat gain
0.9
W/sq ft
Schedule
Lights - Hospital
Miscellaneous loads...
Type
None
Energy
0
W/sq ft
Schedule
Misc - Hospital
Energy meter
None
Internal Load
Airflow
Thermostat
Construction
Room

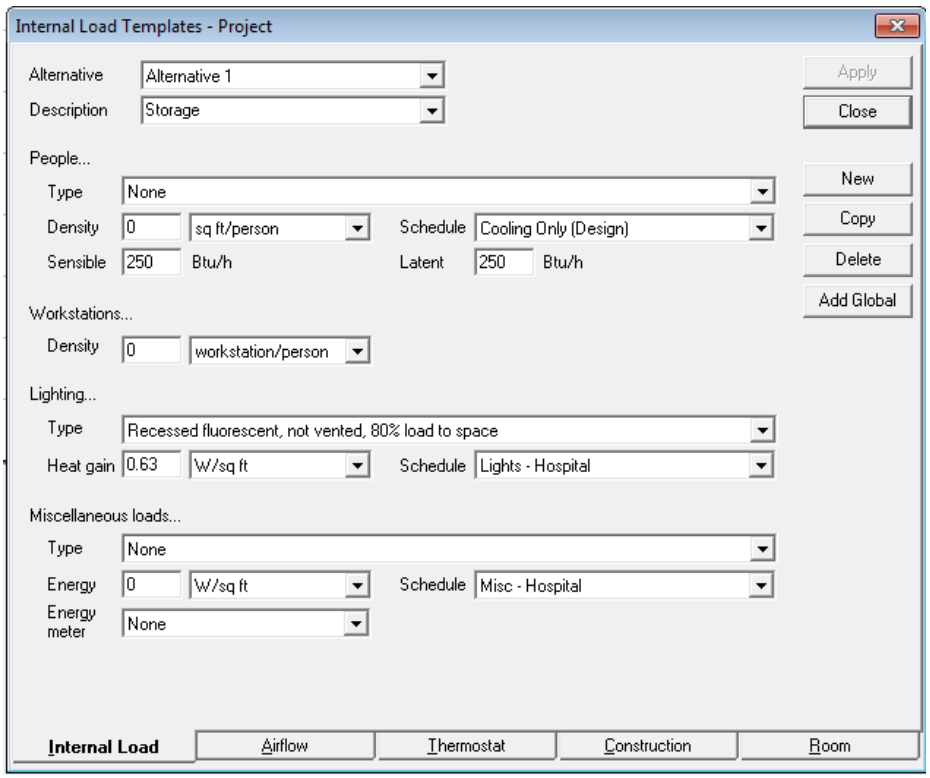

Internal Load Templates - Project
Alternative
Alternative 1
Description
Locker Room
Apply
Close
People...
Type
None
Density
6
People
Schedule
People - Hospital
Sensible
250
Btu/h
Latent
250
Btu/h
New
Copy
Delete
Add Global
Workstations...
Density
0
workstation/person
Lighting...
Type
Recessed fluorescent, not vented, 80% load to space
Heat gain
0.75
W/sq ft
Schedule
Lights - Hospital
Miscellaneous loads...
Type
None
Energy
0
W/sq ft
Schedule
Misc - Hospital
Energy meter
None
Internal Load
Airflow
Thermostat
Construction
Room

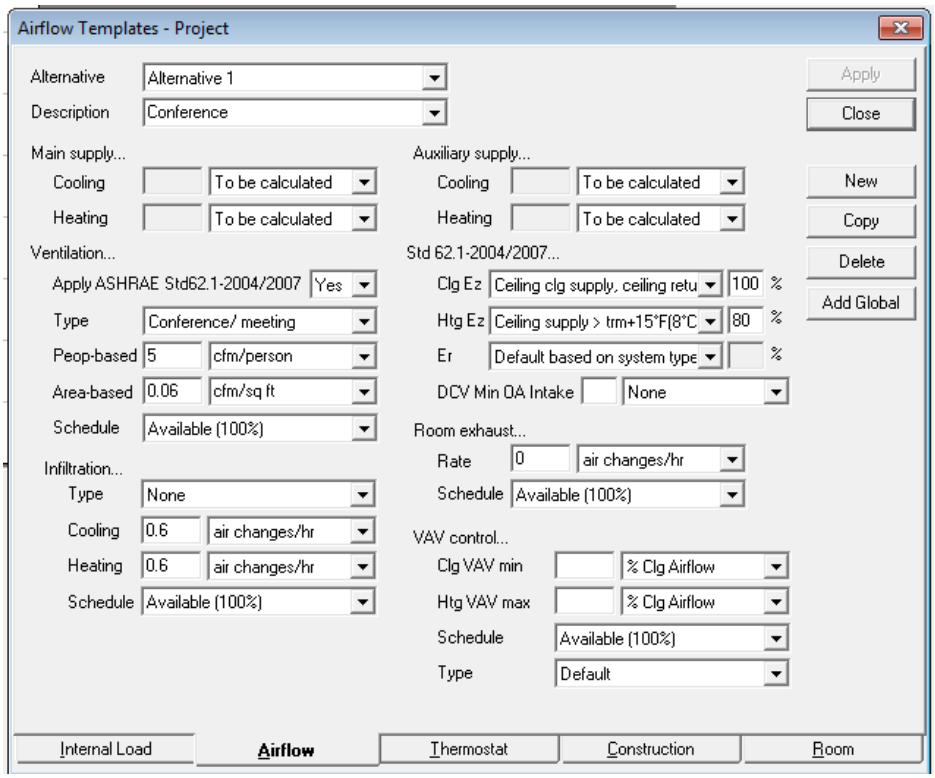

Internal Load Templates - Project
Alternative
Alternative 1
Description
Lounge
Apply
Close
People...
Type
None
Density
40
sq ft/person
Schedule
People - Hospital
Sensible
250
Btu/h
Latent
250
Btu/h
New
Copy
Delete
Add Global
Workstations...
Density
0
workstation/person
Lighting...
Type
Recessed fluorescent, not vented, 80% load to space
Heat gain
1.07
W/sq ft
Schedule
Lights - Hospital
Miscellaneous loads...
Type
None
Energy
350
W
Schedule
Misc - Hospital
Energy meter
None
Internal Load
Airflow
Thermostat
Construction
Room

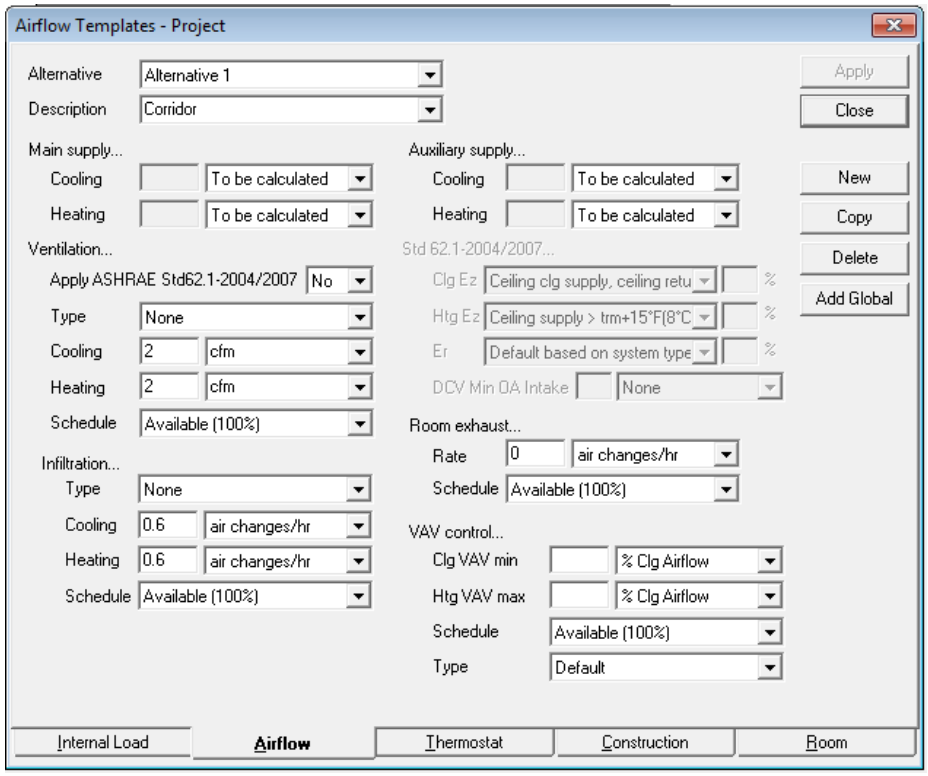

Internal Load Templates - Project
Alternative
Alternative 1
Description
Nurse Station
Apply
Close
People...
Type
None
Density
3
People
Schedule
People - Hospital
Sensible
250
Btu/h
Latent
250
Btu/h
New
Copy
Delete
Add Global
Workstations...
Density
0
workstation/person
Lighting...
Type
Recessed fluorescent, not vented, 80% load to space
Heat gain
0.87
W/sq ft
Schedule
Lights - Hospital
Miscellaneous loads...
Type
None
Energy
350
W
Schedule
Misc - Hospital
Energy meter
None
Internal Load
Airflow
Thermostat
Construction
Room

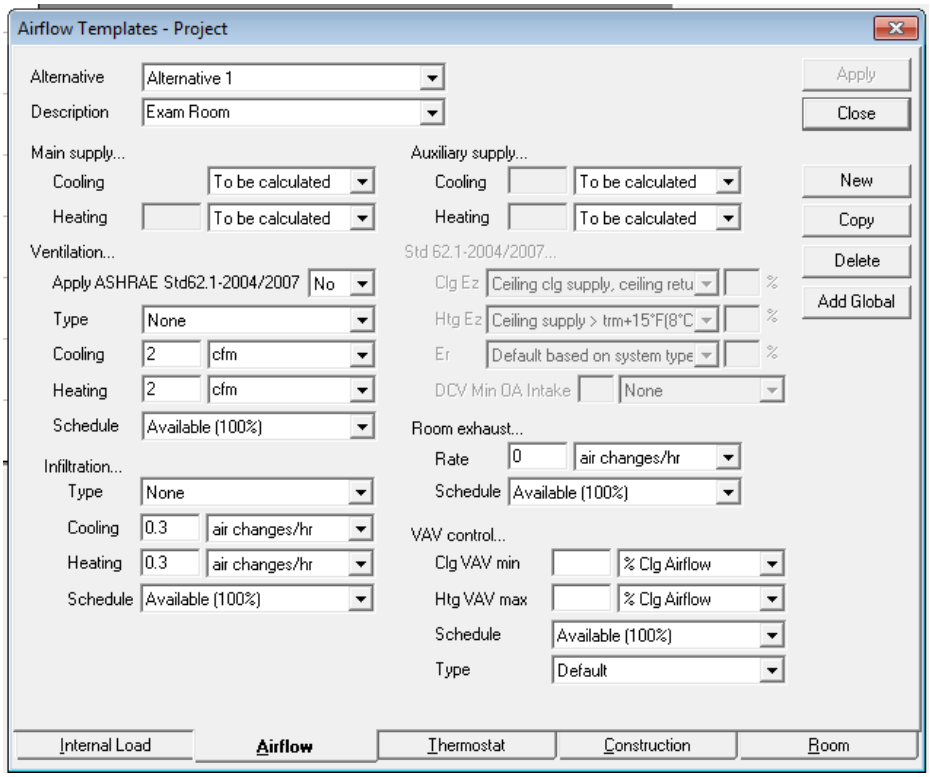

Internal Load Templates - Project
Alternative
Alternative 1
Description
Office
Apply
Close
People...
Type
None
Density
200
sq ft/person
Schedule
Cooling Only (Design)
Sensible
250
Btu/h
Latent
250
Btu/h
New
Copy
Delete
Add Global
Workstations...
Density
0
workstation/person
Lighting...
Type
Recessed fluorescent, not vented, 80% load to space
Heat gain
1.11
W/sq ft
Schedule
Lights - Hospital
Miscellaneous loads...
Type
None
Energy
350
W
Schedule
Misc - Hospital
Energy meter
None
Internal Load
Airflow
Thermostat
Construction
Room

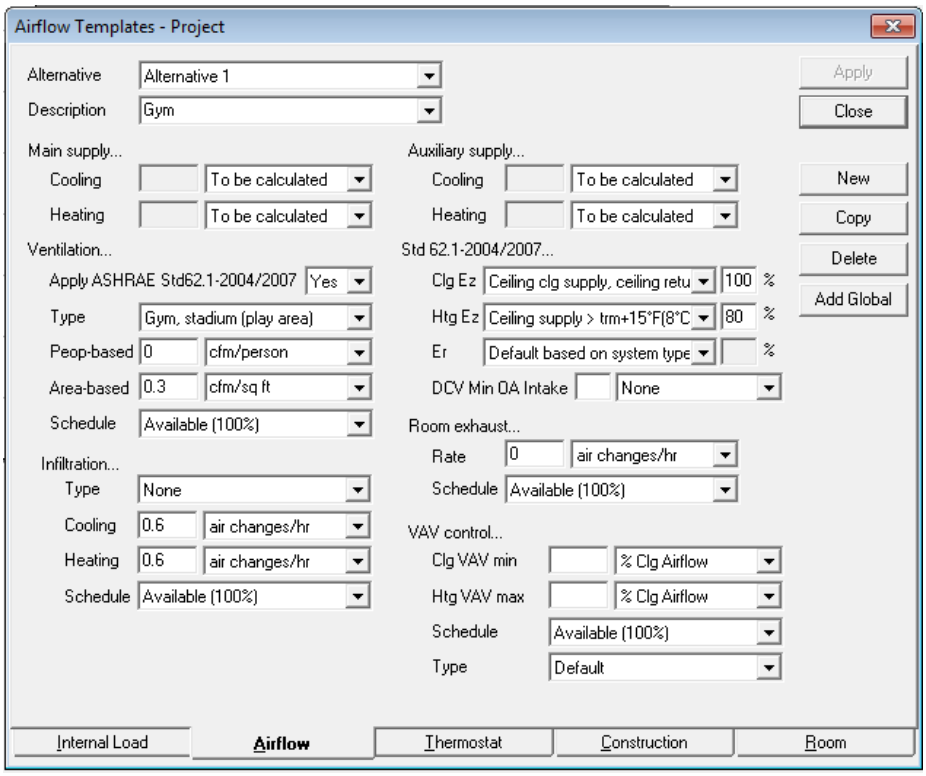

Internal Load Templates - Project
Alternative
Alternative 1
Description
Patient Room
Apply
Close
People...
Type
None
Density
100
sq ft/person
Schedule
Cooling Only (Design)
Sensible
250
Btu/h
Latent
250
Btu/h
New
Copy
Delete
Add Global
Workstations...
Density
0
workstation/person
Lighting...
Type
Recessed fluorescent, not vented, 80% load to space
Heat gain
0.62
W/sq ft
Schedule
Lights - Hospital
Miscellaneous loads...
Type
None
Energy
150
W
Schedule
Misc - Hospital
Energy meter
None
Internal Load
Airflow
Thermostat
Construction
Room

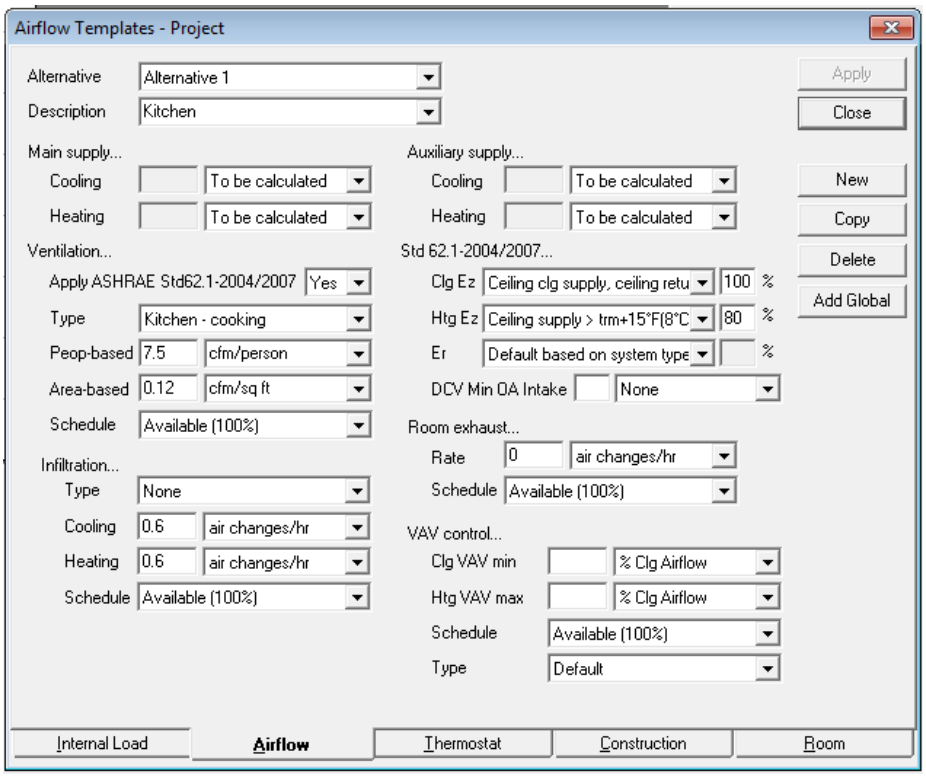

Internal Load Templates - Project
Alternative
Alternative 1
Description
Storage
Apply
Close
People...
Type
None
Density
0
sq ft/person
Schedule
Cooling Only (Design)
Sensible
250
Btu/h
Latent
250
Btu/h
New
Copy
Delete
Add Global
Workstations...
Density
0
workstation/person
Lighting...
Type
Recessed fluorescent, not vented, 80% load to space
Heat gain
0.63
W/sq ft
Schedule
Lights - Hospital
Miscellaneous loads...
Type
None
Energy
0
W/sq ft
Schedule
Misc - Hospital
Energy meter
None
Internal Load
Airflow
Thermostat
Construction
Room

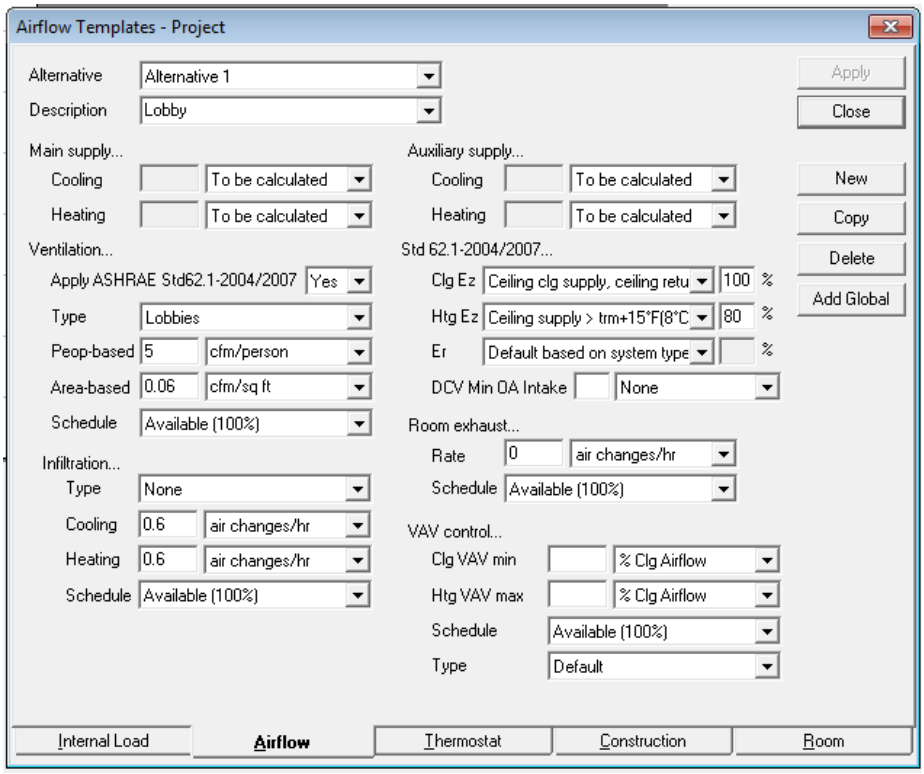

Airflow Templates - Project
Alternative
Alternative 1
Description
Conference
Apply
Close
Main supply...
Cooling
To be calculated
Heating
To be calculated
Auxiliary supply...
Cooling
To be calculated
Heating
To be calculated
Ventilation...
Apply ASHRAE Std62.1-2004/2007
Yes
Type
Conference/ meeting
Peop-based
5
cfm/person
Area-based
0.06
cfm/sq ft
Schedule
Available (100%)
Std 62.1-2004/2007...
Clg Ez
Ceiling clg supply, ceiling retu
100
%
Htg Ez
Ceiling supply > trm+15°F(8°C
80
%
Er
Default based on system type
%
DCV Min OA Intake
None
Room exhaust...
Rate
0
air changes/hr
Schedule
Available (100%)
Infiltration...
Type
None
Cooling
0.6
air changes/hr
Heating
0.6
air changes/hr
Schedule
Available (100%)
VAV control...
Clg VAV min
% Clg Airflow
Htg VAV max
% Clg Airflow
Schedule
Available (100%)
Type
Default
New
Copy
Delete
Add Global
Internal Load
Airflow
Thermostat
Construction
Room

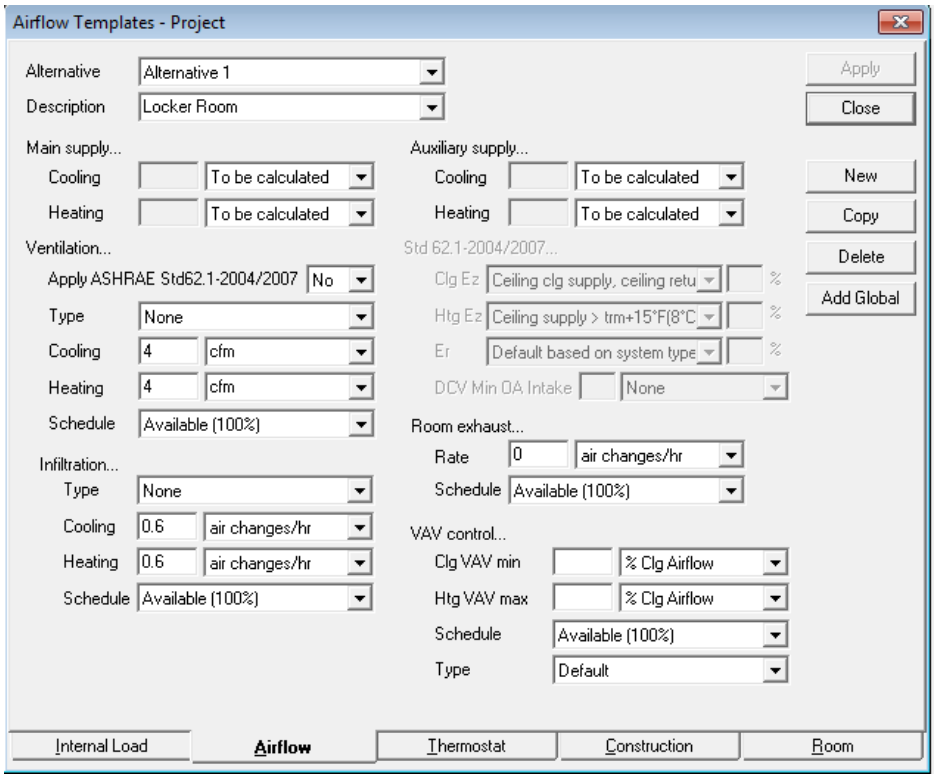

Airflow Templates - Project
Alternative
Alternative 1
Description
Corridor
Apply
Close
Main supply...
Cooling
To be calculated
Heating
To be calculated
Auxiliary supply...
Cooling
To be calculated
Heating
To be calculated
New
Copy
Delete
Add Global
Ventilation...
Apply ASHRAE Std62.1-2004/2007
No
Type
None
Cooling
2
cfm
Heating
2
cfm
Schedule
Available (100%)
Std 62.1-2004/2007...
Clg Ez
Ceiling clg supply, ceiling retu
Htg Ez
Ceiling supply > trm+15°F(8°C
Er
Default based on system type
DCV Min OA Intake
None
Room exhaust...
Rate
0
air changes/hr
Schedule
Available (100%)
Infiltration...
Type
None
Cooling
0.6
air changes/hr
Heating
0.6
air changes/hr
Schedule
Available (100%)
VAV control...
Clg VAV min
% Clg Airflow
Htg VAV max
% Clg Airflow
Schedule
Available (100%)
Type
Default
Internal Load
Airflow
Thermostat
Construction
Room

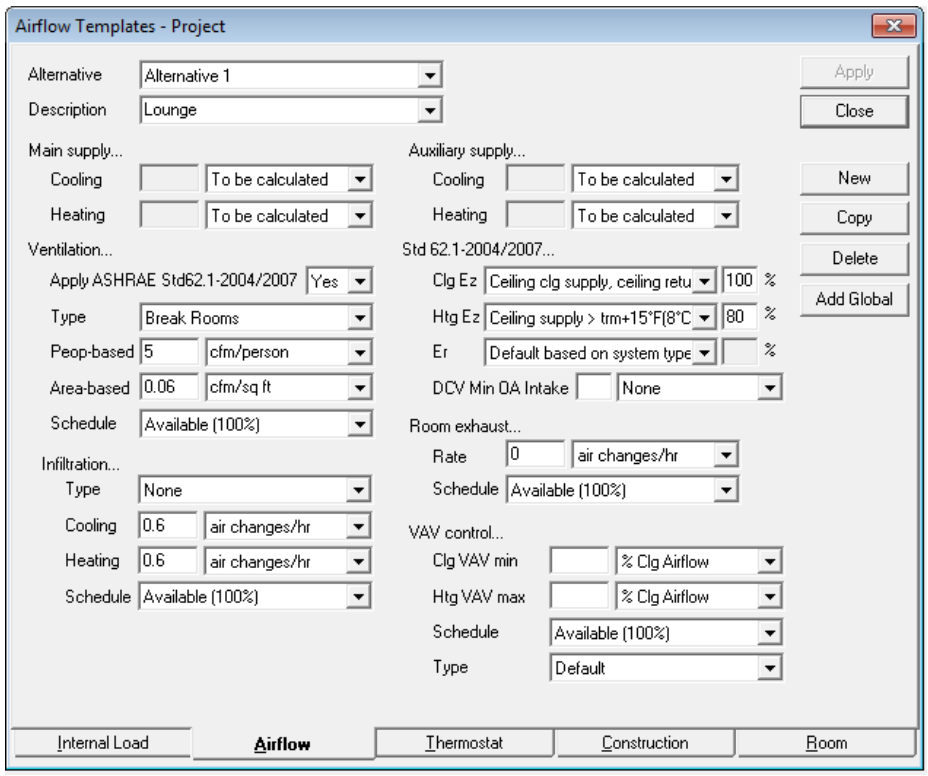

Airflow Templates - Project
Alternative
Alternative 1
Description
Exam Room
Apply
Close
Main supply...
Cooling
To be calculated
Heating
To be calculated
Auxiliary supply...
Cooling
To be calculated
Heating
To be calculated
New
Copy
Delete
Add Global
Ventilation...
Apply ASHRAE Std62.1-2004/2007
No
Type
None
Cooling
2
cfm
Heating
2
cfm
Schedule
Available (100%)
Std 62.1-2004/2007...
Clg Ez
Ceiling clg supply, ceiling retu
Htg Ez
Ceiling supply > trm+15°F(8°C
Er
Default based on system type
DCV Min OA Intake
None
Room exhaust...
Rate
0
air changes/hr
Schedule
Available (100%)
Infiltration...
Type
None
Cooling
0.3
air changes/hr
Heating
0.3
air changes/hr
Schedule
Available (100%)
VAV control...
Clg VAV min
% Clg Airflow
Htg VAV max
% Clg Airflow
Schedule
Available (100%)
Type
Default
Internal Load
Airflow
Thermostat
Construction
Room

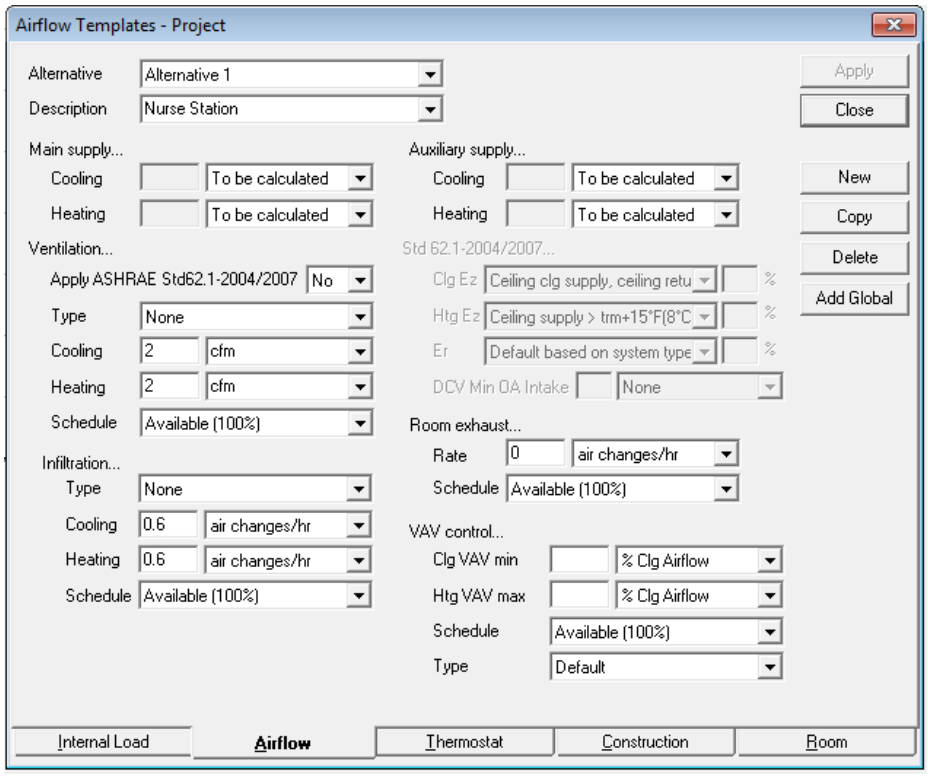

Airflow Templates - Project
Alternative
Alternative 1
Description
Gym
Apply
Close
Main supply...
Cooling
To be calculated
Heating
To be calculated
Auxiliary supply...
Cooling
To be calculated
Heating
To be calculated
New
Copy
Delete
Add Global
Ventilation...
Apply ASHRAE Std62.1-2004/2007
Yes
Type
Gym, stadium (play area)
Peop-based
0
cfm/person
Area-based
0.3
cfm/sq ft
Schedule
Available (100%)
Std 62.1-2004/2007...
Clg Ez
Ceiling clg supply, ceiling retu
100
%
Htg Ez
Ceiling supply > trm+15°F(8°C
80
%
Er
Default based on system type
%
DCV Min OA Intake
None
Room exhaust...
Rate
0
air changes/hr
Schedule
Available (100%)
Infiltration...
Type
None
Cooling
0.6
air changes/hr
Heating
0.6
air changes/hr
Schedule
Available (100%)
VAV control...
Clg VAV min
% Clg Airflow
Htg VAV max
% Clg Airflow
Schedule
Available (100%)
Type
Default
Internal Load
Airflow
Thermostat
Construction
Room

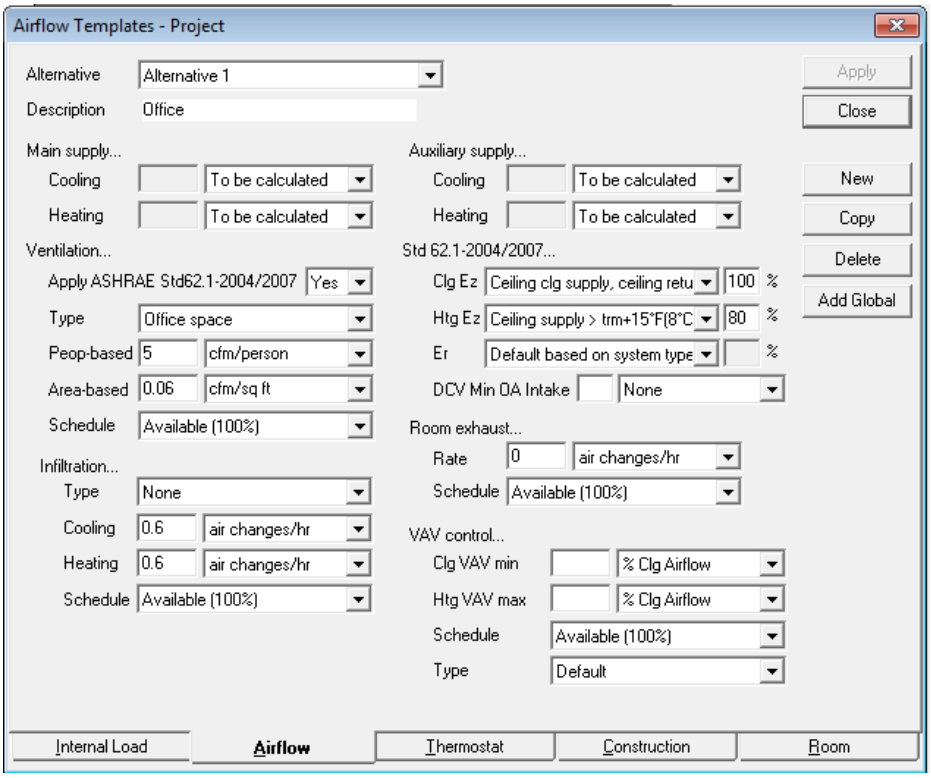

Airflow Templates - Project
Alternative
Alternative 1
Description
Kitchen
Apply
Close
Main supply...
Cooling
To be calculated
Heating
To be calculated
Auxiliary supply...
Cooling
To be calculated
Heating
To be calculated
New
Copy
Delete
Add Global
Ventilation...
Apply ASHRAE Std62.1-2004/2007
Yes
Type
Kitchen - cooking
Peop-based
7.5
cfm/person
Area-based
0.12
cfm/sq ft
Schedule
Available (100%)
Std 62.1-2004/2007...
Clg Ez
Ceiling clg supply, ceiling retu
100
%
Htg Ez
Ceiling supply > trm+15°F(8°C
80
%
Er
Default based on system type
%
DCV Min OA Intake
None
Room exhaust...
Rate
0
air changes/hr
Schedule
Available (100%)
Infiltration...
Type
None
Cooling
0.6
air changes/hr
Heating
0.6
air changes/hr
Schedule
Available (100%)
VAV control...
Clg VAV min
% Clg Airflow
Htg VAV max
% Clg Airflow
Schedule
Available (100%)
Type
Default
Internal Load
Airflow
Thermostat
Construction
Room

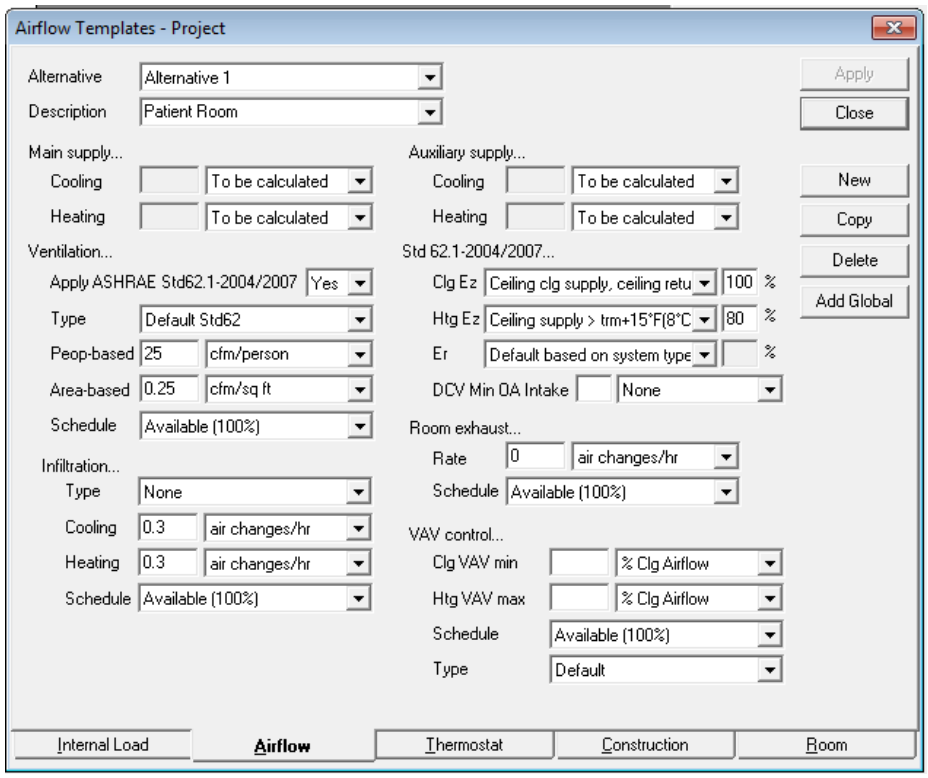

Airflow Templates - Project
Alternative
Alternative 1
Description
Lobby
Apply
Close
Main supply...
Cooling
To be calculated
Heating
To be calculated
Auxiliary supply...
Cooling
To be calculated
Heating
To be calculated
New
Copy
Delete
Add Global
Ventilation...
Apply ASHRAE Std62.1-2004/2007
Yes
Type
Lobbies
Peop-based
5
cfm/person
Area-based
0.06
cfm/sq ft
Schedule
Available (100%)
Std 62.1-2004/2007...
Clg Ez
Ceiling clg supply, ceiling retu
100
%
Htg Ez
Ceiling supply > trm+15°F(8°C
80
%
Er
Default based on system type
%
DCV Min OA Intake
None
Room exhaust...
Rate
0
air changes/hr
Schedule
Available (100%)
Infiltration...
Type
None
Cooling
0.6
air changes/hr
Heating
0.6
air changes/hr
Schedule
Available (100%)
VAV control...
Clg VAV min
% Clg Airflow
Htg VAV max
% Clg Airflow
Schedule
Available (100%)
Type
Default
Internal Load
Airflow
Thermostat
Construction
Room

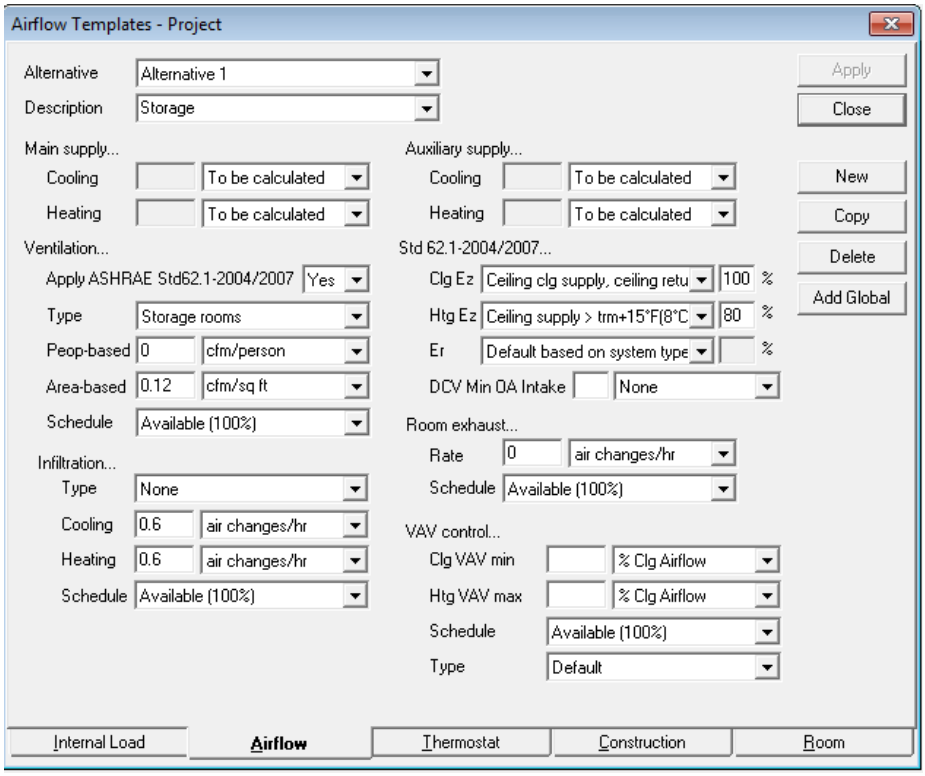

Airflow Templates - Project
Alternative
Alternative 1
Description
Locker Room
Apply
Close
Main supply...
Cooling
To be calculated
Heating
To be calculated
Auxiliary supply...
Cooling
To be calculated
Heating
To be calculated
New
Copy
Delete
Add Global
Ventilation...
Apply ASHRAE Std62.1-2004/2007
No
Type
None
Cooling
4
cfm
Heating
4
cfm
Schedule
Available (100%)
Std 62.1-2004/2007...
Clg Ez
Ceiling clg supply, ceiling retu
%
Htg Ez
Ceiling supply > trm+15°F(8°C
%
Er
Default based on system type
%
DCV Min OA Intake
None
Room exhaust...
Rate
0
air changes/hr
Schedule
Available (100%)
Infiltration...
Type
None
Cooling
0.6
air changes/hr
Heating
0.6
air changes/hr
Schedule
Available (100%)
VAV control...
Clg VAV min
% Clg Airflow
Htg VAV max
% Clg Airflow
Schedule
Available (100%)
Type
Default
Internal Load
Airflow
Thermostat
Construction
Room


Airflow Templates - Project
Alternative
Alternative 1
Description
Lounge
Apply
Close
Main supply...
Cooling
To be calculated
Heating
To be calculated
Auxiliary supply...
Cooling
To be calculated
Heating
To be calculated
New
Copy
Delete
Add Global
Ventilation...
Apply ASHRAE Std62.1-2004/2007
Yes
Type
Break Rooms
Peop-based
5
cfm/person
Area-based
0.06
cfm/sq ft
Schedule
Available (100%)
Std 62.1-2004/2007...
Clg Ez
Ceiling clg supply, ceiling retu
100
%
Htg Ez
Ceiling supply > trm+15°F(8°C
80
%
Er
Default based on system type
%
DCV Min OA Intake
None
Room exhaust...
Rate
0
air changes/hr
Schedule
Available (100%)
Infiltration...
Type
None
Cooling
0.6
air changes/hr
Heating
0.6
air changes/hr
Schedule
Available (100%)
VAV control...
Clg VAV min
% Clg Airflow
Htg VAV max
% Clg Airflow
Schedule
Available (100%)
Type
Default
Internal Load
Airflow
Thermostat
Construction
Room


Airflow Templates - Project
Alternative
Alternative 1
Description
Nurse Station
Apply
Close
Main supply...
Cooling
To be calculated
Heating
To be calculated
Auxiliary supply...
Cooling
To be calculated
Heating
To be calculated
New
Copy
Delete
Add Global
Ventilation...
Apply ASHRAE Std62.1-2004/2007
No
Type
None
Cooling
2
cfm
Heating
2
cfm
Schedule
Available (100%)
Std 62.1-2004/2007...
Clg Ez
Ceiling clg supply, ceiling retu
%
Htg Ez
Ceiling supply > trm+15°F(8°C
%
Er
Default based on system type
%
DCV Min OA Intake
None
Room exhaust...
Rate
0
air changes/hr
Schedule
Available (100%)
Infiltration...
Type
None
Cooling
0.6
air changes/hr
Heating
0.6
air changes/hr
Schedule
Available (100%)
VAV control...
Clg VAV min
% Clg Airflow
Htg VAV max
% Clg Airflow
Schedule
Available (100%)
Type
Default
Internal Load
Airflow
Thermostat
Construction
Room


Airflow Templates - Project
Alternative
Alternative 1
Description
Office
Apply
Close
Main supply...
Cooling
To be calculated
Heating
To be calculated
Auxiliary supply...
Cooling
To be calculated
Heating
To be calculated
New
Copy
Delete
Add Global
Ventilation...
Apply ASHRAE Std62.1-2004/2007
Yes
Type
Office space
Peop-based
5
cfm/person
Area-based
0.06
cfm/sq ft
Schedule
Available (100%)
Std 62.1-2004/2007...
Clg Ez
Ceiling clg supply, ceiling retu
100
%
Htg Ez
Ceiling supply > trm+15°F(8°C
80
%
Er
Default based on system type
%
DCV Min OA Intake
None
Room exhaust...
Rate
0
air changes/hr
Schedule
Available (100%)
Infiltration...
Type
None
Cooling
0.6
air changes/hr
Heating
0.6
air changes/hr
Schedule
Available (100%)
VAV control...
Clg VAV min
% Clg Airflow
Htg VAV max
% Clg Airflow
Schedule
Available (100%)
Type
Default
Internal Load
Airflow
Thermostat
Construction
Room


Airflow Templates - Project
Alternative
Alternative 1
Description
Patient Room
Apply
Close
Main supply...
Cooling
To be calculated
Heating
To be calculated
Auxiliary supply...
Cooling
To be calculated
Heating
To be calculated
New
Copy
Delete
Add Global
Ventilation...
Apply ASHRAE Std62.1-2004/2007
Yes
Type
Default Std62
Peop-based
25
cfm/person
Area-based
0.25
cfm/sq ft
Schedule
Available (100%)
Std 62.1-2004/2007...
Clg Ez
Ceiling clg supply, ceiling retu
100
%
Htg Ez
Ceiling supply > trm+15°F(8°C
80
%
Er
Default based on system type
%
DCV Min OA Intake
None
Room exhaust...
Rate
0
air changes/hr
Schedule
Available (100%)
Infiltration...
Type
None
Cooling
0.3
air changes/hr
Heating
0.3
air changes/hr
Schedule
Available (100%)
VAV control...
Clg VAV min
% Clg Airflow
Htg VAV max
% Clg Airflow
Schedule
Available (100%)
Type
Default
Internal Load
Airflow
Thermostat
Construction
Room


Airflow Templates - Project
Alternative
Alternative 1
Description
Storage
Apply
Close
Main supply...
Cooling
To be calculated
Heating
To be calculated
Auxiliary supply...
Cooling
To be calculated
Heating
To be calculated
New
Copy
Delete
Add Global
Ventilation...
Apply ASHRAE Std62.1-2004/2007
Yes
Type
Storage rooms
Peop-based
0
cfm/person
Area-based
0.12
cfm/sq ft
Schedule
Available (100%)
Std 62.1-2004/2007...
Clg Ez
Ceiling clg supply, ceiling retu
100
%
Htg Ez
Ceiling supply > trm+15°F(8°C
80
%
Er
Default based on system type
%
DCV Min OA Intake
None
Room exhaust...
Rate
0
air changes/hr
Schedule
Available (100%)
Infiltration...
Type
None
Cooling
0.6
air changes/hr
Heating
0.6
air changes/hr
Schedule
Available (100%)
VAV control...
Clg VAV min
% Clg Airflow
Htg VAV max
% Clg Airflow
Schedule
Available (100%)
Type
Default
Internal Load
Airflow
Thermostat
Construction
Room

Appendix C

Figure 13. Emission Factor from the Regional Grid Emission Factors 2007.pdf

Table B-10 (page 2) Total Emission Factors for Delivered Electricity by State (lb of pollutant per kWh of electricity)

Pollutant (lb)	MT	NC	ND	NE	NH	NJ	NM	NV	NY	OH	OK	OR	PA
CO_{2e}	1.99E+00	1.47E+00	2.68E+00	1.81E+00	8.60E-01	9.31E-01	2.43E+00	1.88E+00	1.03E+00	2.20E+00	2.08E+00	4.85E-01	1.55E+00
CO_2	1.87E+00	1.41E+00	2.61E+00	1.71E+00	8.05E-01	8.61E-01	2.29E+00	1.76E+00	9.61E-01	2.10E+00	1.93E+00	4.40E-01	1.48E+00
CH_4	4.17E-03	2.37E-03	2.41E-03	3.70E-03	2.19E-03	2.79E-03	5.38E-03	4.81E-03	2.59E-03	3.71E-03	5.67E-03	1.83E-03	2.70E-03
N_2O	5.29E-05	3.11E-05	5.92E-05	4.94E-05	1.53E-05	1.76E-05	6.50E-05	3.75E-05	1.68E-05	4.73E-05	5.09E-05	1.04E-05	3.22E-05
NO_X	3.33E-03	2.83E-03	3.71E-03	3.09E-03	1.44E-03	1.32E-03	4.00E-03	2.89E-03	1.72E-03	4.14E-03	3.02E-03	5.21E-04	2.91E-03
SO_X	5.88E-03	8.26E-03	1.00E-02	4.79E-03	5.47E-03	6.34E-03	7.30E-03	1.21E-02	6.23E-03	1.19E-02	8.88E-03	3.03E-03	8.88E-03
CO	7.40E-04	4.31E-04	1.07E-03	6.09E-04	1.13E-03	6.69E-04	8.66E-04	7.39E-04	1.75E-03	6.38E-04	8.67E-04	2.72E-04	6.01E-04
TNMOC	6.02E-05	5.25E-05	5.34E-05	5.23E-05	8.62E-05	6.92E-05	7.27E-05	6.23E-05	6.38E-05	5.41E-05	8.01E-05	3.90E-05	5.46E-05
Lead	1.99E-07	1.16E-07	4.23E-07	1.87E-07	4.57E-08	4.27E-08	2.37E-07	1.09E-07	5.59E-08	1.76E-07	1.61E-07	2.05E-08	1.17E-07
Mercury	4.08E-08	2.40E-08	7.52E-08	3.73E-08	2.60E-08	1.44E-08	4.75E-08	2.27E-08	3.99E-08	3.59E-08	3.27E-08	4.59E-09	2.70E-08
PM10	1.14E-04	6.55E-05	3.03E-04	1.01E-04	5.47E-05	5.14E-05	1.36E-04	8.97E-05	6.87E-05	9.87E-05	1.16E-04	2.87E-05	7.14E-05
Solid Waste	3.01E-01	1.78E-01	3.33E-01	2.88E-01	5.65E-02	6.23E-02	3.65E-01	1.68E-01	6.18E-02	2.71E-01	2.49E-01	3.25E-02	1.78E-01

Pollutant (lb)	RI	SC	SD	TN	TX	UT	VA	VT	WA	WI	WV	WY	
CO_{2e}	1.18E+00	1.00E+00	1.45E+00	1.46E+00	1.99E+00	2.62E+00	1.40E+00	1.88E-02	4.11E-01	2.03E+00	2.41E+00	2.67E+00	
CO_2	1.04E+00	9.57E-01	1.36E+00	1.40E+00	1.85E+00	2.51E+00	1.33E+00	1.78E-02	3.82E-01	1.92E+00	2.31E+00	2.52E+00	
CH_4	5.65E-03	1.72E-03	3.02E-03	2.43E-03	5.80E-03	4.21E-03	2.52E-03	2.25E-05	1.13E-03	4.13E-03	3.85E-03	5.42E-03	
N_2O	2.04E-05	2.12E-05	3.91E-05	3.28E-05	4.37E-05	5.53E-05	2.81E-05	1.70E-06	1.05E-05	5.32E-05	5.08E-05	7.30E-05	
NO_X	7.91E-04	1.90E-03	2.45E-03	2.77E-03	2.42E-03	5.00E-03	2.67E-03	1.38E-04	6.13E-04	3.51E-03	4.62E-03	4.58E-03	
SO_X	9.90E-03	5.73E-03	3.97E-03	7.32E-03	1.05E-02	1.47E-02	8.04E-03	1.13E-04	1.70E-03	6.60E-03	1.35E-02	7.05E-03	
CO	8.52E-04	3.22E-04	5.26E-04	4.14E-04	9.77E-04	6.89E-04	9.74E-04	5.90E-05	1.80E-04	7.13E-04	6.50E-04	9.00E-04	
TNMOC	9.92E-05	4.89E-05	4.12E-05	4.17E-05	8.22E-05	5.78E-05	8.77E-05	1.02E-04	3.74E-05	8.26E-05	5.26E-05	7.43E-05	
Lead	6.87E-09	7.66E-08	1.47E-07	1.24E-07	1.49E-07	2.08E-07	1.02E-07	6.33E-10	3.21E-08	1.97E-07	1.92E-07	2.77E-07	
Mercury	4.09E-09	1.62E-08	3.01E-08	2.50E-08	2.96E-08	4.15E-08	3.24E-08	1.03E-09	6.62E-09	4.01E-08	3.87E-08	5.54E-08	
PM10	7.02E-05	4.61E-05	8.12E-05	6.75E-05	1.37E-04	1.14E-04	7.25E-05	7.67E-06	2.46E-05	1.11E-04	1.05E-04	1.49E-04	
Solid Waste	1.31E-02	1.17E-01	2.26E-01	1.91E-01	1.82E-01	3.20E-01	1.47E-01	2.83E-04	4.96E-02	3.03E-01	2.95E-01	4.26E-01	

Figure 14. Monthly Energy Consumption from TRACE

MONTHLY ENERGY CONSUMPTION

By ACADEMIC

------ Monthly Energy Consumption ------

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative: 1	**NORTHFIELD MENTAL HEALTHCARE CENTER**												
Electric													
On-Pk Cons. (kWh)	145,946	118,497	183,838	274,878	380,684	416,332	443,841	428,115	387,504	293,325	226,847	163,203	3,463,011
On-Pk Demand (kW)	401	374	484	734	748	775	782	772	767	746	732	426	782
Gas													
On-Pk Cons. (therms)	8,141	7,790	7,341	2,334	3,069	2,140	4,078	2,747	3,004	2,649	5,447	6,751	55,492
Off-Pk Cons. (therms)	30,731	27,587	24,566	18,796	12,064	7,482	9,428	8,238	10,903	17,949	21,238	28,880	217,861
Mid-Pk Cons. (therms)	14,839	13,615	13,847	9,081	5,079	5,590	5,501	4,337	4,214	8,914	10,108	12,719	107,845
On-Pk Demand (therms/hr)	68	71	60	35	42	40	40	40	39	48	45	57	71
Off-Pk Demand (therms/hr)	92	84	75	60	48	46	53	36	45	57	65	77	92
Mid-Pk Demand (therms/hr)	79	78	70	54	48	53	50	53	42	50	57	75	79

Energy Consumption		
Building	244,823	Btu/(ft2-year)
Source	370,562	Btu/(ft2-year)
Floor Area	203,980	ft2

Environmental Impact Analysis	
CO2	374,116,064 lbm/year
SO2	2,596,303 gm/year
NOX	648,770 gm/year