Building and Plant Energy Analysis

Mechanical Technical Report #2

Bronx School for Law, Government, & Justice

Bronx, NY

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1.0 EXECUTIVE SUMMARY

The objective of this assignment was to gain a clear understanding of the energy analysis procedures. There were multiple objectives to complete and analysis. The first analysis was to determine the LEED rating points of the building. It was determined that Bronx School for Law, Government and Justice did not come close to a LEED certified building. The next procedure was to determine whether Bronx School for Law complied with the Standard 90.1 for both building envelope and lighting. The results of this analysis determined that the school does in fact comply with the Standard 90.1.

A lost rentable space break down was completed and was determined to have a 14.8% of lost rentable space. This number is rather high however; an entire floor was added to the building for a mechanical room where typically a school contains gas-fired rooftop units. The first cost for the mechanical system was also obtained. This figure gave a general idea as to the cost of mechanical system versus the entire building.

Finally, load estimations and annual energy costs were performed. In general when comparing the HVAC loads generated from HAP they were significantly lower than the actual design loads. There are several explanations for this discrepancy for instance, in this HAP analysis restrooms, stairs, electrical closets and mechanical spaces were not accounted for. These spaces are not cooled but do have an impact on the overall building load. There are several labs which contain fume hoods and other equipment that need to be exhausted. In order to prevent the building from having "negative" pressure enough supply air has to be provided, which leads to a load on the air handler. Another difference can be the accuracy of computer programs used. HAP is only one of many energy analysis programs in the market and other commercial energy programs are available.

The last analysis was the determination of energy cost based of the load estimations from HAP. As actual load data was not obtained in time a comparison of the accuracy of this report could not be performed.

2.0 LEED GREEN BUILDING ANALYSES

In December 1988, the New York State Legislature established the New York City School Construction Authority (SCA). The SCA was formed to construct all new public schools, K-12, and mange the design, construction and renovation of capital projects in New York City's more than 1,200 public school buildings. The SCA having the sole responsibility of managing and constructing of new every school lead to the creation of the SCA's Design Standards for all engineered systems in the building. The SCA design standard does not design to the specifications of the LEED Green Building Certification Rating System.

The LEED rating system gives points for different aspects of environmentally friendly buildings. There are a total of 6 major categories, (i.e. Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and resources, Indoor Environmental Quality and LEED innovation) with a total of 69 possible points. There are different levels of certifications (i.e. LEED certified, Silver, Gold and Platinum) with the minimum of 26 points to be considered LEED Certified.

An analysis was done on the Bronx School for Law for LEED rating and was only able to be credited with 3 points and only complied with three prerequisites. As stated earlier the SCA does not consider LEED ratings in their design standards. A detailed analysis of obtained credits and perquisites can be seen on Table 2.1. Note: the Bronx School for Law was completed in 2003 and since has been occupied. In was unknown what was done during construction such as recycling of materials and therefore, it was assumed that it was not and thus LEED points were not awarded. However, even if the school obtained credit for recyclables the building would still not be awarded LEED certification.

TABLE 2.1

LEED
LEADERSHIP IN ENERGY & ENVIRONMENTAL DESIGN

Bronx School for Law, Government & Justice
Bronx, NY

Credit Description		Notes/Required Actions
SS Credit 1	**Site Selection** Avoid development of inappropriate sites. No farmland, parkland, land w/in 100 feet of wetlands, or whose elevation is lower than 5 feet above the 100-year flood.	The Bronx School for Law is located in a local retail zone within a residence zoning district. So the school complies with no farmland or parkland and is not near any wetlands.
SSCredit 4.1	**Alternative Transportation**, Public Transportation Access Locate building within ½ mile of a commuter rail, light rail or subway station or ¼ mile from 2 or more bus lines.	*The Bronx School for Law is located within a retail district which contains multiple subway and bus stops.*
SS Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms Provide means for securing bicycles, with convenient changing/shower facilities for 5% of building occupants.	*There is no onsite parking at the school however, the school provides multiple bike rakes onsite to accommodate the occupants of the building.*
EA Prereq 2	**Minimum Energy Performance** Meet ASHRAE 90.1	*The Bronx School complies with both the Building Envelope and Lighting requirements of Standard 90.1.*
EA Prereq 3	**CFC Reduction in HVAC&R Equipment** No CFC-based refrigerants	*All air handling units are new gas fired units with no CFCs*
IEQ Prereq 1	**Minimum IAQ Performance** Meet ASHRAE 62	*The Bronx School for Law was designed to SCA design standards and New York City Energy codes which comply with ASHRAE 62*
Project Totals (pre-certification estimates)		

Certified 26-32 points **Silver** 33-38 points **Gold** 39-51 points **Platinum** 52-69 points

3.0 Building Envelope and Lighting Compliance w/ Standard 90.1

An analysis was performed on the Bronx School for Law, Government and Justice for building envelope and lighting compliance with Standard 90.1. The purpose of this standard is to provide minimum requirements for the energy-efficient design of the building. The first analysis, building envelope, involved obtaining the U-values for wall and roof sections. Also the U-value and shading coefficient, SGHC, were obtained. This information can be obtained by entering wall and window constructions into energy analysis programs such as Carrier's HAP however; in this case, The U-values were obtained directly from the Architect's construction documents. The building envelope analysis also required that the climate zone be known. It was determined that New York City fell into zone 4A therefore, figures from Table 5.5-4 from Standard 90.1 were used for analysis of building envelope. Table 3.1 is a summary of this analysis and it can be seen that the Bronx School for Law complies with the Standard 90.1. Note: all windows are operable windows and a 28% glass was also obtained from Architect's construction documents.

TABLE 3.1

	REQUIRED		ACTUAL		Compliance
	Assembly	Insulation Min.	Assembly	Insulation Min.	
Roof	U-0.063	R-15.0	U-0.05	R-11	YES
Wall, Above Grade	U-0.124	R-13	U-0.08	R-11	YES
Vertical Glazing, 20.1-30% of Wall	U-fixed - 0.57 U-Oper. - 0.67	SHGC(all) - 0.39 SHGC(NRTH) - 0.49	U-fixed - 0.60 U-Oper. - 0.62	SHGC(all) - 0.34 N/A	YES

Another element that ASHRAE 90.1 considers is the lighting, W/ft^2, of a building. This is because a large lighting load will cause the HVAC loads to increase. In ASHRAE 90 there are two (2) applicable ways to analysis the lighting, Building Area Method and Space-by-Space Method. In this analysis the Space-by-Space analysis was performed. A summary of the results can be seen on Table 3.2. From this analysis the Bronx School for Law complies with the lighting requirements of Standard 90.1. Note: not every space was accounted for in this analysis and similar spaces such as classrooms and labs were only accounted once.

TABLE 3.2

Typical Spaces	Area	# of Fixtures	Watts/Fixture	Watts/ft^2	ASHRAE 90	Compliance
Gymnasium	8944	36	250	1.01	1.4	YES
Student Dining	3729	42	62	0.70	0.9	YES
Classroom	810	12	64	0.95	1.4	YES
Corridor	2648	24	32	0.29	0.5	YES
Science Demo	850	16	66	1.24	1.4	YES
Tri-facial Lab	1250	24	64	1.23	1.4	YES
Computer	1150	24	64	1.34	1.4	YES
Library	3073	32	64	0.67	1.2	YES
Art Studio	1350	24	64	1.14	1.4	YES
Crime lab	1375	26	64	1.21	1.4	YES
Courtroom	1300	8	100	1.40	1.9	YES
		8	64			
		6	64			

4.0 Lost Rentable Space

The SCA, based on their design standards, typically have gas-fired rooftop units with the majority of the horizontal ductwork on the highest floor. Then to supply, return and exhaust air to and from the lower floors vertical mechanical shafts are placed throughout the building. The basic strategy is to have a larger ceiling space for the highest floor and reduce the ceiling height on the remaining lower levels.

In Bronx School for Law the gymnasium is a double heighten space occupying the fifth and sixth floors. Since horizontal and vertical ductwork can not run through the ceiling above the gymnasium a mechanical penthouse was constructed above the sixth floor. This mechanical penthouse contains the majority of the air-handling units in the school. Adding an entire floor for mechanical equipment had a huge impact on lost rentable space. Another factor was in the cellar where it houses another mechanical, boiler and fuel oil rooms. The other contributing factor for lost rentable space is the vertical shafts. Because the air handling units are located on the top level of the building large vertical shafts are needed for supply, return and exhaust. It was estimated with two main shafts at 120 ft^2 each and 60 ft^2 for toilet and misc. exhaust per floor. The overall estimated shaft space was 1800 ft^2. In table 4.1 a summary of mechanical and shaft space has been provided.

TABLE 4.1

MECHANICAL ROOMS		
Rm. No.	Room Name	Area (ft^2)
C11	Mechanical	2938
C12	Mechanical	624
C13	Mechanical	1178
601	Mechanical	2625
602	Mechanical	2625
P-1	Mechanical	2550
P-2	Mechanical	2550
	Total	**15090**
Estimated Mech. Shaft, ft^2		**1800**
	Total	**16890**

The building is approximately 114,000 ft^2 which leaves “Lost Rentable” = (16890/114000)*100 = 14.8% Lost

5.0 HVAC First Cost

A detailed first cost analysis was obtained from the Architect's cost estimate reports and attached as Appendix A. The total building cost was approximately 65 million and from the report the HVAC cost was almost 6 million which is roughly 9.2% of the overall building cost. The cost per ft^2 was approximately 52.63 per ft^2.

The SCA design standard requires certain spaces to be served by separate air handlers such as the cafeteria, kitchen, library, orchestra and gymnasium. This design standard increases the first cost of the mechanical system significantly because simply more equipment equals higher first cost.

6.0 Energy Utilization

Bronx School for Law, Government & Justice has been occupied since the later part of 2003. A utility report is currently being compiled and was not ready by the submission of this report. However, when this report is obtained this section will be updated.

7.0 Design Load Estimation

HEATING/COOLING DESIGN PARAMETERS

A. Heating

1. Outdoor air requirements for ventilation: A minimum of 15 cfm per occupant (number of occupants based on NYC Building code, Table 6-2).

2. Inside ambient design temperature:72°F DB.

3. Outside ambient design temperature: 5°F DB (based on wind at 15 mph).

B. Cooling

1. Outdoor air requirements for ventilation: A minimum of 15 cfm per occupant (number of occupants based on Board of Education Program Space Requirements).

2. Inside ambient design temperature:78°F DB, 50% RH.

3. Outside ambient design temperature: 89°F DB, 73°F WB.

C. Thermal Properties of Building

1.	Overall transmission coefficient for walls:	U_W =	0.08
2.	Overall transmission coefficient for roof:	U_R =	0.05
3.	Overall transmission coefficient for windows:	U_W =	0.63
4.	Overall transmission coefficient for walls below grade walls and floors:	U_B =	0.08

Utilizing the initial design parameters an estimation of the design cooling load using Carrier's Hourly Analysis Program, v. 4.20, (HAP) was performed. Estimated lighting and electrical watts were obtained from original design documents. Also original design occupancy was also used. Each individual zone analyzed was taken directly off construction documents. The actual HAP analysis can be viewed in appendix B. A general summary has been provided in table 7.1.

TABLE 7.1

Air Handling Units (AHU)	Area ft^2	Total Load MBH		Supply CFM		Supply CFM/ft^2		Ventilation CFM		Ventilation CFM/ft^2	
		HAP	Designed	HAP	Designed	HAP	Designed	HAP	Designed	HAP	Designed
AHU 1 [Classrooms]	26059	1462.9	2440	33694	48000	1.29	1.84	12600	26000	0.48	1.00
AHU 2 [Classrooms]	12897	615.6	903.5	13882	19000	1.08	1.47	4890	9000	0.38	0.70
AHU 3 [Gymnasium]	8944	978.6	848.3	18256	18500	2.04	2.07	7500	7500	0.84	0.84
AHU 4 [Library]	3073	111.3	152.1	2137	3400	0.70	1.11	1110	1020	0.36	0.33
AHU 5 [Lobby & Corridor]	11520	222.1	728.1	5105	12000	0.44	1.04	1335	6900	0.12	0.60
AHU 6 [Kitchen]	3486	109.1	287.5	3805	5200/2600	1.09	1.49/.75	150	5200/2600	0.04	1.49/.75
AHU 7 [Administration]	6690	212.2	471.6	5508	12000	0.82	1.79	1020	3800	0.15	0.57
AHU 8 [Dining]	3739	198.4	323.3	3825	6000	1.02	1.60	3825	3360	1.02	0.90
AHU 9 [Plant Operations]	6223	115.8	284.9	2597	7200	0.42	1.16	840	2200	0.13	0.35
AHU-10 [Orchestra]	1711	95.3	134.1	2308	3100	1.35	1.81	990	1050	0.58	0.61

8.0 Annual Energy Consumption and Operating Costs

After the design load estimations were completed HAP will also calculate the energy costs based off the estimated loads. Actual fuel costs for New York City were obtained from the NYSERDA (New York State Energy Research and Power Authority). An extrapolated electricity rate of 18.4 cents/kWh was obtained using current electricity rates for 2005 and rates from 2004. Also the fuel charge for natural gas was obtained the same way at 1.05 per Therm. Entering this information into HAP a energy cost analysis was able to be formed. In Appendix B contains the actual reports from HAP. Table 8.1 displays the annual cost to operate the chiller, the fans, the lighting system, and misc. equipment. Table 8.2 displays annual cooling cost per square foot.

Table 8.1 Annual Costs

Component	**Bronx School for Law($)**
Air System Fans	143,655
Cooling	6,147
Heating	9,340
Pumps	0
Cooling Tower Fans	0
HVAC Sub-Total	**159,142**
Lights	280,872
Electric Equipment	291,499
Misc. Electric	0
Misc. Fuel Use	0
Non-HVAC Sub-Total	**572,371**
Grand Total	**731,513**

Table 8.2 Annual Cost per Unit Floor Area

Component	**Bronx School for Law ($/ft²)**	
HVAC Components		
Electric	1.853	
Natural Gas	0.034	
HVAC Sub-Total		**1.887**
Non-HVAC Components		
Electric	6.786	
Non-HVAC Sub-Total	**6.786**	
Grand Total	**8.673**	

Gross Floor Area (ft²) 84342.0
Conditioned Floor Area (ft²) 84342.0

An energy analysis was not performed by the engineer. The SCA had approved the design and therefore, the engineer did not feel it was necessary to complete an energy analysis.

From the Energy consumption data obtained from HAP an emissions study was also performed to determine the approximate amount of pollutants produced from the building. The utility company serving the Bronx School for Law receives its power from multiple sources therefore, does not have a consistency of mixture of electricity. So data from Electric Power Annual 1999, Vol.II, October 2000, DOE/EIA-0348(99)/2 was used to give a rough estimate as to the amount of pollutants produced. This data can be seen in table 8.3.

TABLE 8.3

Estimating Emissions Associated with On-Site Electricity Use
U.S. Power Generation Mix

			Short Tons				lbm Pollutant$_i$ /kWh			
Fuel	**kWh(1999)**	**% Total**	**SO_2**	**NO_x**	**CO_2**		**Particulates**	**SO_2/kWh**	**NO_x/kWh**	**CO_2/kWh**
Coal	2.21E+06	55.8	1.13E+07	6.55E+06	1.90E+09		N/A	1.02E+04	5.91E+03	1.72E+06
Oil	1.07E+05	2.7	6.70E+05	1.23E+05	9.18E+07		N/A	1.25E+04	2.29E+03	1.71E+06
Nat. Gas	3.70E+05	9.3	2.00E+03	3.76E+05	1.99E+08		N/A	1.08E+01	2.03E+03	1.07E+06
Nuclear	9.06E+05	22.8	0.00E+00	0.00E+00	0.00E+00		N/A	0.00E+00	0.00E+00	0.00E+00
Hydro/Wind	3.74E+05	9.4	0.00E+00	0.00E+00	0.00E+00		N/A	0.00E+00	0.00E+00	0.00E+00
Totals	3.97E+06	100.0	1.20E+07	7.05E+06	2.19E+09		N/A	6.03E+03	3.55E+03	1.10E+06

9.0 References

ASHRAE Standard 90.1-2004

Board of Education Program Space Requirements

Hillier Architecture, schematic reports

http://www.nyserda.org/Energy_Information/energy_prices_supplies.asp

http://www.nyserda.org/Energy_Information/electricity.asp

http://www.nyserda.org/Energy_Information/nyepp.asp

NYC Building code, Table 6-2

New York City School Construction Authority Design Guide

DESCRIPTION OF WORK	UNIT		MATERIAL		LABOR		TOTAL
	QNTY	UNIT MEAS	UNIT COST	TOTAL	UNIT COST	TOTAL	COST
HVAC							
CHILLERS - AIR COOLED, ACC- 1 & 2							
200 T.R., CHILLED WATER, REFRIG. 134A	2	EA	75,000.00	150,000	4,150.00	8,300	158,300
REFRIGERANT LEAK DETECTION SYSTEM	1	SYS	10,500.00	10,500	3,500.00	3,500	14,000
DX PIPING W/ INSULATION - LIQ & GAS	800	LF	18.50	14,800	12.50	10,000	24,800
PUMPS - W/ LOCAL PIPING/VALVING							
CHWP - 1, 2 & 3: CHILLED WATER, 410 GPM, 15.0 HP	3	EA	3,750.00	11,250	1,750.00	5,250	16,500
FOP - 1 & 2: FUEL (GEN), OPEN GPM, 1/3 HP	2	EA	2,150.00	4,300	1,750.00	3,500	7,800
FOP- 3 & 4: FUEL (BOILERS), OPEM GPM, 1/4 HP	2	EA	2,150.00	4,300	775.00	1,550	5,850
AIR HANDLING UNITS: W/ COILS, FILTERS, MOTOR & DRIVE							
AHU-1: 48,000 CFM, 75.0 HP	1	EA	105,000.00	105,000	12,500.00	12,500	117,500
AHU-2: 19,000 CFM, 30.0 HP	1	EA	47,500.00	47,500	5,200.00	5,200	52,700
AHU-3: 17,500 CFM, 20.0 HP	1	EA	46,500.00	46,500	7,500.00	7,500	54,000
AHU-4: 3,200 CFM, 7 1/2 HP	1	EA	12,000.00	12,000	3,100.00	3,100	15,100
AHU-5: 14,500 CFM, 20.0 HP	1	EA	37,500.00	37,500	7,500.00	7,500	45,000
AHU-6: 5,200 CFM, 10.0 HP	1	EA	17,500.00	17,500	4,100.00	4,100	21,600
AHU-7: 12,000 CFM, 25.0 HP	1	EA	36,000.00	36,000	6,100.00	6,100	42,100
AHU-8: 6,000 CFM, 10.0 HP	1	EA	17,500.00	17,500	4,000.00	4,000	21,500
AHU-9: 7,200 CFM, 15.0 HP	1	EA	20,000.00	20,000	5,100.00	5,100	25,100
AHU-10: 3,100 CFM, 7 1/2 HP	1	EA	12,000.00	12,000	3,500.00	3,500	15,500
FANS							
RF-1: 38,400 CFM, 15.0 HP, INLINE	1	EA	12,750.00	12,750	3,250.00	3,250	16,000
RF-2: 15,200 CFM, 7 1/2 HP, INLINE	1	EA	7,100.00	7,100	1,750.00	1,750	8,850
RF-3: 14,000 CFM, 7 1/2 HP, INLINE	1	EA	7,100.00	7,100	1,750.00	1,750	8,850
RF-4: 2,560 CFM, 1 1/2 HP, INLINE	1	EA	1,950.00	1,950	1,040.00	1,040	2,990
RF-5: 14,500 CFM, 5.0 HP, INLINE	1	EA	7,100.00	7,100	1,750.00	1,750	8,850
RF-7: 9,600 CFM, 7 1/2 HP, INLINE	1	EA	5,100.00	5,100	1,500.00	1,500	6,600
RF-8: 4,800 CFM, 5.0 HP, INLINE	1	EA	4,400.00	4,400	1,500.00	1,500	5,900
RF-9: 5,750 CFM, 2.0 HP, INLINE	1	EA	2,750.00	2,750	1,500.00	1,500	4,250
RF-10: 2,480 CFM, 2.0 HP	1	EA	1,750.00	1,750	750.00	750	2,500
HEF-1: 2,200 CFM, 2.0 HP, FUME HOOD	1	EA	4,100.00	4,100	1,080.00	1,080	5,180
HEF-2: 2,100 CFM, 2.0 HP, FUME HOOD	1	EA	4,100.00	4,100	1,080.00	1,080	5,180
HEF-3: 3,200 CFM, 2.0 HP, FUME HOOD	1	EA	4,700.00	4,700	1,080.00	1,080	5,780
HEF-4: 1,950 CFM, 2.0 HP, FUME HOOD	1	EA	4,100.00	4,100	1,080.00	1,080	5,180
KEF-5: 2,500 CFM, 1.0 HP, KILN	1	EA	5,100.00	5,100	1,080.00	1,080	6,180
SEF-1: 23,000 CFM, 1.0 HP, SMOKE	1	EA	8,100.00	8,100	1,750.00	1,750	9,850
VARIABLE FREQUENCY DRIVES	6	EA	3,150.00	18,900	320.00	1,920	20,820

DESCRIPTION OF WORK	UNIT		MATERIAL		LABOR		TOTAL
	QNTY	UNIT MEAS	UNIT COST	TOTAL	UNIT COST	TOTAL	COST
HVAC							
FANS - CONTINUED							
EF-1: 850 CFM, 1.0 HP	1	EA	900.00	900	475.00	475	1,375
EF-2: 5,800 CFM, 1.0 HP	1	EA	1,775.00	1,775	710.00	710	2,485
EF-3: 5,800 CFM, 1.0 HP	1	EA	1,775.00	1,775	710.00	710	2,485
EF-4: 200 CFM, 1.0 HP	1	EA	475.00	475	385.00	385	860
EF-5: 150 CFM, 1/2 HP, XP	1	EA	1,050.00	1,050	510.00	510	1,560
EF-6: 2,000 CFM, ELEVATOR SMOKE	1	EA	1,250.00	1,250	475.00	475	1,725
SF-1: 9,950 CFM, 1 1/2 HP, INLINE	1	EA	390.00	390	1,250.00	1,250	1,640
EF-7: 9,950 CFM, 1 1/2 HP, INLINE	1	EA	3,950.00	3,950	1,250.00	1,250	5,200
EF-8: MEDICAL SUITE	1	EA	1,200.00	1,200	375.00	375	1,575
EF-9: HEALTH EXAM	1	EA	750.00	750	375.00	375	1,125
EF-10: ACID STORAGE	1	EA	1,150.00	1,150	375.00	375	1,525
LX-1: 4,400 CFM, LOCKER EXHAUST	1	EA	1,475.00	1,475	375.00	375	1,850
KX-1: 3,900 CFM, OPEN HP	1	EA	1,475.00	1,475	525.00	525	2,000
GX-2: 1,900 CFM, OPEN HP	1	EA	1,200.00	1,200	525.00	525	1,725
TX-1: 2,000 CFM, 1 1/2 HP	1	EA	1,200.00	1,200	475.00	475	1,675
TX-2: 3,400 CFM, 1 1/2 HP	1	EA	3,950.00	3,950	475.00	475	4,425
TELECOMMUNICATION CLOSET AC UNIT, AC-1	4	EA	3,975.00	15,900	1,475.00	5,900	21,800
TRANSFER FANS: TF-1 TO 5: 380 CFM, 1/4 HP	5	EA	750.00	3,750	375.00	1,875	5,625
SOUND TRAP							
ST-1 AT AHU-1: 48,000 CFM	1	EA	3,100.00	3,100	1,250.00	1,250	4,350
ST-2 AT AHU-2: 19,000 CFM	1	EA	2,000.00	2,000	1,050.00	1,050	3,050
ST-3 AT AHU-3: 17,500 CFM	1	EA	1,775.00	1,775	1,090.00	1,090	2,865
ST-4 AT AHU-4: 3,200 CFM	1	EA	725.00	725	525.00	525	1,250
ST-5 AT AHU-5: 14,500 CFM	1	EA	1,600.00	1,600	1,090.00	1,090	2,690
ST-6 AT AHU-6: 5,200 CFM	1	EA	975.00	975	445.00	445	1,420
ST-7 AT AHU-7: 12,000 CFM	1	EA	1,750.00	1,750	1,100.00	1,100	2,850
ST-8 AT AHU-8: 6,000 CFM	1	EA	1,125.00	1,125	775.00	775	1,900
ST-9 ATAHU-9: 7,200 CFM	1	EA	1,400.00	1,400	590.00	590	1,990
ST-10 AT AHU-10: 3,100 CFM	1	EA	725.00	725	410.00	410	1,135
ST-11 AT RF-1: 38,400 CFM	1	EA	2,750.00	2,750	1,250.00	1,250	4,000
ST-12 AT RF-2: 15,200 CFM	1	EA	1,700.00	1,700	1,090.00	1,090	2,790
ST-13 AT RF-3: 14,000 CFM	1	EA	1,600.00	1,600	1,075.00	1,075	2,675
ST-14 AT RF-4: 2,560 CFM	1	EA	1,050.00	1,050	525.00	525	1,575
ST-15 AT RF-5: 14,500 CFM	1	EA	1,600.00	1,600	1,090.00	1,090	2,690
ST-16 AT RF-7: 9,600 CFM	1	EA	975.00	975	910.00	910	1,885
ST-17 AT RF-8: 4,800 CFM	1	EA	1,020.00	1,020	710.00	710	1,730
ST-18 AT RF-9: 5,760 CFM	1	EA	1,750.00	1,750	805.00	805	2,555
ST-19 AT RF-10: 2,480 CFM	1	EA	1,600.00	1,600	1,075.00	1,075	2,675

DESCRIPTION OF WORK	UNIT		MATERIAL		LABOR		TOTAL
	QNTY	UNIT MEAS	UNIT COST	TOTAL	UNIT COST	TOTAL	COST
HVAC							
AIR DISTRIBUTION							
GALVANIZED IRON DUCTWORK	155,000	LBS	1.50	232,500	5.00	775,000	1,007,500
BLACK IRON DUCTWORK	5,100	LBS	1.75	8,925	5.50	28,050	36,975
STAINLESS STEEL DUCTWORK	7,000	LBS	4.00	28,000	11.00	77,000	105,000
ALUMINUM DUCTWORK	1,000	LBS	3.50	3,500	12.50	12,500	16,000
DOUBLE WALL PLENUMS	175	SF	12.50	2,188	12.50	2,188	4,375
DUCT INSULATION	80,000	SF	1.05	84,000	1.60	128,000	212,000
ACOUSTIC LINING	10,000	SF	1.05	10,500	2.10	21,000	31,500
KITCHEN EXHAUST INSULATION	1,700	SF	3.50	5,950	6.75	11,475	17,425
DIFFUSERS	575	EA	105.00	60,375	40.00	23,000	83,375
GRILLES / REGISTERS	360	EA	85.00	30,600	35.00	12,600	43,200
VOLUME DAMPERS	620	EA	75.00	46,500	40.00	24,800	71,300
FIRE DAMPERS	300	SF	37.50	11,250	37.50	11,250	22,500
FIRE SMOKE DAMPERS	560	SF	65.00	36,400	44.50	24,920	61,320
MOTOR OPERATED DAMPERS	600	SF	36.00	21,600	36.00	21,600	43,200
WIRE MESH SCREENED OPENING	50	SF	17.50	875	8.75	438	1,313
ACCESS DOORS	100	EA	47.50	4,750	47.50	4,750	9,500
VARIABLE AIR VOLUME TERMINAL	70	EA	600.00	42,000	275.00	19,250	61,250
CONSTANT VOLUME TERMINAL W/ REHEAT COIL	10	EA	830.00	8,300	350.00	3,500	11,800
REHEAT COIL - DUCT MOUNTED	10	EA	600.00	6,000	275.00	2,750	8,750
BOILER ROOM WORK							
BREECHING & CHIMNEY LINER							
16" DIA. BREECHING- PRE-FAB	40	LF	60.00	2,400	75.00	3,000	5,400
12" DIA. BREECHING- PRE-FAB	80	LF	45.00	3,600	50.00	4,000	7,600
STAINLESS STEEL CHIMNEY, 10 GAUGE W/ GUIDES	100	LF	575.00	57,500	225.00	22,500	80,000
10 GAUGE ST.STL. CAP & COLLAR	1	SET	920.00	920	275.00	275	1,195
8" DIA. H.W. HEATER FLUE, DOUBLE WALL	85	LF	65.00	5,525	20.00	1,700	7,225
ROOF THIMBLE W/ STORM COLLAR	1	EA	1,175.00	1,175	610.00	610	1,785
CLEAN -OUT AT BASE OF STACK	1	EA	215.00	215	275.00	275	490
NEW BOILER- OIL FIRED/GAS PILOT, STEAM AT 2,070 LBS/HR, 10.0 HP FAN MOTOR, 1/3 HP OIL OIL PILOT, W/ FREE STANDING CONTROL PANELS, 60 BHP: B-1,2 & 3:	3	BLR	72,000.00	216,000	17,500.00	52,500	268,500
OIL PUMPS AT BURNERS	3	SETS	1,500.00	4,500	1,500.00	4,500	9,000
SEQUENTIAL DRAFT DAMPER	4	EA	750.00	3,000	190.00	760	3,760
SMOKE DETECTION SYSTEM W/ ALARMS	3	BLR	3,500.00	10,500	1,675.00	5,025	15,525
D.A.R. FILING	3	BLR	0.00	0	450.00	1,350	1,350
START-UP TESTS & ADJUSTMENTS	3	BLR	250.00	750	1,500.00	4,500	5,250
FIELD DEMONSTRATION OF BOILERS	80	MH	0.00	0	75.00	6,000	6,000

DESCRIPTION OF WORK	UNIT		MATERIAL		LABOR		TOTAL
	QNTY	UNIT MEAS	UNIT COST	TOTAL	UNIT COST	TOTAL	COST
HVAC							
DUPLEX AIR COMPRESSOR	1	SET	5,175.00	5,175	1,290.00	1,290	6,465
REFRIGERATED AIR DRYER - 10 CFM, 1/6 HP	2	SETS	2,210.00	4,420	610.00	1,220	5,640
DUPLEX BOILER FEED UNIT W/ RECEIVER AND 2 PUMPS AT 3.0 HP, BF-1	1	SET	51,000.00	51,000	7,500.00	7,500	58,500
DUPLEX VACUUM PUMP SET W/ TANK INCLUDING 2 PUMPS AT 2.0 HP, VP-1	1	SET	11,750.00	11,750	2,375.00	2,375	14,125
CONDENSATE RECIEVER PUMP SET W/ TANK INCLUDING 2 PUMPS AT 1 1/2 HP, CP-1	1	SET	5,700.00	5,700	1,775.00	1,775	7,475
10,000 GAL.F.O. STORAGE TANK PAINTED, W/ TAPING	1	TNK	17,500.00	17,500	3,150.00	3,150	20,650
FUEL OIL GAUGE/ CONDUIT TO WALL	1	EA	1,750.00	1,750	375.00	375	2,125
OVERFILL ALARM/EXTERIOR	1	EA	1,100.00	1,100	1,250.00	1,250	2,350
LEAK DETECTION - FUEL OIL ROOM	1	EA	6,100.00	6,100	1,080.00	1,080	7,180
LADDERS / PLATFORM / SADDLE	1	LS	2,750.00	2,750	3,500.00	3,500	6,250
FUEL OIL CONTAINMENT STRUCTURE	420	SF	7.50	3,150	12.00	5,040	8,190
FUEL OIL PIPING							
FILL BOX W/ SPILL CONTAINER	1	EA	1,250.00	1,250	375.00	375	1,625
VENT CAP	1	EA	65.00	65	80.00	80	145
3" PIPE/FITTINGS/SUPPORTS	150	LF	17.50	2,625	17.50	2,625	5,250
1 1/4" - 1" PIPE/FITTINGS/SUPPORTS	400	LF	9.75	3,900	10.75	4,300	8,200
VALVING & SPECIALTIES AT STORAGE TANK	1	EA	775.00	775	525.00	525	1,300
VALVING & SPECIALTIES AT FUEL OIL PUMP	4	EA	375.00	1,500	375.00	1,500	3,000
VALVING AND SPECIALTIES AT BURNER	3	EA	875.00	2,625	675.00	2,025	4,650
WATERPROOF SLEEVE	7	EA	77.50	543	47.50	333	875
GENERATOR REQUIREMENTS							
260 GAL. DAY TANK W/ CONTAINMENT	1	EA	3,675.00	3,675	1,275.00	1,275	4,950
PIPING TO GENERATOR	1	EA	475.00	475	625.00	625	1,100
LEAK DETECTION - PROBE / PANEL @ DAY TANK	1	EA	3,750.00	3,750	275.00	275	4,025
PIPING - DISTRIBUTION	200	LF	9.50	1,900	10.20	2,040	3,940
VENT CAP	1	EA	65.00	65	80.00	80	145
SOUND ATTENUATOR	1	EA	1,275.00	1,275	475.00	475	1,750
GENERATOR EXHAUSTW/ INSULATION, 6" DIA.	50	LF	45.00	2,250	50.00	2,500	4,750
VALVING & SPECIALTIES	1	LS	1,500.00	1,500	2,500.00	2,500	4,000

DESCRIPTION OF WORK	UNIT		MATERIAL		LABOR		TOTAL
	QNTY	UNIT MEAS	UNIT COST	TOTAL	UNIT COST	TOTAL	COST
HVAC							
BOILER WORK							
STEAM/CONDENSATE/MAKE-UP- PIPING							
SCH. 40 CS. PIPING - WELDED/ TREADED							
8" STEAM HEADER	20	LF	125.00	2,500	150.00	3,000	5,500
8" PIPE/ FITTINGS/ SUPPORTS	500	LF	30.00	15,000	60.00	30,000	45,000
6" / 5" PIPE/ FITTINGS/ SUPPORTS	1,200	LF	29.00	34,800	39.50	47,400	82,200
4" PIPE/ FITTINGS/ SUPPORTS	750	LF	19.50	14,625	21.50	16,125	30,750
3" PIPE/ FITTINGS/ SUPPORTS	900	LF	17.50	15,750	17.50	15,750	31,500
2 1/2" PIPE/ FITTINGS/ SUPPORTS	800	LF	13.25	10,600	13.25	10,600	21,200
2" PIPE/ FITTINGS/ SUPPORTS	700	LF	11.25	7,875	9.50	6,650	14,525
1 1/2" PIPE/ FITTINGS/ SUPPORTS	1,000	LF	9.20	9,200	9.25	9,250	18,450
1 1/4" PIPE/ FITTINGS/ SUPPORTS	1,200	LF	8.20	9,840	8.75	10,500	20,340
1" PIPE/ FITTINGS/ SUPPORTS	900	LF	7.10	6,390	8.25	7,425	13,815
3/4/ 1/2" PIPE/ FITTINGS/ SUPPORTS	900	LF	7.10	6,390	8.25	7,425	13,815
VALVING & SPECIALTIES & HEADER VALVES	1	LS	25,000.00	25,000	20,000.00	20,000	45,000
PIPING CONNECTION TO AHU	10	EA	2,750.00	27,500	3,250.00	32,500	60,000
PIPING CONNECTION TO CHILLER	2	EA	7,750.00	15,500	5,100.00	10,200	25,700
PIPING CONNECTION TO PUMPS	6	EA	2,750.00	16,500	1,750.00	10,500	27,000
PIPING CONNECTION TO BOILERS	3	EA	6,250.00	18,750	4,750.00	14,250	33,000
PIPING CONNECTION TO RADIATION	80	SECT	175.00	14,000	290.00	23,200	37,200
AIR SEPARATOR - FLANGED	1	EA	1,475.00	1,475	720.00	720	2,195
EXPANSION TANK	1	EA	2,100.00	2,100	650.00	650	2,750
M.E.R. - PIPING AT EQUIPMENT	1	LS	25,000.00	25,000	10,000.00	10,000	35,000
PIPE INSULATION							
8" PIPE SIZE	20	LF	21.00	420	23.00	460	880
8"/5" PIPE SIZE	1,700	LF	10.40	17,680	7.90	13,430	31,110
4"/3" PIPE SIZE	1,650	LF	3.60	5,940	5.65	9,323	15,263
2 1/2" / 2"PIPE SIZE	1,500	LF	3.60	5,400	5.25	7,875	13,275
1 1/2"/ 1 1/4" PIPE SIZE	2,200	LF	2.15	4,730	4.15	9,130	13,860
1" / 1/2"PIPE SIZE	1,800	LF	2.15	3,870	4.15	7,470	11,340
FINNED TUBE RADIATION	2,600	LF	52.00	135,200	12.50	32,500	167,700
CABINET UNIT HEATERS	10	EA	1,725.00	17,250	750.00	7,500	24,750
UNIT HEATERS	25	EA	1,300.00	32,500	675.00	16,875	49,375

DESCRIPTION OF WORK	UNIT QNTY	UNIT MEAS	MATERIAL UNIT COST	MATERIAL TOTAL	LABOR UNIT COST	LABOR TOTAL	TOTAL COST
HVAC							
AUTO CONTROLS (UNIT COST)							
AIR HANDLERS	10	EA	8,750.00	87,500			87,500
CHILLER INTERFACE	2	EA	2,500.00	5,000			5,000
BOILER INTERFACE W/ PROCESS CONTROL CENTI	3	EA	2,500.00	7,500			7,500
MONITORING	50	EA	500.00	25,000			25,000
V.A.V.& C.A.V. CONTROL TERMINAL UNITS	80	EA	775.00	62,000			62,000
REHEAT COIL	10	EA	775.00	7,750			7,750
PUMPS - CHILLED	3	EA	3,150.00	9,450			9,450
PUMPS - FUEL SETS - INTERFACE	4	EA	1,750.00	7,000			7,000
UNIT HEATER / CABINET HEATER	35	EA	650.00	22,750			22,750
RADIATION ZONES	80	EA	525.00	42,000			42,000
GAS LEAK DETECTION - METER ROOM	1	SYS	4,150.00	4,150			4,150
SMOKE DETECTION - FSD	90	EA	425.00	38,250			38,250
PACKAGED SPLIT - AC-UNITS	1	EA	3,150.00	3,150			3,150
EXHAUST/SMOKE/GENERAL FANS	10	EA	650.00	6,500			6,500
RETURN AIR FANS W/ ENTHALPY CONTROLS	9	EA	2,750.00	24,750			24,750
GENERATOR INTERFACE	1	LS	9,500.00	9,500			9,500
FUEL OIL TANK CONTROLS - ATC	1	TK	7,750.00	7,750			7,750
L.V. WIRING	1	LS	25,000.00	25,000			25,000
HEAD END EQUIPMENT & CERTIFICATIONS	1	LS	35,000.00	35,000			35,000
BOILER WATER TREATMENT UNIT	1	SET	5,500.00	5,500	1,500.00	1,500	7,000
CHEMICAL TREATMENT - CHILLED	1	SYS	2,750.00	2,750	925.00	925	3,675
TEMPORARY HEAT	1	LS	10,000.00	10,000	25,000.00	25,000	35,000
HOISTING AND SETTING OF EQUIPMENT	1	LS	1,000.00	1,000	24,000.00	24,000	25,000
AIR BALANCE & TESTS OF PIPING SYSTEMS	1	LS	1,250.00	1,250	7,500.00	7,500	8,750
CHOPPING / PATCHING / FIRESTOPPING	1	LS	1,500.00	1,500	6,000.00	6,000	7,500
PIPE IDENTIFICATION - VALVE TAGS, PAINT, ETC.	1	LS	1,250.00	1,250	3,250.00	3,250	4,500
MISCELLANEOUS JOB EXPENSES - PERMITS, FEES, TRUCKING, DISTRIBUTION, HANDLING COORDINATION, SHOP DRAWINGS, ETC.	1	LS	110,000.00	110,000	90,000.00	90,000	200,000
SUBTOTAL							4,930,975
SUBCONTRACTOR'S OVERHEAD & PROFIT- 21%							1,036,025
TOTAL HVAC							**$ 5,967,000**

Air System Sizing Summary for AHU-1 [Classrooms & Misc]

Project Name: Tech 2 — 10/31/2005
Prepared by: psuae — 03:16AM

Air System Information

Air System Name	**AHU-1 [Classrooms & Misc]**	Number of zones	**38**
Equipment Class	**PKG VERT**	Floor Area	**26059.0** ft²
Air System Type	**VAV**	Location	**New York La Guardia, New York**

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	**Peak zone sensible load**	Calculation Months	**Jan to Dec**
Space CFM	**Individual peak space loads**	Sizing Data	**Calculated**

Central Cooling Coil Sizing Data

Total coil load	**121.9**	Tons	Load occurs at	**Jul 1500**	
Total coil load	**1462.9**	MBH	OA DB / WB	**92.0 / 74.0**	°F
Sensible coil load	**1061.7**	MBH	Entering DB / WB	**88.1 / 69.5**	°F
Coil CFM at Jul 1500	**29697**	CFM	Leaving DB / WB	**55.0 / 53.5**	°F
Max block CFM at Jul 1600	**33694**	CFM	Coil ADP	**51.3**	°F
Sum of peak zone CFM	**34481**	CFM	Bypass Factor	**0.100**	
Sensible heat ratio	**0.726**		Resulting RH	**41**	%
ft²/Ton	**213.8**		Design supply temp.	**55.0**	°F
BTU/(hr-ft²)	**56.1**		Zone T-stat Check	**38 of 38**	OK
Water flow @ 10.0 °F rise	**N/A**		Max zone temperature deviation	**0.0**	°F

Preheat Coil Sizing Data

Max coil load	**85.6**	MBH	Load occurs at	**Des Htg**	
Coil CFM at Des Htg	**12600**	CFM	Ent. DB / Lvg DB	**43.7 / 50.0**	°F
Max coil CFM	**33694**	CFM			
Water flow @ 20.0 °F drop	**N/A**				

Supply Fan Sizing Data

Actual max CFM at Jul 1600	**33694**	CFM	Fan motor BHP	**0.00**	BHP
Standard CFM	**33657**	CFM	Fan motor kW	**0.00**	kW
Actual max CFM/ft²	**1.29**	CFM/ft²	Fan static	**0.00**	in wg

Return Fan Sizing Data

Actual max CFM at Jul 1600	**33694**	CFM	Fan motor BHP	**58.31**	BHP
Standard CFM	**33657**	CFM	Fan motor kW	**43.48**	kW
Actual max CFM/ft²	**1.29**	CFM/ft²	Fan static	**5.50**	in wg

Outdoor Ventilation Air Data

Design airflow CFM	**12600**	CFM	CFM/person	**15.00**	CFM/person
CFM/ft²	**0.48**	CFM/ft²			

Ventilation Sizing Summary for AHU-1 [Classrooms & Misc]

Project Name: Tech 2
Prepared by: psuae

10/31/2005
03:22AM

1. Summary

Ventilation Sizing Method ..... **Sum of Space OA Airflows**
Design Ventilation Airflow Rate ..... **12600** CFM

2. Space Ventilation Analysis Table

Zone Name / Space Name	Mult.	Floor Area (ft²)	Maximum Occupants	Maximum Supply Air (CFM)	Required Outdoor Air (CFM/person)	Required Outdoor Air (CFM/ft²)	Required Outdoor Air (CFM)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (CFM)
Zone 1									
118 - Classroom 3	1	820.0	35.0	1353.0	15.00	0.00	0.0	0.0	525.0
Zone 2									
120 - Classroom 2	1	820.0	35.0	1237.2	15.00	0.00	0.0	0.0	525.0
Zone 3									
121 - Classroom2	1	773.0	35.0	1223.5	15.00	0.00	0.0	0.0	525.0
Zone 4									
122 - Classroom 1	1	782.0	35.0	1103.8	15.00	0.00	0.0	0.0	525.0
Zone 5									
201 - Computer Classroom	1	1855.0	35.0	2575.1	15.00	0.00	0.0	0.0	525.0
Zone 6									
202 - Staff Infirmary	1	165.0	2.0	69.7	15.00	0.00	0.0	0.0	30.0
Zone 7									
204 - Guid. College/Voc.	1	213.0	3.0	130.8	15.00	0.00	0.0	0.0	45.0
Zone 8									
204A - Office	1	115.0	1.0	226.4	15.00	0.00	0.0	0.0	15.0
Zone 9									
204B - Conference	1	128.0	1.0	245.0	15.00	0.00	0.0	0.0	15.0
Zone 10									
205 - Teaching Aid Lockr	1	218.0	3.0	202.0	15.00	0.00	0.0	0.0	45.0
Zone 11									
207 - Courtroom Distance	1	1714.0	38.0	647.7	15.00	0.00	0.0	0.0	570.0
Zone 12									
208 - Resource	1	382.0	13.0	649.8	15.00	0.00	0.0	0.0	195.0
Zone 13									
210 - Substitute Office	1	133.0	1.0	159.8	15.00	0.00	0.0	0.0	15.0
Zone 14									
210A - Office	1	93.0	3.0	129.1	15.00	0.00	0.0	0.0	45.0
Zone 15									
210B - Office/Conference	1	177.0	3.0	436.6	15.00	0.00	0.0	0.0	45.0
Zone 16									
210C - Office	1	174.0	2.0	134.4	15.00	0.00	0.0	0.0	30.0
Zone 17									
211 - Supervisor Office	1	500.0	3.0	157.3	15.00	0.00	0.0	0.0	45.0
Zone 18									
211A - Conference	1	209.0	6.0	298.3	15.00	0.00	0.0	0.0	90.0
Zone 19									

213 - Special Ed.	1	441.0	21.0	928.5	15.00	0.00	0.0	0.0	315.0
Zone 20									
214 - Special Ed.	1	554.0	21.0	1117.5	15.00	0.00	0.0	0.0	315.0
Zone 21									
219 - Spch. Wrk & Health	1	339.0	19.0	451.0	15.00	0.00	0.0	0.0	285.0
Zone 22									
220 - Classroom 8	1	434.0	19.0	414.3	15.00	0.00	0.0	0.0	285.0
Zone 23									
221 - Classroom 7	1	860.0	35.0	1248.3	15.00	0.00	0.0	0.0	525.0
Zone 24									
222 - Classroom 6	1	910.0	35.0	1196.3	15.00	0.00	0.0	0.0	525.0
Zone 25									
223 - Classroom 5	1	848.0	35.0	1021.5	15.00	0.00	0.0	0.0	525.0
Zone 26									
301 - Forensic Science	1	1440.0	36.0	1078.7	15.00	0.00	0.0	0.0	540.0
Zone 27									
304 - Teacher's Work Rm	1	300.0	36.0	782.2	15.00	0.00	0.0	0.0	540.0
Zone 28									
305 - Conference	1	171.0	2.0	72.3	15.00	0.00	0.0	0.0	30.0
Zone 29									
305B - Supervisor Office	1	159.0	2.0	342.8	15.00	0.00	0.0	0.0	30.0
Zone 30									
306 - Tri-facial Science	1	1623.0	39.0	1656.2	15.00	0.00	0.0	0.0	585.0
Zone 31									
308 - Science Prep	1	1792.0	35.0	3650.6	15.00	0.00	0.0	0.0	525.0
Zone 32									
309 - Science Demo. Lab	1	859.0	36.0	1261.8	15.00	0.00	0.0	0.0	540.0
Zone 33									
310 - Tri-facial Science	1	1476.0	39.0	1822.8	15.00	0.00	0.0	0.0	585.0
Zone 34									
311 - Science Demo. Lab	1	992.0	36.0	1503.0	15.00	0.00	0.0	0.0	540.0
Zone 35									
318 - Classroom 12	1	888.0	35.0	1369.9	15.00	0.00	0.0	0.0	525.0
Zone 36									
319 - Classroom 11	1	840.0	35.0	1248.3	15.00	0.00	0.0	0.0	525.0
Zone 37									
320 - Classroom 10	1	978.0	35.0	1186.5	15.00	0.00	0.0	0.0	525.0
Zone 38									
321 - Classroom 9	1	884.0	35.0	1149.2	15.00	0.00	0.0	0.0	525.0
Totals (incl. Space Multipliers)				**34481.0**					**12600.0**

Air System Design Load Summary for AHU-1 [Classrooms & Misc]

Project Name: Tech 2 10/31/2005
Prepared by: psuae 03:22AM

	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 1500 COOLING OA DB / WB 92.0 °F / 74.0 °F			HEATING DATA AT DES HTG HEATING OA DB / WB 13.0 °F / 10.4 °F		
ZONE LOADS	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**
Window & Skylight Solar Loads	2968 ft²	134234	-	2968 ft²	-	-
Wall Transmission	12792 ft²	21391	-	12792 ft²	61347	-
Roof Transmission	0 ft²	0	-	0 ft²	0	-
Window Transmission	2968 ft²	21287	-	2968 ft²	106581	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	0 ft²	0	-	0 ft²	0	-
Floor Transmission	0 ft²	0	-	0 ft²	0	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	0 ft²	0	-	0 ft²	0	-
Overhead Lighting	54901 W	159563	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	102534 W	326719	-	0	0	-
People	840	167706	172200	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	0% / 0%	0	0	0%	0	0
>> Total Zone Loads	**-**	**830900**	**172200**	**-**	**167928**	**0**
Zone Conditioning	-	855242	172200	-	109289	0
Plenum Wall Load	0%	0	-	0	0	-
Plenum Roof Load	0%	0	-	0	0	-
Plenum Lighting Load	0%	0	-	0	0	-
Return Fan Load	29697 CFM	132527	-	12600 CFM	-69285	-
Ventilation Load	11105 CFM	73903	229037	4712 CFM	249281	0
Supply Fan Load	29697 CFM	0	-	12600 CFM	0	-
Space Fan Coil Fans	-	0	-	-	0	-
Duct Heat Gain / Loss	0%	0	-	0%	0	-
>> Total System Loads	**-**	**1061672**	**401237**	**-**	**289286**	**0**
Central Cooling Coil	-	1061672	401243	-	0	0
Preheat Coil	-	0	-	-	85624	-
Terminal Reheat Coils	-	0	-	-	203662	-
Zone Heating Unit Coils	-	0	-	-	0	-
>> Total Conditioning	**-**	**1061672**	**401243**	**-**	**289286**	**0**
Key:	**Positive values are clg loads Negative values are htg loads**			**Positive values are htg loads Negative values are clg loads**		

Air System Sizing Summary for AHU-2 [Classrooms & Misc]

Project Name: Tech 2 — 10/31/2005
Prepared by: psuae — 03:24AM

Air System Information

Air System Name	**AHU-2 [Classrooms & Misc]**	Number of zones	**25**
Equipment Class	**PKG VERT**	Floor Area	**12897.0** ft²
Air System Type	**VAV**	Location	**New York La Guardia, New York**

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	**Peak zone sensible load**	Calculation Months	**Jan to Dec**
Space CFM	**Individual peak space loads**	Sizing Data	**Calculated**

Central Cooling Coil Sizing Data

Total coil load	**51.3**	Tons	Load occurs at	**Jul 1500**	
Total coil load	**615.6**	MBH	OA DB / WB	**92.0 / 74.0**	°F
Sensible coil load	**451.9**	MBH	Entering DB / WB	**87.3 / 69.0**	°F
Coil CFM at Jul 1500	**12957**	CFM	Leaving DB / WB	**55.0 / 53.5**	°F
Max block CFM at Jul 1700	**13882**	CFM	Coil ADP	**51.4**	°F
Sum of peak zone CFM	**14388**	CFM	Bypass Factor	**0.100**	
Sensible heat ratio	**0.734**		Resulting RH	**42**	%
ft²/Ton	**251.4**		Design supply temp.	**55.0**	°F
BTU/(hr-ft²)	**47.7**		Zone T-stat Check	**21 of 25**	OK
Water flow @ 10.0 °F rise	**N/A**		Max zone temperature deviation	**0.3**	°F

Preheat Coil Sizing Data

No heating coil loads occurred during this calculation.

Supply Fan Sizing Data

Actual max CFM at Jul 1700	**13882**	CFM	Fan motor BHP	**0.00**	BHP
Standard CFM	**13867**	CFM	Fan motor kW	**0.00**	kW
Actual max CFM/ft²	**1.08**	CFM/ft²	Fan static	**0.00**	in wg

Return Fan Sizing Data

Actual max CFM at Jul 1700	**13882**	CFM	Fan motor BHP	**24.02**	BHP
Standard CFM	**13867**	CFM	Fan motor kW	**17.92**	kW
Actual max CFM/ft²	**1.08**	CFM/ft²	Fan static	**5.50**	in wg

Outdoor Ventilation Air Data

Design airflow CFM	**4890**	CFM	CFM/person	**15.00**	CFM/person
CFM/ft²	**0.38**	CFM/ft²			

Ventilation Sizing Summary for AHU-2 [Classrooms & Misc]

Project Name: Tech 2
Prepared by: psuae

10/31/2005
03:24AM

1. Summary

Ventilation Sizing Method ..... **Sum of Space OA Airflows**
Design Ventilation Airflow Rate ..... **4890** CFM

2. Space Ventilation Analysis Table

Zone Name / Space Name	Mult.	Floor Area (ft²)	Maximum Occupants	Maximum Supply Air (CFM)	Required Outdoor Air (CFM/person)	Required Outdoor Air (CFM/ft²)	Required Outdoor Air (CFM)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (CFM)
Zone 1									
312 - Vestibule	1	258.0	4.0	60.3	15.00	0.00	0.0	0.0	60.0
Zone 2									
312A - Conference	1	247.0	1.0	98.6	15.00	0.00	0.0	0.0	15.0
Zone 3									
312B - Records Rm.	1	142.0	1.0	45.4	15.00	0.00	0.0	0.0	15.0
Zone 4									
312C - Office	1	142.0	1.0	153.8	15.00	0.00	0.0	0.0	15.0
Zone 5									
312D - Office	1	142.0	1.0	153.8	15.00	0.00	0.0	0.0	15.0
Zone 6									
312E - Office	1	142.0	1.0	153.8	15.00	0.00	0.0	0.0	15.0
Zone 7									
313 - Science Demo Lab	1	856.0	36.0	1503.0	15.00	0.00	0.0	0.0	540.0
Zone 8									
402 - Teacher's Workshop	1	442.0	10.0	532.1	15.00	0.00	0.0	0.0	150.0
Zone 9									
404 - Crime Lab	1	1666.0	35.0	1129.2	15.00	0.00	0.0	0.0	525.0
Zone 10									
406 - Computer Classroom	1	1668.0	35.0	2717.8	15.00	0.00	0.0	0.0	525.0
Zone 11									
407 - Large book Storage	1	330.0	35.0	525.0	15.00	0.00	0.0	0.0	525.0
Zone 12									
409 - Art Studio	1	1568.0	35.0	1583.6	15.00	0.00	0.0	0.0	525.0
Zone 13									
410 - Super Off. Sec.	1	186.0	2.0	340.3	15.00	0.00	0.0	0.0	30.0
Zone 14									
410A - Super Office	1	179.0	2.0	240.7	15.00	0.00	0.0	0.0	30.0
Zone 15									
412 - Vestibule	1	233.0	2.0	127.3	15.00	0.00	0.0	0.0	30.0
Zone 16									
412A - Conference	1	247.0	6.0	90.0	15.00	0.00	0.0	0.0	90.0
Zone 17									
412B - Guidance Records	1	142.0	3.0	65.0	15.00	0.00	0.0	0.0	45.0
Zone 18									
412C - Office	1	142.0	1.0	156.4	15.00	0.00	0.0	0.0	15.0
Zone 19									

412D - Office	1	142.0	1.0	156.4	15.00	0.00	0.0	0.0	15.0
Zone 20									
412E - Guidance Office	1	150.0	3.0	70.8	15.00	0.00	0.0	0.0	45.0
Zone 21									
416 - Language Lab	1	868.0	3.0	658.3	15.00	0.00	0.0	0.0	45.0
Zone 22									
417 - Classroom 15	1	840.0	35.0	1248.3	15.00	0.00	0.0	0.0	525.0
Zone 23									
418 - Classroom 14	1	918.0	35.0	1196.3	15.00	0.00	0.0	0.0	525.0
Zone 24									
419 - Classroom 13	1	884.0	35.0	1273.4	15.00	0.00	0.0	0.0	525.0
Zone 25									
501 - Health Insturctor	1	363.0	3.0	108.4	15.00	0.00	0.0	0.0	45.0
Totals (incl. Space Multipliers)				**14387.8**					**4890.0**

Air System Design Load Summary for AHU-2 [Classrooms & Misc]

Project Name: Tech 2 10/31/2005
Prepared by: psuae 03:24AM

	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 1500 COOLING OA DB / WB 92.0 °F / 74.0 °F			HEATING DATA AT DES HTG HEATING OA DB / WB 13.0 °F / 10.4 °F		
ZONE LOADS	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**
Window & Skylight Solar Loads	1176 ft²	55701	-	1176 ft²	-	-
Wall Transmission	5096 ft²	8694	-	5096 ft²	24439	-
Roof Transmission	0 ft²	0	-	0 ft²	0	-
Window Transmission	1176 ft²	8435	-	1176 ft²	42230	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	0 ft²	0	-	0 ft²	0	-
Floor Transmission	0 ft²	0	-	0 ft²	0	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	0 ft²	0	-	0 ft²	0	-
Overhead Lighting	24754 W	71944	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	40936 W	130440	-	0	0	-
People	326	65086	66830	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	0% / 0%	0	0	0%	0	0
>> Total Zone Loads	**-**	**340299**	**66830**	**-**	**66669**	**0**
Zone Conditioning	-	358938	66830	-	1257	0
Plenum Wall Load	0%	0	-	0	0	-
Plenum Roof Load	0%	0	-	0	0	-
Plenum Lighting Load	0%	0	-	0	0	-
Return Fan Load	12957 CFM	57460	-	144 CFM	-17370	-
Ventilation Load	4564 CFM	35500	96908	51 CFM	7972	0
Supply Fan Load	12957 CFM	0	-	144 CFM	0	-
Space Fan Coil Fans	-	0	-	-	0	-
Duct Heat Gain / Loss	0%	0	-	0%	0	-
>> Total System Loads	**-**	**451899**	**163738**	**-**	**-8140**	**0**
Central Cooling Coil	-	451899	163742	-	-8140	0
Preheat Coil	-	0	-	-	0	-
Terminal Reheat Coils	-	0	-	-	0	-
Zone Heating Unit Coils	-	0	-	-	0	-
>> Total Conditioning	**-**	**451899**	**163742**	**-**	**-8140**	**0**
Key:	**Positive values are clg loads Negative values are htg loads**			**Positive values are htg loads Negative values are clg loads**		

Air System Sizing Summary for AHU-3 [Gymnasium]

Project Name: Tech 2 — 10/31/2005
Prepared by: psuae — 03:25AM

Air System Information

Air System Name	**AHU-3 [Gymnasium]**	Number of zones	**1**
Equipment Class	**PKG VERT**	Floor Area	**8944.0** ft²
Air System Type	**SZCAV**	Location	**New York La Guardia, New York**

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	**Sum of space airflow rates**	Calculation Months	**Jan to Dec**
Space CFM	**Individual peak space loads**	Sizing Data	**Calculated**

Central Cooling Coil Sizing Data

Total coil load	**81.5**	Tons	Load occurs at	**Jul 1500**	
Total coil load	**978.6**	MBH	OA DB / WB	**92.0 / 74.0**	°F
Sensible coil load	**532.8**	MBH	Entering DB / WB	**86.9 / 74.5**	°F
Coil CFM at Jul 1500	**18256**	CFM	Leaving DB / WB	**59.8 / 58.9**	°F
Max block CFM	**18256**	CFM	Coil ADP	**56.8**	°F
Sum of peak zone CFM	**18256**	CFM	Bypass Factor	**0.100**	
Sensible heat ratio	**0.544**		Resulting RH	**75**	%
ft²/Ton	**109.7**		Design supply temp.	**58.0**	°F
BTU/(hr-ft²)	**109.4**		Zone T-stat Check	**1 of 1**	OK
Water flow @ 10.0 °F rise	**N/A**		Max zone temperature deviation	**0.0**	°F

Central Heating Coil Sizing Data

Max coil load	**439.6**	MBH	Load occurs at	**Des Htg**	
Coil CFM at Des Htg	**18256**	CFM	BTU/(hr-ft²)	**49.2**	
Max coil CFM	**18256**	CFM	Ent. DB / Lvg DB	**50.0 / 72.3**	°F
Water flow @ 20.0 °F drop	**N/A**				

Preheat Coil Sizing Data

Max coil load	**31.2**	MBH	Load occurs at	**Des Htg**	
Coil CFM at Des Htg	**18256**	CFM	Ent. DB / Lvg DB	**48.4 / 50.0**	°F
Max coil CFM	**18256**	CFM			
Water flow @ 20.0 °F drop	**N/A**				

Supply Fan Sizing Data

Actual max CFM	**18256**	CFM	Fan motor BHP	**0.00**	BHP
Standard CFM	**18237**	CFM	Fan motor kW	**0.00**	kW
Actual max CFM/ft²	**2.04**	CFM/ft²	Fan static	**0.00**	in wg

Return Fan Sizing Data

Actual max CFM	**18256**	CFM	Fan motor BHP	**23.55**	BHP
Standard CFM	**18237**	CFM	Fan motor kW	**17.56**	kW
Actual max CFM/ft²	**2.04**	CFM/ft²	Fan static	**4.10**	in wg

Outdoor Ventilation Air Data

Design airflow CFM	**7500**	CFM	CFM/person	**15.00**	CFM/person
CFM/ft²	**0.84**	CFM/ft²			

Ventilation Sizing Summary for AHU-3 [Gymnasium]

Project Name: Tech 2
Prepared by: psuae

10/31/2005
03:25AM

1. Summary

Ventilation Sizing Method ..... **Sum of Space OA Airflows**
Design Ventilation Airflow Rate ..... **7500** CFM

2. Space Ventilation Analysis Table

Zone Name / Space Name	Mult.	Floor Area (ft²)	Maximum Occupants	Maximum Supply Air (CFM)	Required Outdoor Air (CFM/person)	Required Outdoor Air (CFM/ft²)	Required Outdoor Air (CFM)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (CFM)
Zone 1									
517 - Gymnasium	1	8944.0	500.0	18256.3	15.00	0.00	0.0	0.0	7500.0
Totals (incl. Space Multipliers)				**18256.3**					**7500.0**

Air System Design Load Summary for AHU-3 [Gymnasium]

Project Name: Tech 2
Prepared by: psuae

10/31/2005
03:25AM

	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 1500 COOLING OA DB / WB 92.0 °F / 74.0 °F			HEATING DATA AT DES HTG HEATING OA DB / WB 13.0 °F / 10.4 °F		
ZONE LOADS	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**
Window & Skylight Solar Loads	504 ft²	19483	-	504 ft²	-	-
Wall Transmission	4895 ft²	9333	-	4895 ft²	23475	-
Roof Transmission	0 ft²	0	-	0 ft²	0	-
Window Transmission	504 ft²	3615	-	504 ft²	18099	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	0 ft²	0	-	0 ft²	0	-
Floor Transmission	0 ft²	0	-	0 ft²	0	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	0 ft²	0	-	0 ft²	0	-
Overhead Lighting	19319 W	60490	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	0 W	0	-	0	0	-
People	500	289289	545000	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	0% / 0%	0	0	0%	0	0
>> Total Zone Loads	**-**	**382209**	**545000**	**-**	**41574**	**0**
Zone Conditioning	-	402283	545000	-	44376	0
Plenum Wall Load	0%	0	-	0	0	-
Plenum Roof Load	0%	0	-	0	0	-
Plenum Lighting Load	0%	0	-	0	0	-
Return Fan Load	18256 CFM	59927	-	18256 CFM	-59927	-
Ventilation Load	7500 CFM	70565	-99195	7500 CFM	486365	0
Supply Fan Load	18256 CFM	0	-	18256 CFM	0	-
Space Fan Coil Fans	-	0	-	-	0	-
Duct Heat Gain / Loss	0%	0	-	0%	0	-
>> Total System Loads	**-**	**532775**	**445805**	**-**	**470814**	**0**
Central Cooling Coil	-	532775	445813	-	0	0
Central Heating Coil	-	0	-	-	439615	-
Preheat Coil	-	0	-	-	31199	-
>> Total Conditioning	**-**	**532775**	**445813**	**-**	**470814**	**0**
Key:	**Positive values are clg loads Negative values are htg loads**			**Positive values are htg loads Negative values are clg loads**		

Air System Sizing Summary for AHU-4 [Library]

Project Name: Tech 2 — 10/31/2005
Prepared by: psuae — 03:26AM

Air System Information

Air System Name	**AHU-4 [Library]**	Number of zones	**6**
Equipment Class	**PKG VERT**	Floor Area	**3073.0** ft²
Air System Type	**CAV/RH**	Location	**New York La Guardia, New York**

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	**Sum of space airflow rates**	Calculation Months	**Jan to Dec**
Space CFM	**Individual peak space loads**	Sizing Data	**Calculated**

Central Cooling Coil Sizing Data

Total coil load	**9.3**	Tons	Load occurs at	**Jul 1500**	
Total coil load	**111.3**	MBH	OA DB / WB	**92.0 / 74.0**	°F
Sensible coil load	**75.2**	MBH	Entering DB / WB	**87.6 / 70.4**	°F
Coil CFM at Jul 1500	**2137**	CFM	Leaving DB / WB	**55.0 / 53.6**	°F
Max block CFM	**2137**	CFM	Coil ADP	**51.4**	°F
Sum of peak zone CFM	**2137**	CFM	Bypass Factor	**0.100**	
Sensible heat ratio	**0.676**		Resulting RH	**46**	%
ft²/Ton	**331.2**		Design supply temp.	**55.0**	°F
BTU/(hr-ft²)	**36.2**		Zone T-stat Check	**6 of 6**	OK
Water flow @ 10.0 °F rise	**N/A**		Max zone temperature deviation	**0.0**	°F

Preheat Coil Sizing Data

Max coil load	**30.0**	MBH	Load occurs at	**Des Htg**	
Coil CFM at Des Htg	**2137**	CFM	Ent. DB / Lvg DB	**37.0 / 50.0**	°F
Max coil CFM	**2137**	CFM			
Water flow @ 20.0 °F drop	**N/A**				

Supply Fan Sizing Data

Actual max CFM	**2137**	CFM	Fan motor BHP	**0.00**	BHP
Standard CFM	**2135**	CFM	Fan motor kW	**0.00**	kW
Actual max CFM/ft²	**0.70**	CFM/ft²	Fan static	**0.00**	in wg

Return Fan Sizing Data

Actual max CFM	**2137**	CFM	Fan motor BHP	**2.82**	BHP
Standard CFM	**2135**	CFM	Fan motor kW	**2.11**	kW
Actual max CFM/ft²	**0.70**	CFM/ft²	Fan static	**4.20**	in wg

Outdoor Ventilation Air Data

Design airflow CFM	**1110**	CFM	CFM/person	**15.00**	CFM/person
CFM/ft²	**0.36**	CFM/ft²			

Ventilation Sizing Summary for AHU-4 [Library]

Project Name: Tech 2 10/31/2005
Prepared by: psuae 03:26AM

1. Summary

Ventilation Sizing Method ..... **Sum of Space OA Airflows**
Design Ventilation Airflow Rate ..... **1110** CFM

2. Space Ventilation Analysis Table

Zone Name / Space Name	Mult.	Floor Area (ft²)	Maximum Occupants	Maximum Supply Air (CFM)	Required Outdoor Air (CFM/person)	Required Outdoor Air (CFM/ft²)	Required Outdoor Air (CFM)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (CFM)
Zone 1									
209 - Library	1	2321.0	68.0	1463.4	15.00	0.00	0.0	0.0	1020.0
Zone 2									
209A - Law Collection Rm	1	150.0	2.0	462.1	15.00	0.00	0.0	0.0	30.0
Zone 3									
209B - Tech. Center	1	156.0	1.0	53.3	15.00	0.00	0.0	0.0	15.0
Zone 4									
209C - Librarian Workshp	1	116.0	1.0	37.5	15.00	0.00	0.0	0.0	15.0
Zone 5									
209D - Librarian Office	1	126.0	1.0	42.7	15.00	0.00	0.0	0.0	15.0
Zone 6									
209E - Audio/Visual	1	204.0	1.0	77.9	15.00	0.00	0.0	0.0	15.0
Totals (incl. Space Multipliers)				**2136.9**					**1110.0**

Air System Design Load Summary for AHU-4 [Library]

Project Name: Tech 2
Prepared by: psuae

10/31/2005
03:26AM

	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 1500 COOLING OA DB / WB 92.0 °F / 74.0 °F			HEATING DATA AT DES HTG HEATING OA DB / WB 13.0 °F / 10.4 °F		
ZONE LOADS	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**
Window & Skylight Solar Loads	392 ft²	13165	-	392 ft²	-	-
Wall Transmission	455 ft²	798	-	455 ft²	2182	-
Roof Transmission	0 ft²	0	-	0 ft²	0	-
Window Transmission	392 ft²	2812	-	392 ft²	14077	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	0 ft²	0	-	0 ft²	0	-
Floor Transmission	0 ft²	0	-	0 ft²	0	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	0 ft²	0	-	0 ft²	0	-
Overhead Lighting	6564 W	19078	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	120 W	382	-	0	0	-
People	74	14774	15170	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	0% / 0%	0	0	0%	0	0
>> Total Zone Loads	**-**	**51009**	**15170**	**-**	**16259**	**0**
Zone Conditioning	-	57160	15170	-	11976	0
Plenum Wall Load	0%	0	-	0	0	-
Plenum Roof Load	0%	0	-	0	0	-
Plenum Lighting Load	0%	0	-	0	0	-
Return Fan Load	2137 CFM	7186	-	2137 CFM	-7186	-
Ventilation Load	1110 CFM	10884	20941	1110 CFM	59782	0
Supply Fan Load	2137 CFM	0	-	2137 CFM	0	-
Space Fan Coil Fans	-	0	-	-	0	-
Duct Heat Gain / Loss	0%	0	-	0%	0	-
>> Total System Loads	**-**	**75229**	**36111**	**-**	**64572**	**0**
Central Cooling Coil	-	75229	36114	-	0	0
Preheat Coil	-	0	-	-	29992	-
Terminal Reheat Coils	-	0	-	-	34580	-
Zone Heating Unit Coils	-	0	-	-	0	-
>> Total Conditioning	**-**	**75229**	**36114**	**-**	**64572**	**0**
Key:	**Positive values are clg loads Negative values are htg loads**			**Positive values are htg loads Negative values are clg loads**		

Air System Sizing Summary for AHU-5 [Lobby & Corridor]

Project Name: Tech 2
Prepared by: psuae

10/31/2005
03:29AM

Air System Information

Air System Name	**AHU-5 [Lobby & Corridor]**		Number of zones	**7**	
Equipment Class	**PKG VERT**		Floor Area	**11520.0**	ft²
Air System Type	**CAV/RH**		Location	**New York La Guardia, New York**	

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	**Sum of space airflow rates**		Calculation Months	**Jan to Dec**	
Space CFM	**Individual peak space loads**		Sizing Data	**Calculated**	

Central Cooling Coil Sizing Data

Total coil load	**18.5**	Tons	Load occurs at	**Jul 1500**	
Total coil load	**222.1**	MBH	OA DB / WB	**92.0 / 74.0**	°F
Sensible coil load	**173.1**	MBH	Entering DB / WB	**86.4 / 67.9**	°F
Coil CFM at Jul 1500	**5105**	CFM	Leaving DB / WB	**55.0 / 53.4**	°F
Max block CFM	**5105**	CFM	Coil ADP	**51.5**	°F
Sum of peak zone CFM	**5105**	CFM	Bypass Factor	**0.100**	
Sensible heat ratio	**0.779**		Resulting RH	**41**	%
ft²/Ton	**622.4**		Design supply temp.	**55.0**	°F
BTU/(hr-ft²)	**19.3**		Zone T-stat Check	**7 of 7**	OK
Water flow @ 10.0 °F rise	**N/A**		Max zone temperature deviation	**0.0**	°F

Preheat Coil Sizing Data

Max coil load	**41.0**	MBH	Load occurs at	**Des Htg**	
Coil CFM at Des Htg	**5105**	CFM	Ent. DB / Lvg DB	**42.6 / 50.0**	°F
Max coil CFM	**5105**	CFM			
Water flow @ 20.0 °F drop	**N/A**				

Supply Fan Sizing Data

Actual max CFM	**5105**	CFM	Fan motor BHP	**0.00**	BHP
Standard CFM	**5099**	CFM	Fan motor kW	**0.00**	kW
Actual max CFM/ft²	**0.44**	CFM/ft²	Fan static	**0.00**	in wg

Return Fan Sizing Data

Actual max CFM	**5105**	CFM	Fan motor BHP	**8.67**	BHP
Standard CFM	**5099**	CFM	Fan motor kW	**6.47**	kW
Actual max CFM/ft²	**0.44**	CFM/ft²	Fan static	**5.40**	in wg

Outdoor Ventilation Air Data

Design airflow CFM	**1335**	CFM	CFM/person	**15.00**	CFM/person
CFM/ft²	**0.12**	CFM/ft²			

Ventilation Sizing Summary for AHU-5 [Lobby & Corridor]

Project Name: Tech 2
Prepared by: psuae

10/31/2005
03:29AM

1. Summary

Ventilation Sizing Method ..... **Sum of Space OA Airflows**
Design Ventilation Airflow Rate ..... **1335** CFM

2. Space Ventilation Analysis Table

Zone Name / Space Name	Mult.	Floor Area (ft²)	Maximum Occupants	Maximum Supply Air (CFM)	Required Outdoor Air (CFM/person)	Required Outdoor Air (CFM/ft²)	Required Outdoor Air (CFM)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (CFM)
Zone 1									
112 - Corridor	1	1846.0	15.0	640.0	15.00	0.00	0.0	0.0	225.0
Zone 2									
127 - Main Hall	1	1055.0	10.0	354.6	15.00	0.00	0.0	0.0	150.0
Zone 3									
212 - Corridor	1	2665.0	20.0	1377.3	15.00	0.00	0.0	0.0	300.0
Zone 4									
325 - Corridor	1	2651.0	20.0	1269.2	15.00	0.00	0.0	0.0	300.0
Zone 5									
411 - Corridor	1	2651.0	20.0	1269.2	15.00	0.00	0.0	0.0	300.0
Zone 6									
502 - W. Corridor	1	326.0	2.0	95.2	15.00	0.00	0.0	0.0	30.0
Zone 7									
513 - E. Corridor	1	326.0	2.0	99.3	15.00	0.00	0.0	0.0	30.0
Totals (incl. Space Multipliers)				**5104.8**					**1335.0**

Air System Design Load Summary for AHU-5 [Lobby & Corridor]

Project Name: Tech 2 10/31/2005
Prepared by: psuae 03:29AM

	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 1500 COOLING OA DB / WB 92.0 °F / 74.0 °F			HEATING DATA AT DES HTG HEATING OA DB / WB 13.0 °F / 10.4 °F		
ZONE LOADS	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**
Window & Skylight Solar Loads	672 ft²	28743	-	672 ft²	-	-
Wall Transmission	1029 ft²	1642	-	1029 ft²	4935	-
Roof Transmission	0 ft²	0	-	0 ft²	0	-
Window Transmission	672 ft²	4820	-	672 ft²	24132	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	0 ft²	0	-	0 ft²	0	-
Floor Transmission	0 ft²	0	-	0 ft²	0	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	0 ft²	0	-	0 ft²	0	-
Overhead Lighting	23465 W	68199	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	0 W	0	-	0	0	-
People	89	17769	18245	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	0% / 0%	0	0	0%	0	0
>> Total Zone Loads	**-**	**121173**	**18245**	**-**	**29066**	**0**
Zone Conditioning	-	140197	18245	-	5385	0
Plenum Wall Load	0%	0	-	0	0	-
Plenum Roof Load	0%	0	-	0	0	-
Plenum Lighting Load	0%	0	-	0	0	-
Return Fan Load	5105 CFM	22070	-	5105 CFM	-22070	-
Ventilation Load	1335 CFM	10853	30721	1335 CFM	57652	0
Supply Fan Load	5105 CFM	0	-	5105 CFM	0	-
Space Fan Coil Fans	-	0	-	-	0	-
Duct Heat Gain / Loss	0%	0	-	0%	0	-
>> Total System Loads	**-**	**173120**	**48966**	**-**	**40967**	**0**
Central Cooling Coil	-	173120	48974	-	0	0
Preheat Coil	-	0	-	-	40967	-
>> Total Conditioning	**-**	**173120**	**48974**	**-**	**40967**	**0**
Key:	**Positive values are clg loads Negative values are htg loads**			**Positive values are htg loads Negative values are clg loads**		

Air System Sizing Summary for AHU-6 [Kitchen]

Project Name: Tech 2 — 10/31/2005
Prepared by: psuae — 03:34AM

Air System Information

Air System Name	**AHU-6 [Kitchen]**	Number of zones	**1**
Equipment Class	**PKG VERT**	Floor Area	**3486.0** ft²
Air System Type	**SZCAV**	Location	**New York La Guardia, New York**

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	**Sum of space airflow rates**	Calculation Months	**Jan to Dec**
Space CFM	**Individual peak space loads**	Sizing Data	**Calculated**

Central Cooling Coil Sizing Data

Total coil load	**9.1**	Tons	Load occurs at	**Jul 0700**	
Total coil load	**109.1**	MBH	OA DB / WB	**78.4 / 70.1**	°F
Sensible coil load	**104.1**	MBH	Entering DB / WB	**84.0 / 66.4**	°F
Coil CFM at Jul 0700	**3805**	CFM	Leaving DB / WB	**58.6 / 57.0**	°F
Max block CFM	**3805**	CFM	Coil ADP	**55.8**	°F
Sum of peak zone CFM	**3805**	CFM	Bypass Factor	**0.100**	
Sensible heat ratio	**0.953**		Resulting RH	**43**	%
ft²/Ton	**383.3**		Design supply temp.	**58.0**	°F
BTU/(hr-ft²)	**31.3**		Zone T-stat Check	**1 of 1**	OK
Water flow @ 10.0 °F rise	**N/A**		Max zone temperature deviation	**0.0**	°F

Central Heating Coil Sizing Data

No central heating coil loads occurred during this calculation.

Preheat Coil Sizing Data

No heating coil loads occurred during this calculation.

Supply Fan Sizing Data

Actual max CFM	**3805**	CFM	Fan motor BHP	**0.00**	BHP
Standard CFM	**3801**	CFM	Fan motor kW	**0.00**	kW
Actual max CFM/ft²	**1.09**	CFM/ft²	Fan static	**0.00**	in wg

Return Fan Sizing Data

Actual max CFM	**3805**	CFM	Fan motor BHP	**5.39**	BHP
Standard CFM	**3801**	CFM	Fan motor kW	**4.02**	kW
Actual max CFM/ft²	**1.09**	CFM/ft²	Fan static	**4.50**	in wg

Outdoor Ventilation Air Data

Design airflow CFM	**150**	CFM	CFM/person	**15.00**	CFM/person
CFM/ft²	**0.04**	CFM/ft²			

Ventilation Sizing Summary for AHU-6 [Kitchen]

Project Name: Tech 2
Prepared by: psuae

10/31/2005
03:34AM

1. Summary

Ventilation Sizing Method ..... **Sum of Space OA Airflows**
Design Ventilation Airflow Rate ..... **150** CFM

2. Space Ventilation Analysis Table

Zone Name / Space Name	Mult.	Floor Area (ft²)	Maximum Occupants	Maximum Supply Air (CFM)	Required Outdoor Air (CFM/person)	Required Outdoor Air (CFM/ft²)	Required Outdoor Air (CFM)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (CFM)
Zone 1									
C16 - Kitchen	1	3486.0	10.0	3805.0	15.00	0.00	0.0	0.0	150.0
Totals (incl. Space Multipliers)				**3805.0**					**150.0**

Air System Design Load Summary for AHU-6 [Kitchen]

Project Name: Tech 2
Prepared by: psuae

10/31/2005
03:34AM

	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 0700 COOLING OA DB / WB 78.4 °F / 70.1 °F			HEATING DATA AT DES HTG HEATING OA DB / WB 13.0 °F / 10.4 °F		
ZONE LOADS	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**
Window & Skylight Solar Loads	0 ft²	0	-	0 ft²	-	-
Wall Transmission	0 ft²	0	-	0 ft²	0	-
Roof Transmission	0 ft²	0	-	0 ft²	0	-
Window Transmission	0 ft²	0	-	0 ft²	0	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	0 ft²	0	-	0 ft²	0	-
Floor Transmission	0 ft²	0	-	0 ft²	0	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	0 ft²	0	-	0 ft²	0	-
Overhead Lighting	7599 W	19309	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	17590 W	53183	-	0	0	-
People	10	1669	2050	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	0% / 0%	0	0	0%	0	0
>> Total Zone Loads	**-**	**74161**	**2050**	**-**	**0**	**0**
Zone Conditioning	-	91278	2050	-	0	0
Plenum Wall Load	0%	0	-	0	0	-
Plenum Roof Load	0%	0	-	0	0	-
Plenum Lighting Load	0%	0	-	0	0	-
Return Fan Load	3805 CFM	13709	-	3805 CFM	-13709	-
Ventilation Load	150 CFM	-937	3047	150 CFM	9764	0
Supply Fan Load	3805 CFM	0	-	3805 CFM	0	-
Space Fan Coil Fans	-	0	-	-	0	-
Duct Heat Gain / Loss	0%	0	-	0%	0	-
>> Total System Loads	**-**	**104051**	**5097**	**-**	**-3944**	**0**
Central Cooling Coil	-	104051	5099	-	-3944	0
Central Heating Coil	-	0	-	-	0	-
Preheat Coil	-	0	-	-	0	-
>> Total Conditioning	**-**	**104051**	**5099**	**-**	**-3944**	**0**
Key:	**Positive values are clg loads Negative values are htg loads**			**Positive values are htg loads Negative values are clg loads**		

Air System Sizing Summary for AHU-7 [Administration]

Project Name: Tech 2 — 10/31/2005
Prepared by: psuae — 03:35AM

Air System Information

Air System Name	**AHU-7 [Administration]**	Number of zones	**31**
Equipment Class	**PKG VERT**	Floor Area	**6690.0** ft²
Air System Type	**VAV**	Location	**New York La Guardia, New York**

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	**Peak zone sensible load**	Calculation Months	**Jan to Dec**
Space CFM	**Individual peak space loads**	Sizing Data	**Calculated**

Central Cooling Coil Sizing Data

Total coil load	**17.7**	Tons	Load occurs at	**Jul 1600**	
Total coil load	**212.2**	MBH	OA DB / WB	**91.6 / 73.9**	°F
Sensible coil load	**175.0**	MBH	Entering DB / WB	**86.1 / 67.0**	°F
Coil CFM at Jul 1600	**5211**	CFM	Leaving DB / WB	**55.0 / 53.3**	°F
Max block CFM at Jul 1600	**5508**	CFM	Coil ADP	**51.5**	°F
Sum of peak zone CFM	**5701**	CFM	Bypass Factor	**0.100**	
Sensible heat ratio	**0.825**		Resulting RH	**40**	%
ft²/Ton	**378.2**		Design supply temp.	**55.0**	°F
BTU/(hr-ft²)	**31.7**		Zone T-stat Check	**25 of 31**	OK
Water flow @ 10.0 °F rise	**N/A**		Max zone temperature deviation	**0.1**	°F

Preheat Coil Sizing Data

No heating coil loads occurred during this calculation.

Supply Fan Sizing Data

Actual max CFM at Jul 1600	**5508**	CFM	Fan motor BHP	**0.00**	BHP
Standard CFM	**5502**	CFM	Fan motor kW	**0.00**	kW
Actual max CFM/ft²	**0.82**	CFM/ft²	Fan static	**0.00**	in wg

Return Fan Sizing Data

Actual max CFM at Jul 1600	**5508**	CFM	Fan motor BHP	**9.71**	BHP
Standard CFM	**5502**	CFM	Fan motor kW	**7.24**	kW
Actual max CFM/ft²	**0.82**	CFM/ft²	Fan static	**5.60**	in wg

Outdoor Ventilation Air Data

Design airflow CFM	**1020**	CFM	CFM/person	**15.00**	CFM/person
CFM/ft²	**0.15**	CFM/ft²			

Ventilation Sizing Summary for AHU-7 [Administration]

Project Name: Tech 2
Prepared by: psuae

10/31/2005
03:35AM

1. Summary

Ventilation Sizing Method ..... **Sum of Space OA Airflows**
Design Ventilation Airflow Rate ..... **1020** CFM

2. Space Ventilation Analysis Table

Zone Name / Space Name	Mult.	Floor Area (ft²)	Maximum Occupants	Maximum Supply Air (CFM)	Required Outdoor Air (CFM/person)	Required Outdoor Air (CFM/ft²)	Required Outdoor Air (CFM)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (CFM)
Zone 1									
101 - Program Office	1	197.0	2.0	167.0	15.00	0.00	0.0	0.0	30.0
Zone 2									
101A - Work Room	1	280.0	1.0	367.5	15.00	0.00	0.0	0.0	15.0
Zone 3									
101B - Office	1	148.0	1.0	124.5	15.00	0.00	0.0	0.0	15.0
Zone 4									
102 - Medical Suite	1	129.0	1.0	42.7	15.00	0.00	0.0	0.0	15.0
Zone 5									
102B - Office/Exam	1	110.0	1.0	41.4	15.00	0.00	0.0	0.0	15.0
Zone 6									
102E - Wait Rm	1	100.0	1.0	21.1	15.00	0.00	0.0	0.0	15.0
Zone 7									
107 - AP. AD. Secretary	1	260.0	5.0	299.3	15.00	0.00	0.0	0.0	75.0
Zone 8									
108 - AP. AD. Office	1	389.0	5.0	440.8	15.00	0.00	0.0	0.0	75.0
Zone 9									
109 - Conference	1	474.0	5.0	378.0	15.00	0.00	0.0	0.0	75.0
Zone 10									
110 - Principal Sec.	1	262.0	5.0	292.4	15.00	0.00	0.0	0.0	75.0
Zone 11									
110A - Wait Room	1	93.0	5.0	75.0	15.00	0.00	0.0	0.0	75.0
Zone 12									
111A - Principal's Off.	1	461.0	1.0	432.1	15.00	0.00	0.0	0.0	15.0
Zone 13									
128 - Duplicate Rm.	1	132.0	1.0	470.6	15.00	0.00	0.0	0.0	15.0
Zone 14									
129 - Teacher's Mail	1	143.0	1.0	52.7	15.00	0.00	0.0	0.0	15.0
Zone 15									
130 - Security Win. Desk	1	127.0	1.0	97.9	15.00	0.00	0.0	0.0	15.0
Zone 16									
130A- Sec. Change Rm	1	96.0	1.0	93.9	15.00	0.00	0.0	0.0	15.0
Zone 17									
130B- Sec. Change Rm	1	96.0	1.0	34.8	15.00	0.00	0.0	0.0	15.0
Zone 18									
131 - General Office	1	305.0	1.0	269.9	15.00	0.00	0.0	0.0	15.0
Zone 19									

131A - Wait & Reception	1	127.0	3.0	58.1	15.00	0.00	0.0	0.0	45.0
Zone 20									
131B - Treasury Office	1	149.0	1.0	168.4	15.00	0.00	0.0	0.0	15.0
Zone 21									
131C - Payroll Office	1	148.0	3.0	185.4	15.00	0.00	0.0	0.0	45.0
Zone 22									
132 - Lateness & Attend.	1	96.0	2.0	123.9	15.00	0.00	0.0	0.0	30.0
Zone 23									
133 - Student Support	1	110.0	3.0	59.2	15.00	0.00	0.0	0.0	45.0
Zone 24									
133A - Records	1	67.0	1.0	17.3	15.00	0.00	0.0	0.0	15.0
Zone 25									
133B - Dean	1	118.0	1.0	168.7	15.00	0.00	0.0	0.0	15.0
Zone 26									
133C - Dean	1	118.0	1.0	168.7	15.00	0.00	0.0	0.0	15.0
Zone 27									
134 - Custodian Office	1	313.0	2.0	278.6	15.00	0.00	0.0	0.0	30.0
Zone 28									
136 - Parent Com.	1	195.0	1.0	116.5	15.00	0.00	0.0	0.0	15.0
Zone 29									
137 - AP. Guidance Sec.	1	220.0	1.0	122.1	15.00	0.00	0.0	0.0	15.0
Zone 30									
141 - AP Guidance	1	350.0	2.0	289.8	15.00	0.00	0.0	0.0	30.0
Zone 31									
142 - N. Corridor	1	877.0	8.0	242.8	15.00	0.00	0.0	0.0	120.0
Totals (incl. Space Multipliers)				**5701.3**					**1020.0**

Air System Design Load Summary for AHU-7 [Administration]

Project Name: Tech 2 10/31/2005
Prepared by: psuae 03:35AM

	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 1600 COOLING OA DB / WB 91.6 °F / 73.9 °F			HEATING DATA AT DES HTG HEATING OA DB / WB 13.0 °F / 10.4 °F		
ZONE LOADS	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**
Window & Skylight Solar Loads	588 ft²	27523	-	588 ft²	-	-
Wall Transmission	2631 ft²	4316	-	2631 ft²	12618	-
Roof Transmission	0 ft²	0	-	0 ft²	0	-
Window Transmission	588 ft²	4170	-	588 ft²	21115	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	0 ft²	0	-	0 ft²	0	-
Floor Transmission	0 ft²	0	-	0 ft²	0	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	0 ft²	0	-	0 ft²	0	-
Overhead Lighting	15291 W	44949	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	13097 W	41927	-	0	0	-
People	68	13779	13940	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	0% / 0%	0	0	0%	0	0
>> Total Zone Loads	**-**	**136664**	**13940**	**-**	**33733**	**0**
Zone Conditioning	-	144580	13940	-	31669	0
Plenum Wall Load	0%	0	-	0	0	-
Plenum Roof Load	0%	0	-	0	0	-
Plenum Lighting Load	0%	0	-	0	0	-
Return Fan Load	5211 CFM	23497	-	57 CFM	-7017	-
Ventilation Load	965 CFM	6939	23293	11 CFM	1923	0
Supply Fan Load	5211 CFM	0	-	57 CFM	0	-
Space Fan Coil Fans	-	0	-	-	0	-
Duct Heat Gain / Loss	0%	0	-	0%	0	-
>> Total System Loads	**-**	**175016**	**37233**	**-**	**26575**	**0**
Central Cooling Coil	-	175016	37231	-	-5878	0
Preheat Coil	-	0	-	-	0	-
Terminal Reheat Coils	-	0	-	-	32453	-
>> Total Conditioning	**-**	**175016**	**37231**	**-**	**26575**	**0**
Key:	**Positive values are clg loads Negative values are htg loads**			**Positive values are htg loads Negative values are clg loads**		

Air System Sizing Summary for AHU-8 [Dining]

Project Name: Tech 2
Prepared by: psuae

10/31/2005
03:36AM

Air System Information

Air System Name	**AHU-8 [Dining]**	Number of zones	**1**
Equipment Class	**PKG VERT**	Floor Area	**3739.0** ft²
Air System Type	**SZCAV**	Location	**New York La Guardia, New York**

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	**Sum of space airflow rates**	Calculation Months	**Jan to Dec**
Space CFM	**Individual peak space loads**	Sizing Data	**Calculated**

Central Cooling Coil Sizing Data

Total coil load	**16.5**	Tons	Load occurs at	**Aug 1500**	
Total coil load	**198.4**	MBH	OA DB / WB	**92.0 / 74.0**	°F
Sensible coil load	**131.1**	MBH	Entering DB / WB	**92.0 / 74.0**	°F
Coil CFM at Aug 1500	**3825**	CFM	Leaving DB / WB	**60.2 / 58.7**	°F
Max block CFM	**3825**	CFM	Coil ADP	**56.7**	°F
Sum of peak zone CFM	**3825**	CFM	Bypass Factor	**0.100**	
Sensible heat ratio	**0.661**		Resulting RH	**58**	%
ft²/Ton	**226.1**		Design supply temp.	**58.0**	°F
BTU/(hr-ft²)	**53.1**		Zone T-stat Check	**1 of 1**	OK
Water flow @ 10.0 °F rise	**N/A**		Max zone temperature deviation	**0.0**	°F

Central Heating Coil Sizing Data

Max coil load	**96.0**	MBH	Load occurs at	**Des Htg**	
Coil CFM at Des Htg	**3825**	CFM	BTU/(hr-ft²)	**25.7**	
Max coil CFM	**3825**	CFM	Ent. DB / Lvg DB	**50.0 / 73.3**	°F
Water flow @ 20.0 °F drop	**N/A**				

Preheat Coil Sizing Data

Max coil load	**152.7**	MBH	Load occurs at	**Des Htg**	
Coil CFM at Des Htg	**3825**	CFM	Ent. DB / Lvg DB	**13.0 / 50.0**	°F
Max coil CFM	**3825**	CFM			
Water flow @ 20.0 °F drop	**N/A**				

Supply Fan Sizing Data

Actual max CFM	**3825**	CFM	Fan motor BHP	**0.00**	BHP
Standard CFM	**3821**	CFM	Fan motor kW	**0.00**	kW
Actual max CFM/ft²	**1.02**	CFM/ft²	Fan static	**0.00**	in wg

Return Fan Sizing Data

Actual max CFM	**3825**	CFM	Fan motor BHP	**2.17**	BHP
Standard CFM	**3821**	CFM	Fan motor kW	**1.62**	kW
Actual max CFM/ft²	**1.02**	CFM/ft²	Fan static	**1.80**	in wg

Outdoor Ventilation Air Data

Design airflow CFM	**3825**	CFM	CFM/person	**15.00**	CFM/person
CFM/ft²	**1.02**	CFM/ft²			

Ventilation Sizing Summary for AHU-8 [Dining]

Project Name: Tech 2 10/31/2005
Prepared by: psuae 03:36AM

1. Summary

Ventilation Sizing Method ..... **Sum of Space OA Airflows**
Design Ventilation Airflow Rate ..... **3825** CFM

2. Space Ventilation Analysis Table

Zone Name / Space Name	Mult.	Floor Area (ft²)	Maximum Occupants	Maximum Supply Air (CFM)	Required Outdoor Air (CFM/person)	Required Outdoor Air (CFM/ft²)	Required Outdoor Air (CFM)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (CFM)
Zone 1									
C15 - Student Ding	1	3739.0	255.0	3825.0	15.00	0.00	0.0	0.0	3825.0
Totals (incl. Space Multipliers)				**3825.0**					**3825.0**

Air System Design Load Summary for AHU-8 [Dining]

Project Name: Tech 2
Prepared by: psuae

10/31/2005
03:36AM

	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Aug 1500 COOLING OA DB / WB 92.0 °F / 74.0 °F			HEATING DATA AT DES HTG HEATING OA DB / WB 13.0 °F / 10.4 °F		
ZONE LOADS	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**
Window & Skylight Solar Loads	0 ft²	0	-	0 ft²	-	-
Wall Transmission	1156 ft²	1728	-	1156 ft²	5738	-
Roof Transmission	0 ft²	0	-	0 ft²	0	-
Window Transmission	0 ft²	0	-	0 ft²	0	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	0 ft²	0	-	0 ft²	0	-
Floor Transmission	0 ft²	0	-	0 ft²	0	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	0 ft²	0	-	0 ft²	0	-
Overhead Lighting	8076 W	23473	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	0 W	0	-	0	0	-
People	255	50911	52275	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	0% / 0%	0	0	0%	0	0
>> Total Zone Loads	**-**	**76112**	**52275**	**-**	**5738**	**0**
Zone Conditioning	-	83896	52275	-	5611	0
Plenum Wall Load	0%	0	-	0	0	-
Plenum Roof Load	0%	0	-	0	0	-
Plenum Lighting Load	0%	0	-	0	0	-
Return Fan Load	3825 CFM	5512	-	3825 CFM	-5512	-
Ventilation Load	3825 CFM	41534	14999	3825 CFM	248440	0
Supply Fan Load	3825 CFM	0	-	3825 CFM	0	-
Space Fan Coil Fans	-	0	-	-	0	-
Duct Heat Gain / Loss	0%	0	-	0%	0	-
>> Total System Loads	**-**	**130942**	**67274**	**-**	**248539**	**0**
Central Cooling Coil	-	131147	67274	-	0	0
Central Heating Coil	-	0	-	-	95977	-
Preheat Coil	-	0	-	-	152681	-
>> Total Conditioning	**-**	**131147**	**67274**	**-**	**248659**	**0**
Key:	**Positive values are clg loads Negative values are htg loads**			**Positive values are htg loads Negative values are clg loads**		

Air System Sizing Summary for AHU-9 [Plant Operations]

Project Name: Tech 2 — 10/31/2005
Prepared by: psuae — 03:38AM

Air System Information

Air System Name	**AHU-9 [Plant Operations]**	Number of zones	**17**
Equipment Class	**PKG VERT**	Floor Area	**6223.0** ft²
Air System Type	**CAV/RH**	Location	**New York La Guardia, New York**

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	**Sum of space airflow rates**	Calculation Months	**Jan to Dec**
Space CFM	**Individual peak space loads**	Sizing Data	**Calculated**

Central Cooling Coil Sizing Data

Total coil load	**9.6**	Tons	Load occurs at	**Jul 1500**	
Total coil load	**115.8**	MBH	OA DB / WB	**92.0 / 74.0**	°F
Sensible coil load	**85.9**	MBH	Entering DB / WB	**85.7 / 68.3**	°F
Coil CFM at Jul 1500	**2597**	CFM	Leaving DB / WB	**55.0 / 53.5**	°F
Max block CFM	**2597**	CFM	Coil ADP	**51.6**	°F
Sum of peak zone CFM	**2597**	CFM	Bypass Factor	**0.100**	
Sensible heat ratio	**0.742**		Resulting RH	**43**	%
ft²/Ton	**645.1**		Design supply temp.	**55.0**	°F
BTU/(hr-ft²)	**18.6**		Zone T-stat Check	**17 of 17**	OK
Water flow @ 10.0 °F rise	**N/A**		Max zone temperature deviation	**0.0**	°F

Preheat Coil Sizing Data

No heating coil loads occurred during this calculation.

Supply Fan Sizing Data

Actual max CFM	**2597**	CFM	Fan motor BHP	**0.00**	BHP
Standard CFM	**2594**	CFM	Fan motor kW	**0.00**	kW
Actual max CFM/ft²	**0.42**	CFM/ft²	Fan static	**0.00**	in wg

Return Fan Sizing Data

Actual max CFM	**2597**	CFM	Fan motor BHP	**2.95**	BHP
Standard CFM	**2594**	CFM	Fan motor kW	**2.20**	kW
Actual max CFM/ft²	**0.42**	CFM/ft²	Fan static	**3.90**	in wg

Outdoor Ventilation Air Data

Design airflow CFM	**840**	CFM	CFM/person	**15.00**	CFM/person
CFM/ft²	**0.13**	CFM/ft²			

Ventilation Sizing Summary for AHU-9 [Plant Operations]

Project Name: Tech 2
Prepared by: psuae

10/31/2005
03:38AM

1. Summary

Ventilation Sizing Method ..... **Sum of Space OA Airflows**
Design Ventilation Airflow Rate ..... **840** CFM

2. Space Ventilation Analysis Table

Zone Name / Space Name	Mult.	Floor Area (ft²)	Maximum Occupants	Maximum Supply Air (CFM)	Required Outdoor Air (CFM/person)	Required Outdoor Air (CFM/ft²)	Required Outdoor Air (CFM)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (CFM)
Zone 1									
C01 - Govt. Clubs Pub	1	504.0	12.0	497.9	15.00	0.00	0.0	0.0	180.0
Zone 2									
C01A - Office	1	100.0	1.0	124.9	15.00	0.00	0.0	0.0	15.0
Zone 3									
C01B - Office	1	105.0	1.0	106.8	15.00	0.00	0.0	0.0	15.0
Zone 4									
C06 - W. Corridor	1	941.0	5.0	171.5	15.00	0.00	0.0	0.0	75.0
Zone 5									
C09 - Year Round Storage	1	336.0	1.0	141.3	15.00	0.00	0.0	0.0	15.0
Zone 6									
C14 - Student Store	1	167.0	1.0	121.4	15.00	0.00	0.0	0.0	15.0
Zone 7									
C14A - Student St. Offce	1	161.0	1.0	162.1	15.00	0.00	0.0	0.0	15.0
Zone 8									
C17 - Staff Lunch	1	602.0	20.0	346.7	15.00	0.00	0.0	0.0	300.0
Zone 9									
C23 - Corridor	1	437.0	2.0	130.4	15.00	0.00	0.0	0.0	30.0
Zone 10									
C31 - Custod. Male Lockr	1	91.0	1.0	34.8	15.00	0.00	0.0	0.0	15.0
Zone 11									
C32 - Custod. Shop/Strge	1	405.0	1.0	128.1	15.00	0.00	0.0	0.0	15.0
Zone 12									
C33 - Custod. Female Lck	1	91.0	1.0	34.8	15.00	0.00	0.0	0.0	15.0
Zone 13									
C35 - Furn. Storage	1	151.0	1.0	94.5	15.00	0.00	0.0	0.0	15.0
Zone 14									
C36 - Vault	1	485.0	1.0	154.4	15.00	0.00	0.0	0.0	15.0
Zone 15									
C37 Vault Anter. Rm.	1	104.0	1.0	61.8	15.00	0.00	0.0	0.0	15.0
Zone 16									
C38 - N. Corridor	1	1074.0	5.0	217.4	15.00	0.00	0.0	0.0	75.0
Zone 17									
C39 - Receiving & Supply	1	469.0	1.0	68.6	15.00	0.00	0.0	0.0	15.0
Totals (incl. Space Multipliers)				**2597.2**					**840.0**

Air System Design Load Summary for AHU-9 [Plant Operations]

Project Name: Tech 2 10/31/2005
Prepared by: psuae 03:38AM

	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 1500 COOLING OA DB / WB 92.0 °F / 74.0 °F			HEATING DATA AT DES HTG HEATING OA DB / WB 13.0 °F / 10.4 °F		
ZONE LOADS	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**
Window & Skylight Solar Loads	0 ft²	0	-	0 ft²	-	-
Wall Transmission	2197 ft²	3594	-	2197 ft²	10906	-
Roof Transmission	0 ft²	0	-	0 ft²	0	-
Window Transmission	0 ft²	0	-	0 ft²	0	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	0 ft²	0	-	0 ft²	0	-
Floor Transmission	0 ft²	0	-	0 ft²	0	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	0 ft²	0	-	0 ft²	0	-
Overhead Lighting	11700 W	34004	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	4087 W	13023	-	0	0	-
People	56	11180	11480	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	0% / 0%	0	0	0%	0	0
>> Total Zone Loads	**-**	**61801**	**11480**	**-**	**10906**	**0**
Zone Conditioning	-	69938	11480	-	10258	0
Plenum Wall Load	0%	0	-	0	0	-
Plenum Roof Load	0%	0	-	0	0	-
Plenum Lighting Load	0%	0	-	0	0	-
Return Fan Load	2597 CFM	7509	-	2597 CFM	-7509	-
Ventilation Load	840 CFM	8482	18341	840 CFM	53294	0
Supply Fan Load	2597 CFM	0	-	2597 CFM	0	-
Space Fan Coil Fans	-	0	-	-	0	-
Duct Heat Gain / Loss	0%	0	-	0%	0	-
>> Total System Loads	**-**	**85929**	**29821**	**-**	**56043**	**0**
Central Cooling Coil	-	85929	29824	-	0	0
Preheat Coil	-	0	-	-	0	-
Terminal Reheat Coils	-	0	-	-	56023	-
>> Total Conditioning	**-**	**85929**	**29824**	**-**	**56023**	**0**
Key:	**Positive values are clg loads Negative values are htg loads**			**Positive values are htg loads Negative values are clg loads**		

Air System Sizing Summary for AHU-10 [Orchestra]

Project Name: Tech 2 — 10/31/2005
Prepared by: psuae — 03:39AM

Air System Information

Air System Name	**AHU-10 [Orchestra]**	Number of zones	**1**
Equipment Class	**PKG VERT**	Floor Area	**1711.0** ft²
Air System Type	**SZCAV**	Location	**New York La Guardia, New York**

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	**Sum of space airflow rates**	Calculation Months	**Jan to Dec**
Space CFM	**Individual peak space loads**	Sizing Data	**Calculated**

Central Cooling Coil Sizing Data

Total coil load	**7.9**	Tons	Load occurs at	**Jul 1500**	
Total coil load	**95.3**	MBH	OA DB / WB	**92.0 / 74.0**	°F
Sensible coil load	**68.9**	MBH	Entering DB / WB	**87.1 / 70.7**	°F
Coil CFM at Jul 1500	**2308**	CFM	Leaving DB / WB	**59.4 / 58.0**	°F
Max block CFM	**2308**	CFM	Coil ADP	**56.3**	°F
Sum of peak zone CFM	**2308**	CFM	Bypass Factor	**0.100**	
Sensible heat ratio	**0.723**		Resulting RH	**50**	%
ft²/Ton	**215.4**		Design supply temp.	**58.0**	°F
BTU/(hr-ft²)	**55.7**		Zone T-stat Check	**1 of 1**	OK
Water flow @ 10.0 °F rise	**N/A**		Max zone temperature deviation	**0.0**	°F

Central Heating Coil Sizing Data

Max coil load	**59.4**	MBH	Load occurs at	**Des Htg**	
Coil CFM at Des Htg	**2308**	CFM	BTU/(hr-ft²)	**34.7**	
Max coil CFM	**2308**	CFM	Ent. DB / Lvg DB	**50.0 / 73.8**	°F
Water flow @ 20.0 °F drop	**N/A**				

Preheat Coil Sizing Data

Max coil load	**7.6**	MBH	Load occurs at	**Des Htg**	
Coil CFM at Des Htg	**2308**	CFM	Ent. DB / Lvg DB	**46.9 / 50.0**	°F
Max coil CFM	**2308**	CFM			
Water flow @ 20.0 °F drop	**N/A**				

Supply Fan Sizing Data

Actual max CFM	**2308**	CFM	Fan motor BHP	**0.00**	BHP
Standard CFM	**2306**	CFM	Fan motor kW	**0.00**	kW
Actual max CFM/ft²	**1.35**	CFM/ft²	Fan static	**0.00**	in wg

Return Fan Sizing Data

Actual max CFM	**2308**	CFM	Fan motor BHP	**2.83**	BHP
Standard CFM	**2306**	CFM	Fan motor kW	**2.11**	kW
Actual max CFM/ft²	**1.35**	CFM/ft²	Fan static	**3.90**	in wg

Outdoor Ventilation Air Data

Design airflow CFM	**990**	CFM	CFM/person	**15.00**	CFM/person
CFM/ft²	**0.58**	CFM/ft²			

Ventilation Sizing Summary for AHU-10 [Orchestra]

Project Name: Tech 2 10/31/2005
Prepared by: psuae 03:39AM

1. Summary

Ventilation Sizing Method ..... **Sum of Space OA Airflows**
Design Ventilation Airflow Rate ..... **990** CFM

2. Space Ventilation Analysis Table

Zone Name / Space Name	Mult.	Floor Area (ft²)	Maximum Occupants	Maximum Supply Air (CFM)	Required Outdoor Air (CFM/person)	Required Outdoor Air (CFM/ft²)	Required Outdoor Air (CFM)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (CFM)
Zone 1									
401 - Orchestra	1	1711.0	66.0	2308.2	15.00	0.00	0.0	0.0	990.0
Totals (incl. Space Multipliers)				**2308.2**					**990.0**

Air System Design Load Summary for AHU-10 [Orchestra]

Project Name: Tech 2
Prepared by: psuae

10/31/2005
03:39AM

	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 1500 COOLING OA DB / WB 92.0 °F / 74.0 °F			HEATING DATA AT DES HTG HEATING OA DB / WB 13.0 °F / 10.4 °F		
ZONE LOADS	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**
Window & Skylight Solar Loads	168 ft²	5873	-	168 ft²	-	-
Wall Transmission	1123 ft²	1514	-	1123 ft²	5386	-
Roof Transmission	0 ft²	0	-	0 ft²	0	-
Window Transmission	168 ft²	1205	-	168 ft²	6033	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	0 ft²	0	-	0 ft²	0	-
Floor Transmission	0 ft²	0	-	0 ft²	0	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	0 ft²	0	-	0 ft²	0	-
Overhead Lighting	4493 W	13058	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	4472 W	14250	-	0	0	-
People	66	13177	13530	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	0% / 0%	0	0	0%	0	0
>> Total Zone Loads	**-**	**49076**	**13530**	**-**	**11418**	**0**
Zone Conditioning	-	52472	13530	-	10764	0
Plenum Wall Load	0%	0	-	0	0	-
Plenum Roof Load	0%	0	-	0	0	-
Plenum Lighting Load	0%	0	-	0	0	-
Return Fan Load	2308 CFM	7207	-	2308 CFM	-7207	-
Ventilation Load	990 CFM	9221	12888	990 CFM	63464	0
Supply Fan Load	2308 CFM	0	-	2308 CFM	0	-
Space Fan Coil Fans	-	0	-	-	0	-
Duct Heat Gain / Loss	0%	0	-	0%	0	-
>> Total System Loads	**-**	**68901**	**26418**	**-**	**67021**	**0**
Central Cooling Coil	-	68901	26425	-	0	0
Central Heating Coil	-	0	-	-	59387	-
Preheat Coil	-	0	-	-	7634	-
>> Total Conditioning	**-**	**68901**	**26425**	**-**	**67021**	**0**
Key:	**Positive values are clg loads Negative values are htg loads**			**Positive values are htg loads Negative values are clg loads**		

Annual Cost Summary

Table 1. Annual Costs

Component	Bronx School for Law ($)
Air System Fans	143,655
Cooling	6,147
Heating	9,340
Pumps	0
Cooling Tower Fans	0
HVAC Sub-Total	**159,142**
Lights	280,872
Electric Equipment	291,499
Misc. Electric	0
Misc. Fuel Use	0
Non-HVAC Sub-Total	**572,371**
Grand Total	**731,513**

Table 2. Annual Cost per Unit Floor Area

Component	Bronx School for Law ($/ft²)
Air System Fans	1.703
Cooling	0.073
Heating	0.111
Pumps	0.000
Cooling Tower Fans	0.000
HVAC Sub-Total	**1.887**
Lights	3.330
Electric Equipment	3.456
Misc. Electric	0.000
Misc. Fuel Use	0.000
Non-HVAC Sub-Total	**6.786**
Grand Total	**8.673**
Gross Floor Area (ft²)	84342.0
Conditioned Floor Area (ft²)	84342.0

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

Table 3. Component Cost as a Percentage of Total Cost

Component	Bronx School for Law (%)
Air System Fans	19.6
Cooling	0.8
Heating	1.3
Pumps	0.0
Cooling Tower Fans	0.0
HVAC Sub-Total	**21.8**
Lights	38.4
Electric Equipment	39.8
Misc. Electric	0.0
Misc. Fuel Use	0.0
Non-HVAC Sub-Total	**78.2**
Grand Total	**100.0**

Annual Energy and Emissions Summary

Table 1. Annual Costs

Component	Bronx School for Law ($)
HVAC Components	
Electric	156,252
Natural Gas	2,892
Fuel Oil	0
Propane	0
Remote HW	0
Remote Steam	0
Remote CW	0
HVAC Sub-Total	**159,144**
Non-HVAC Components	
Electric	572,376
Natural Gas	0
Fuel Oil	0
Propane	0
Remote HW	0
Remote Steam	0
Non-HVAC Sub-Total	**572,376**
Grand Total	**731,520**

Table 2. Annual Energy Consumption

Component	Bronx School for Law
HVAC Components	
Electric (kWh)	858,525
Natural Gas (Therm)	2,582
Fuel Oil (na)	0
Propane (na)	0
Remote HW (na)	0
Remote Steam (na)	0
Remote CW (na)	0
Non-HVAC Components	
Electric (kWh)	3,144,923
Natural Gas (Therm)	0
Fuel Oil (na)	0
Propane (na)	0
Remote HW (na)	0
Remote Steam (na)	0
Totals	
Electric (kWh)	4,003,448
Natural Gas (Therm)	2,582
Fuel Oil (na)	0
Propane (na)	0
Remote HW (na)	0
Remote Steam (na)	0
Remote CW (na)	0

Table 3. Annual Emissions

Component	Bronx School for Law
CO2 (lb)	0
SO2 (kg)	0
NOx (kg)	0

Table 4. Annual Cost per Unit Floor Area

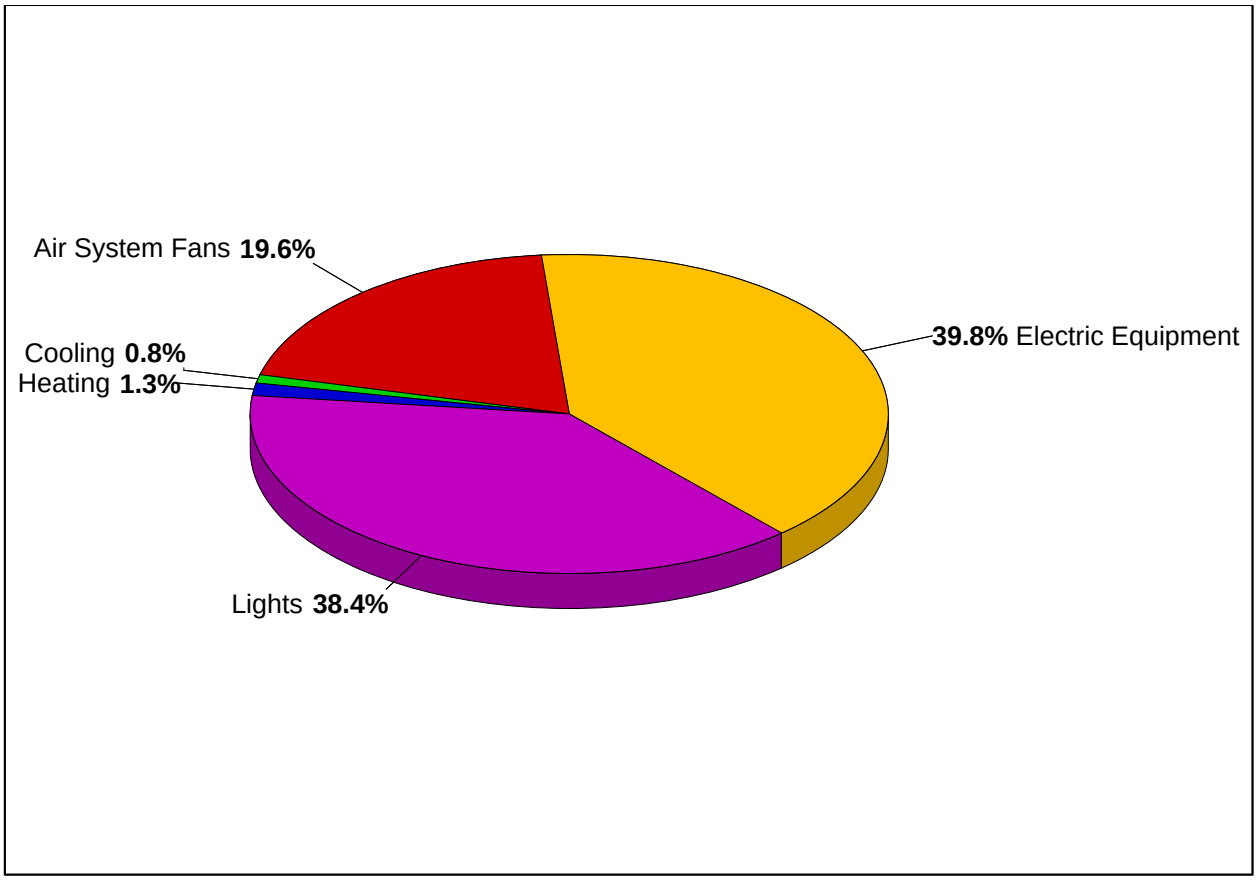
Component	Bronx School for Law ($/ft²)
HVAC Components	
Electric	1.853
Natural Gas	0.034
Fuel Oil	0.000
Propane	0.000
Remote HW	0.000
Remote Steam	0.000
Remote CW	0.000
HVAC Sub-Total	**1.887**
Non-HVAC Components	
Electric	6.786
Natural Gas	0.000
Fuel Oil	0.000
Propane	0.000
Remote HW	0.000
Remote Steam	0.000
Non-HVAC Sub-Total	**6.786**
Grand Total	**8.673**
Gross Floor Area (ft²)	84342.0
Conditioned Floor Area (ft²)	84342.0

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

Table 5. Component Cost as a Percentage of Total Cost

Component	Bronx School for Law (%)
HVAC Components	
Electric	21.4
Natural Gas	0.4
Fuel Oil	0.0
Propane	0.0
Remote HW	0.0
Remote Steam	0.0
Remote CW	0.0
HVAC Sub-Total	**21.8**
Non-HVAC Components	
Electric	78.2
Natural Gas	0.0
Fuel Oil	0.0
Propane	0.0
Remote HW	0.0
Remote Steam	0.0
Non-HVAC Sub-Total	**78.2**
Grand Total	**100.0**

Annual Component Costs - Bronx School for Law



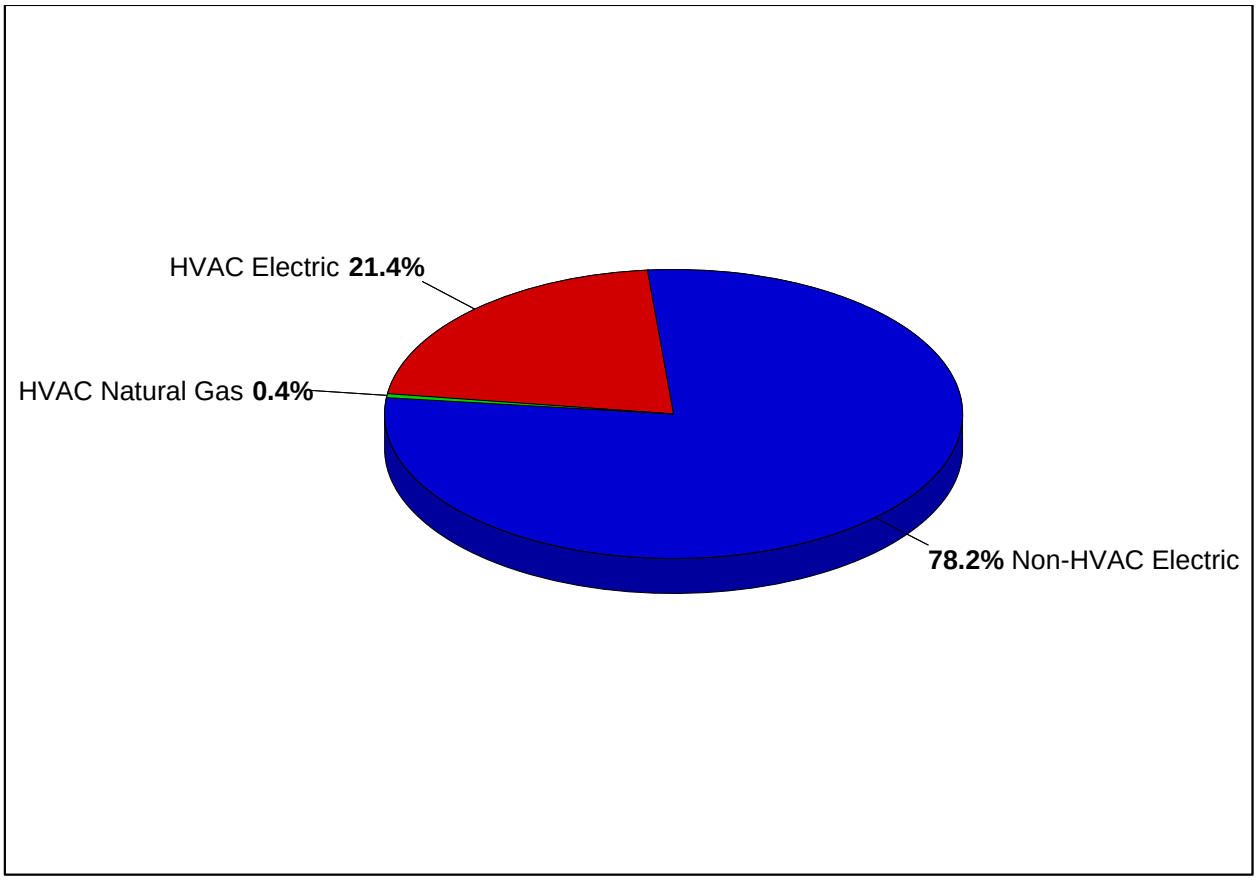
1. Annual Costs

Component	Annual Cost ($)	($/ft²)	Percent of Total (%)
Air System Fans	143,655	1.703	19.6
Cooling	6,147	0.073	0.8
Heating	9,340	0.111	1.3
Pumps	0	0.000	0.0
Cooling Tower Fans	0	0.000	0.0
HVAC Sub-Total	**159,142**	**1.887**	**21.8**
Lights	280,872	3.330	38.4
Electric Equipment	291,499	3.456	39.8
Misc. Electric	0	0.000	0.0
Misc. Fuel Use	0	0.000	0.0
Non-HVAC Sub-Total	**572,371**	**6.786**	**78.2**
Grand Total	**731,513**	**8.673**	**100.0**

Note: Cost per unit floor area is based on the gross building floor area.

Gross Floor Area ..... **84342.0** ft²
Conditioned Floor Area ..... **84342.0** ft²

Annual Energy Costs - Bronx School for Law



1. Annual Costs

Component	Annual Cost ($/yr)	($/ft²)	Percent of Total (%)
HVAC Components			
Electric	156,251	1.853	21.4
Natural Gas	2,892	0.034	0.4
Fuel Oil	0	0.000	0.0
Propane	0	0.000	0.0
Remote Hot Water	0	0.000	0.0
Remote Steam	0	0.000	0.0
Remote Chilled Water	0	0.000	0.0
HVAC Sub-Total	**159,144**	**1.887**	**21.8**
Non-HVAC Components			
Electric	572,376	6.786	78.2
Natural Gas	0	0.000	0.0
Fuel Oil	0	0.000	0.0
Propane	0	0.000	0.0
Remote Hot Water	0	0.000	0.0
Remote Steam	0	0.000	0.0
Non-HVAC Sub-Total	**572,376**	**6.786**	**78.2**
Grand Total	**731,520**	**8.673**	**100.0**

Note: Cost per unit floor area is based on the gross building floor area.

Gross Floor Area ..... **84342.0** ft²
Conditioned Floor Area ..... **84342.0** ft²

Monthly Energy Use by Component - Bronx School for Law

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1. Monthly Energy Use by System Component

Component	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Air System Fans (kWh)	63494	57780	65214	64981	68578	67395	70279	70247	66713	67433	63313	63886
Cooling												
Electric (kWh)	0	0	129	1560	3940	5693	6261	6311	5448	3482	930	19
Natural Gas (Therm)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel Oil (na)	0	0	0	0	0	0	0	0	0	0	0	0
Propane (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote HW (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote Steam (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote CW (na)	0	0	0	0	0	0	0	0	0	0	0	0
Heating												
Electric (kWh)	6441	5556	5030	3443	1514	372	307	338	689	1973	4450	5317
Natural Gas (Therm)	713	640	431	75	6	0	0	0	0	23	188	506
Fuel Oil (na)	0	0	0	0	0	0	0	0	0	0	0	0
Propane (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote HW (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote Steam (na)	0	0	0	0	0	0	0	0	0	0	0	0
Pumps (kWh)	0	0	0	0	0	0	0	0	0	0	0	0
Clg. Tower Fans (kWh)	0	0	0	0	0	0	0	0	0	0	0	0
Lighting (kWh)	131071	118386	131071	126843	131071	126843	131071	131071	126843	131071	126843	131071
Electric Eqpt. (kWh)	136032	122863	136032	131639	136032	131639	136032	136032	131639	136032	131639	136032
Misc. Electric (kWh)	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Fuel												
Natural Gas (Therm)	0	0	0	0	0	0	0	0	0	0	0	0
Propane (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote HW (na)	0	0	0	0	0	0	0	0	0	0	0	0
Remote Steam (na)	0	0	0	0	0	0	0	0	0	0	0	0

Monthly Energy Costs - Bronx School for Law

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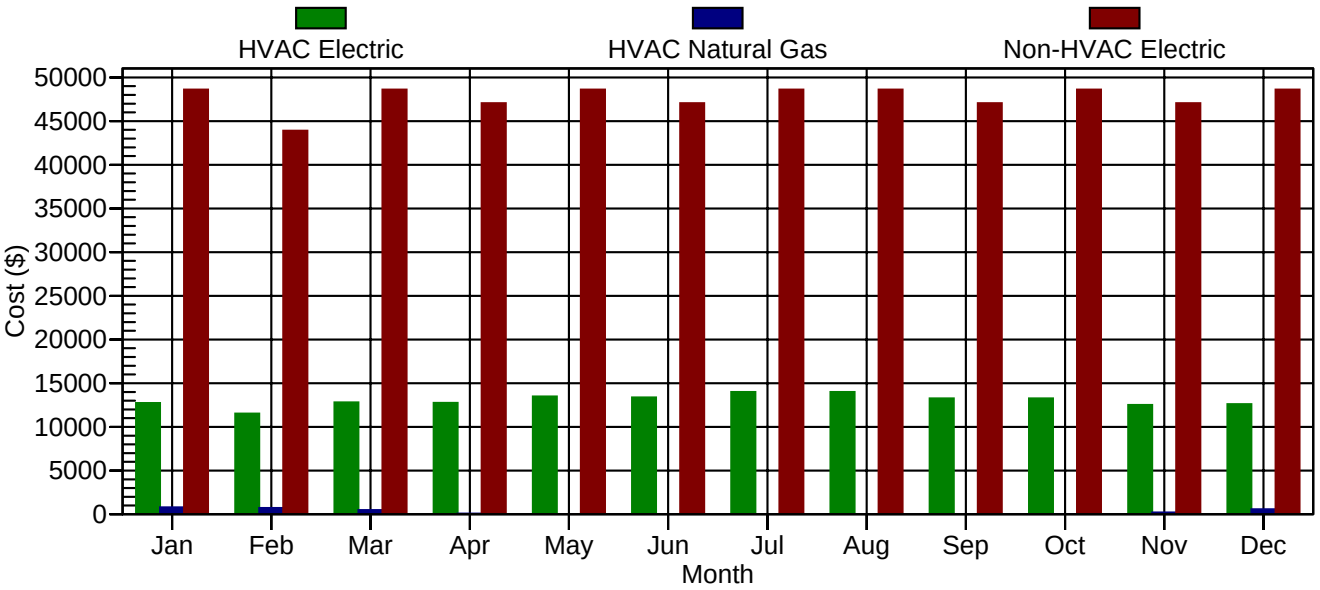

1. HVAC Costs

Month	Electric ($)	Natural Gas ($)	Fuel Oil ($)	Propane ($)	Remote Hot Water ($)	Remote Steam ($)	Remote Chilled Water ($)
January	12,729	798	0	0	0	0	0
February	11,527	717	0	0	0	0	0
March	12,808	483	0	0	0	0	0
April	12,738	84	0	0	0	0	0
May	13,474	6	0	0	0	0	0
June	13,370	0	0	0	0	0	0
July	13,985	0	0	0	0	0	0
August	13,995	0	0	0	0	0	0
September	13,259	0	0	0	0	0	0
October	13,266	25	0	0	0	0	0
November	12,503	211	0	0	0	0	0
December	12,599	567	0	0	0	0	0
Total	**156,251**	**2,892**	**0**	**0**	**0**	**0**	**0**

2. Non-HVAC Costs

Month	Electric ($)	Natural Gas ($)	Fuel Oil ($)	Propane ($)	Remote Hot Water ($)	Remote Steam ($)
January	48,613	0	0	0	0	0
February	43,909	0	0	0	0	0
March	48,613	0	0	0	0	0
April	47,045	0	0	0	0	0
May	48,613	0	0	0	0	0
June	47,045	0	0	0	0	0
July	48,613	0	0	0	0	0
August	48,613	0	0	0	0	0
September	47,045	0	0	0	0	0
October	48,613	0	0	0	0	0
November	47,045	0	0	0	0	0
December	48,613	0	0	0	0	0
Total	**572,376**	**0**	**0**	**0**	**0**	**0**

Monthly Energy Use by Energy Type - Bronx School for Law

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1. HVAC Energy Use

Month	Electric (kWh)	Natural Gas (Therm)	Fuel Oil (na)	Propane (na)	Remote HW (na)	Remote Steam (na)	Remote CW (na)
Jan	69,938	713	0	0	0	0	0
Feb	63,336	640	0	0	0	0	0
Mar	70,376	431	0	0	0	0	0
Apr	69,987	75	0	0	0	0	0
May	74,033	6	0	0	0	0	0
Jun	73,460	0	0	0	0	0	0
Jul	76,843	0	0	0	0	0	0
Aug	76,893	0	0	0	0	0	0
Sep	72,852	0	0	0	0	0	0
Oct	72,888	23	0	0	0	0	0
Nov	68,695	188	0	0	0	0	0
Dec	69,224	506	0	0	0	0	0
Totals	858,525	2,582	0	0	0	0	0

2. Non-HVAC Energy Use

Month	Electric (kWh)	Natural Gas (Therm)	Fuel Oil (na)	Propane (na)	Remote HW (na)	Remote Steam (na)
Jan	267,102	0	0	0	0	0
Feb	241,256	0	0	0	0	0
Mar	267,102	0	0	0	0	0
Apr	258,488	0	0	0	0	0
May	267,102	0	0	0	0	0
Jun	258,488	0	0	0	0	0
Jul	267,102	0	0	0	0	0
Aug	267,102	0	0	0	0	0
Sep	258,488	0	0	0	0	0
Oct	267,102	0	0	0	0	0
Nov	258,488	0	0	0	0	0
Dec	267,102	0	0	0	0	0
Totals	3,144,923	0	0	0	0	0