Nassau Community College Life Sciences Building

Garden City, New York

# Technical Report One ASHRAE Standard 62.1-2007 and Standard 90.1-2007 Analysis



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# **Executive Summary**

The purpose of this report is to determine if new building on Nassau Community College's campus are incompliance with both ASHRAE Standard 62.1-2007 and Standard 90.1-2007. The Life Sciences Building is a new 72,400 square foot laboratory building that will house both the chemistry department as well as the upcoming nursing department. The building will be comprised of general lecture halls, computer labs, organic and inorganic chemistry laboratories and office spaces for the faculty.

An analysis of ASHRAE Standard 62.1-2007, Ventilation for Acceptable Indoor Air Quality, was the first standard to be evaluated. The purpose of this standard is to specify minimum ventilation rates and other means to provide acceptable indoor air quality for the building's occupants. Two of the standard's section were selected, Section 5 and Section 6. These two were selected because they are directly related to the design and specifications of the building rather than the outdoor air, operation and maintenance or construction, which may be out of the designer's control. Section 5 incorporates requirements in the building mechanical components that control indoor air quality such as outdoor intake requirements, particulate filtration and combustion air. All requirements under Section 5 were checked against the Life Sciences Building and were determined to be compliant. Section 6 diagrams a procedure in order to calculate the minimum ventilation air that is required for acceptable indoor air quality. All air handlers in the Life Sciences Building were selected or analysis for a compliance check.

ASHRAE Standard 90.1-2007, Energy Standard for Buildings Except Low-Rise Residential Buildings, was the second analysis in this report. The purpose of this standard is to provide minimum equipment efficiencies and insulation values in order to create an energy efficient design. The Life Science Building was checked against Sections 5 through 10 in this standard. Neither the building's exterior glazing to wall ratio, nor were the U-values for the exterior walls incompliance with this standard. Furthermore, efficiencies for certain fans did not meet the criteria set forth by this standard. In order to make up for the exterior glazing to wall ratio, the glazing far surpass the requirements for both SHGC and U-value. Power distribution and lighting densities were determined to be in compliance with this standard.

The Life Sciences Building has submitted its application for LEED certification and is striving for LEED Gold. Therefore, it is not surprising that where requirements failed for aesthetic purposes, like the percent glazing ratio, other requirements overachieved. This report will provide a more detailed breakdown of each section in each standard and illustrate which parts of the system fails according to the standard and which parts succeed.

# **Building Overview**

The Nassau Community College Life Sciences Building will house the expanding Chemistry Department and rising Nursing Department. The building will be a cluster of general lecture halls, computer labs, inorganic and organic laboratories, practical skills nursing rooms and faculty offices. The Life Science Building is a "U-shape" where the courtyard façade is a floor-to-floor glass curtain wall system. Faculty offices on all three floors are facing the courtyard and can have periods of high heat transfer through the curtain wall. The classrooms, lecture halls and laboratories, are located along the opposite exterior perimeter. The façade is composed of copper rain screen panels and long strips of glazing. There may also be periods of high heat transfer through this façade, but it was designed for a high aesthetic appeal rather than thermal function.

The design of the Life Sciences Building was highly influenced by the occupants, both students and faculty, as well as its use. It was designed to easily connect to the greater campus with spaces to accommodate the overall student population, not just the Chemistry and Nursing Departments. Furthermore, function played a role in the design because of the hazardous chemical storage and waste spaces that need to be guarded under restricted access but readily available to the classrooms for learning.

# **Mechanical System Overview**

The Life Sciences Building receives conditioned air from three air handlers located in the Penthouse. One of the air handlers is a 100 percent outdoor air unit due to the nature of the chemistry laboratories that it serves. The supply air to the laboratory spaces is exhausted through a laboratory exhaust system. Three large exhaust fans operate as one unit, which pulls contaminated air from the laboratories. Because this air handler is a 100 percent outdoor air unit, a heat recover run-around loop transfers sensible heat from the exhaust fans to the air handler to either pre-heat or pre-cool the incoming outdoor air. All three air handlers are part of a variable air volume (VAV) system with terminal reheat coils.

The Life Sciences Building as well as the Nassau Community College campus is served by a campus-wide high temperature hot water and chilled water system. The high temperature hot water creates building hot water through several heat exchangers for the perimeter radiation, fan coils, cabinet unit heaters and air handler pre-heat coils. The 100 percent outdoor air unit's pre-heat coil uses a glycol system, which is heated via heat exchanger by the high temperature hot water system. A primary/secondary system is utilized with the chilled water and high temperature hot water systems. Booster pumps have been designed for the chilled water system in the event that there is a decrease in pressure in the primary line. The majority of the

heat exchangers and pumps are located along with the service entrance in the basement mechanical equipment room.

The Central Utility Plant that serves Nassau Community College is operated by Suez Energy and is comprised of a boiler and chiller plant. This 60 MW cogeneration facility produces 250 psig steam, 270°F high temperature hot water and 42°F chilled water that are distributed to various surrounding facilities such as Nassau University Medical Center (NUMC), Nassau Veterans Memorial Coliseum and Long Island Marriott Hotel. Figure 1 below is a diagram provided by Parsons Brinckerhoff's report that shows the location of the Central Utility Plant in red as well as the steam loads in blue stars and the high temperature hot water loads in yellow stars. Nassau Community College is denoted by the dotted yellow circle. Nassau Community College uses 50.6% of the high temperature hot water and chilled water produced by the Central Utility Plant compared to all buildings tapped into the high temperature hot water service.



Figure 1 – Location of Central Utility Plan (Red) and NCC (Yellow)

# ASHRAE Standard 62.1-2007 Analysis

# **Section 5 Analysis**

### Section 5.1 Natural Ventilation

Exterior spaces have operable windows but all spaces are ventilated mechanically. Therefore, natural ventilation is not a method of ventilation for this building.

# Section 5.2 Ventilation Air Distribution

The Life Sciences Building is able to meet the minimum ventilation requirement under and load condition. The construction documents specify explicitly a minimum airflow rate through each VAV terminal unit that complies with Section 6 of Standard 62.1. The discussion of Section 6 is discussed later in this report.

# Section 5.3 Exhaust Duct Location

Chemistry laboratories, hazardous chemical storage, hazardous waste storage as well as general chemical storage rooms are all ducted and negatively pressurized relative to its surroundings and exhausted through laboratory exhaust fans located in the penthouse. General exhaust ducts are specified to be negatively pressurized to 2 in. Wg. relative to the surroundings and laboratory exhaust ducts are to be 3 in. Wg. relative to the surroundings. The laboratory exhaust fans are specified to maintain an exhaust intake velocity of 4,000 FPM through the stack in order to provide the proper clearance plume.

### Section 5.4 Ventilation System Controls

The mechanical ventilation controls are designed to allow reduction in airflow when the spaces within each zone are unoccupied. Being that the Life Sciences Building is partly a VAV system, the VAV terminal units have been specified on the drawings to turn down to a minimum ventilation airflow rate that is greater than the minimum requirement given in Section 6 of Standard 62.1. Therefore, the Life Sciences Building complies with this section.

### Section 5.5 Airstream Surfaces

Duct liners exposed to airstreams are specified to comply with ASTM C 1071 and UL 181. ASTM C 1071 incorporates ASTM C 1338. Therefore, the Life Sciences Building complies with this section.

### Section 5.6 Outdoor Air Intakes

Noxious or dangerous exhausts are more than 30'. Therefore all outdoor air intakes are more than the minimum distance apart as per Table 5-1 in Standard 62.1. The main concern is the

laboratory exhausts fans, which are a minimum of 48 feet from an outdoor air intake louver. All louvers are specified to provide the appropriate rain entrainment resistance and contain a  $\frac{1}{2}$ " bird screen mounted flush with the louver. Therefore, all outdoor air intakes comply with this section.

# Section 5.7 Local Capture of Contaminants

The exhaust from spaces where contaminants could be an issue of indoor air quality in spaces such as the hazardous chemical storage or the chemical laboratory rooms are exhausted through the roof by dedicated laboratory exhaust fans.

### Section 5.8 Combustion Air

The emergency generator exhaust flue is ducted and sized with the appropriate CFM through and exhaust vent on located on the roof. An adequate amount of outdoor air to ensure a complete combustion process is ducted into the emergency generator room directly from the exterior. Therefore, the Life Sciences Building complies with this section.

### Section 5.9 Particulate Matter Removal

The filters located in the air handlers are specified to comply with ASHRAE Standard 52.2 and therefore comply with this section.

### Section 5.10 Dehumidification Systems

The Life Sciences Building is specified to maintain a maximum relative humidity ratio of 60%. Therefore, the Life Sciences Building complies with this section. The volume of return air is specified to be less than the volume of outdoor air in order to assure a positive building pressurization.

### Section 5.11 Drain Pans

Drain pans are specified to be of doubled-wall construction with the interior wall being stainless steel. The pan shall be pitched positively in two directions with a 2" minimum drain connection. Stacked cooling coils are specified to have intermediate drain pans or troughs to channel to main pan. The Life Sciences Building specifies that the drain pans to comply with ASHRAE Standard 62.1 and therefore complies with this section.

### Section 5.12 Finned-Tube Coils and Heat Exchangers

Drain pans are provided beneath each cooling coil assembly as per Section 5.11. No specification has been stated regarding the minimum 18 in. access space for the perimeter finned-tube radiation.

# Section 5.13 Humidifiers and Water-Spray Systems

The Life Sciences Building does not use humidifiers or water-spray systems. This section does not apply.

# Section 5.14 Access for Inspection, Cleaning and Maintenance

Access doors for each air handler are specified to be at least 24" by 60" located in the proper sections to allow access to each element of the unit. Appropriate clearances have been designated on the drawings for the removal and maintenance of the coils in each air handler. Access doors have been located for variable air volume box re-heat coils. The Life Science Building complies with this section.

# Section 5.15 Building Envelope and Interior Surfaces

A continuous moisture barrier is located behind exterior copper panels. For below grade walls, a continuous waterproof membrane will be used. Internal piping and ductwork that has the ability to fall below the local dew point temperature will be provided with preventative insulation. The Life Science Building complies with this section.

### Section 5.16 Buildings with Attached Parking Garages

No parking structure is attached to the Life Sciences Building. This section does not apply.

### Section 5.17 Air Classification and Recirculation

Part of the Life Sciences Building is Class 1 air, which is returned via plenum return from the offices, lecture rooms and general classrooms. This air can be re-circulated back into the building. Class 2 air from the restrooms and janitor's closets are ducted separately from other systems through a dedicated general exhaust system up through the roof. The chemistry laboratory, hazardous chemical storage, hazardous waste storage spaces contain Class 4 air by design and are isolated through a laboratory exhaust system up through the roof.

### Section 5.18 Requirements for Buildings Containing ETS Areas and ETS-Free Areas

The Life Science Building is applying for LEED certification and therefore is a non-smoking facility. This section does not apply.

# **Section 6 Analysis**

For the purpose of verifying the ventilation and exhaust requirements of ASHRAE Standard 62.1 Section 6, all air handlers (AHU-1, AHU-2 and AHU-3) were selected for the analysis. Each air handler is not restricted to one floor of the building, and due to the variety of different spaces it was beneficial to analyze all spaces requiring ventilation. The following are the sets of equations based on ASHRAE Standard 62.1-2007 Section 6 that are required for this analysis.

#### Ventilation Rate Procedure

Note: All tables and equations in this section refer to those found in ASHRAE Standard 62.1-2007

Breathing Zone Outdoor Airflow (V<sub>bz</sub>):

$$V_{bz} = R_{p+} \cdot P_z + R_a \cdot A_z \tag{Eq. 6-1}$$

where,

 $A_z$  = zone floor area (ft<sup>2</sup>)

 $P_z$  = zone population, the largest number of people expected to occupy the zone during typical usage. (Estimated values found in Table 6-1)

R<sub>p</sub> = outdoor airflow rate per person (CFM/person) (Values found in Table 6.1)

 $R_a$  = outdoor airflow rate per unit area (CFM/ft<sup>2</sup>) (Values found in Table 6.1)

Zone Air Distribution Effectiveness (E<sub>z</sub>):

Zone Outdoor Airflow (V<sub>oz</sub>):

$$V_{oz} = V_{bz} / E_z$$
 (Eq. 6-2)

Primary Outdoor Air Fraction (Z<sub>p</sub>):

$$Z_{p} = V_{oz} / V_{pz}$$
 (Eq. 6-5)

System Ventilation Efficiency (E<sub>v</sub>):

 $E_v$  is found in Table 6-3based on the maximum  $Z_p$  value

Uncorrected Outdoor Air Intake (V<sub>ou</sub>):

$$V_{ou} = D \cdot \Sigma_{all \ zones}(R_p \cdot P_z) + \Sigma_{all \ zones}(R_a \cdot A_z)$$
(Eq. 6-6)

Occupant Diversity (D):

$$D = P_s / \Sigma_{all zones} P_z$$
 (Eq. 6-7)

where, P<sub>s</sub> = system population

Outdoor Air Intake (V<sub>ot</sub>):

$$V_{ot} = V_{ou} / E_{v}$$
 (Eq. 6-8)

Appendix A contains the spreadsheet for each air handler used to calculate the ventilation based on the method described. For the majority of spaces occupancies were not calculated based on ASHRAE Standard 62.1 Table 6-1. Rather the design assumptions for occupancies were used when known. Furthermore, restrooms were categorized as janitor closets for the purpose of the spreadsheet because of the high airflow rate per square foot that would be necessary for ventilation. The vending area was categorized as a coffee station based on the assumptions put forth by the design team.

Appendix B provides a summary of each space grouped by air handler and illustrates its compliance with ASHRAE Standard 62.1-2007 Section 6 based on design airflow rates and minimum required airflow rates. As specified by the drawings, air handlers AHU-1 and AHU-2 are to supply a minimum of 12,775 CFM of outdoor air, which equates to 40 percent of the total supply airflow at the design condition. The ventilation rate procedure of Section 6 requires a minimum of 9,700 and 4,850 CFM of outdoor air for air handlers AHU-1 and AHU-2 respectively. Air handler AHU-3 is a 100 percent outdoor air unit, which supplies the laboratory spaces. The ventilation requirements for these spaces are far surpassed by the quantity supply air that has been designed. This calculation illustrates that the cooling design load quantity of supply air id the determining factor for the amount of airflow delivered to each space being served by AHU-3.

# ASHRAE Standard 62.1-2007 Summary

The HVAC design of the Life Sciences Building surpasses the requirements of Section 5 where the Section is applicable. The Life Sciences Building is applying for LEED certification, which effects the design considerations from the beginning.

The minimum ventilation requirements of Section 6 are exceeded in the design of Life Sciences Building. Two of the air handlers provide 40 percent of the supply air as outdoor at the design condition, which is more than the required ratio mandated by Section 6. The third air handler is a 100 percent outdoor air unit, which is designed to meet both the ventilation requirements and the room cooling loads. The 100 percent outdoor air unit will provide the laboratory and hazardous storages spaces with a safer environment.

# ASHRAE Standard 90.1-2007 Analysis

# Section 5 - Building Envelope

# 5.1.4 Climate Zone

The climate zone for Nassau Community College Life Sciences Building is located in Garden City, NY on Long Island, which corresponds to zone 4A. Zone 4A is defined by having mixed weather conditions as well as experiencing periods of high humidity. The climate zone was determined using Table B-1 in ASHRAE Standard 90.1-2007 or by viewing Figure 2 below.



Figure 2 – United States Climate Regions

# 5.4 Mandatory Provisions

The exterior envelope of the Life Sciences Building is specified on the drawings to be sealed where exterior door frames, fenestration and the copper rain screen panels join in order to prevent infiltration of unconditioned air.

The two building entrance to the Life Sciences Building contain vestibules that provide a barrier between the interior conditioned space and the exterior. The smallest of the vestibules has a distance of 10 feet between the exterior and interior doors, which is greater than the mandated 7 feet.

# 5.5 Prescriptive Building Envelope

The prescriptive building envelope method was used to determine the Life Sciences Building's compliance with Standard 90.1's building envelope requirements. Located in Table 5.5-4 in

Standard 90.1 are values corresponding to maximum U-values, R-values, C-values, F-values and SHGC for the appropriate assemblies. Standard 90.1 mandates that no more than 40% of a building's façade may be comprised of vertical fenestration as compared to exterior wall area. The summary of Standard 90.1's requirements and the Life Sciences Building's design can be viewed in Tables 2 through 4 below.

	Glazing Area (ft <sup>2</sup> )	Wall Area (ft²)	Percent Glazing	Standard 90.1 Compliance (Y/N)
Life Science Building	16,901	42,084	40.16%	N
Life Science Building	16,901	42,084	40.16%	

Table 1 – Total Building Glazing Area

The Life Sciences Building does not comply with Standard 90.1. This is due to the large storefront windows on the first floor that increase the aesthetic appeal of the building. Furthermore, the courtyard side of the building that houses the faculty offices contains a glass curtain wall that stretches from the ground to the third floor. This is to accommodate the faculty who contribute to the operations and education of the campus. The Life Sciences Building would only need a small adjustment in the windows for the smaller teaching classrooms in order to meet Standard 90.1 requirements

Exterior M	laterials	Prescribed No	onresidential	Prescribed N	Standard 90.1	
Element	Element	Assembly	Insulation	Assembly	Insulation	Compliance
Element	Construction	Maximum	Minimum	Maximum	Minimum	(Y/N)
Roof	Insulation Entirely above Deck	U-0.048	R-20.0 c.i.	U-0.06811	R-14.7	Y
Walls, Above Grade	Steel-Framed	U-0.064	R-9.5 c.i.	U-0.04678	R-21.4	Ν
Walls, Below Grade	Below-Grade Wall	C-1.140	NR	C-1.33	NR	Ν
Slab-On- Grade Floors	Unheated	F-0.730	NR	F-0.36	NR	Y

**Table 2 - Building Material Properties** 

Two of the exterior façade elements do not meet the requirements of Standard 90.1. The walls above grade as well as the walls below grade do not have the resistance required. The walls below grade to not pass because of the lack of insulation required. The above grade walls do not meet Standard 90.1 because the composition was selected based on aesthetics rather than function. In order to compensate for the thermal loss through the above grade walls, the curtain walls and windows far surpass the requirements for maximum U-value and maximum SHGC as seen in Table 4 below.

	Prescribed N	onresidential	Actual Desi	gn Assembly	Standard 90.1
Fenestration	Maximum U-Value	Maximum SHGC	Maximum U-Value	Maximum SHGC	Compliance (Y/N)
Metal Framing	U-0.50	SHGC-0.40	U-0.28	SHGC-0.27	Y

**Table 3 - Building Fenestration Properties** 

# Section 6 – Heating, Ventilating, and Air Conditioning

### 6.2 Compliance Path

Two methods are described in Standard 90.1 in order to evaluate the efficiency of the overall building mechanical system – the Simplified Approach Option or the Mandatory Provisions method.

# 6.3 The Simplified Approach Option for HVAC Systems

The Simplified Approach Option can be used if the building is two stories or fewer in height and in the gross floor area is less than 25,000 square feet. Since the Life Sciences Building does not meet either of those conditions, the Mandatory Provisions method will be used in this analysis.

### 6.4 Mandatory Provisions

The Life Science building is has zone thermostats to control both the heating and cooling space temperature. The thermostatic controls respond with an accuracy ranging from  $\pm 2^{\circ}$ F to  $\pm 5^{\circ}$ F. In order to prevent setpoint overlap, the thermostat will call for heat when the outdoor air temperature falls below 50°F. An outdoor air temperature below 50°F will activate the perimeter finned tube radiation and decrease the quantity of CFM supplied from the air handler to the zone.

The thermostat is also controlled by periods of occupancy based on a carbon dioxide sensor. During occupied hours the space is to maintain a temperature of 72°F. When unoccupied, the setpoint is between 68°F and 76°F to keep the space occupant ready. When the air handler is off, the space temperature will be maintained at a 55°F minimum

In the event of a fire alarm emergency, the ventilation dampers at the top of the elevator shaft are programmed to open. During all other operating modes, the elevator shaft vent is normally closed. The air handlers will shut down upon receiving a fire alarm signal. In a smoke purge situation, the air handlers operate both the return and supply fan at full capacity in full exhaust, which draws in 100 percent outdoor air to purge smoke.

Insulation for supply and return ductwork is dependent on location and use. All exterior ductwork must be insulated regardless of its use. Return ductwork is insulated in mechanical equipment rooms. Supply ductwork is insulated between the fan discharge and terminal outlet.

The outdoor air intake ductwork between the air entrance and fan inlet shall be insulated. The emergency generator exhaust will be insulated for safety due to the extremely hot temperatures of combustion. Sizes for ductwork insulation can be viewed in Table 5. All piping supply and return lines are insulated regardless of service. Make-up water and condensate drain piping is also insulated. A summary of the Life Sciences Building's piping insulation thickness can be seen in Table 6.

Duct	work Insulation Thick	ness								
DuctLocation	Insulation Material									
	Rigid Fiberglass	Flexible Fiberglass								
Interior	2″	2″								
Exterior	3"	N/A								

Table 4 - Ductwork Insulation Thicknes	S

	Pipe Insulation	Thickness		
Service	Material	<1"	1" - 1¼"	1½" – 6"
Chilled Water	Fiberglass	1″	2″	2″
(40°F - Ambient)	Cellular Glass	1″	2″	2″
Hot Water (<250°F)	Fiberglass	1″	2"	2″

#### Table 5 – Pipe Insulation Thickness

Duct seam and joint sealing is specified as per the Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) and is also designed to meet the requirements of Standard 90.1.

### 6.5 Prescriptive Path

Of the three air handlers serving the Life Sciences Building, one is a 100% outdoor air unit. The two remaining air handlers have the capability to provide up to 100% of the design supply air quantity as outdoor air for cooling. Outdoor air dampers are specified to return to minimum outdoor air position when the outside air is 55°F, which is not among the acceptable control types for high-limit shutoff. The normal outdoor air fraction of supply air is 50%.

Based on the Motor Nameplate Horsepower method of calculating fan system power limitations, Table 7 provides a summary of which fans in the Life Sciences Building comply with the maximum allowable motor horsepower for a given airflow rate. It is worth noting that E/F-9 A, B, C complies with Standard 90.1 even though it is a laboratory exhaust fan serving fume hoods on the second floor. Furthermore, E/F-9 A, B, C contains a heat recovery run-around loop that recovers sensible heat, which preconditions make-up air entering the air handler.

		Fan Com	pliance	
Unit	HP	CFM	CFM x 0.0015	90.1 Compliance
AHU-1 Supply	40	25,550	38.32	Ν
AHU-2 Supply	40	25,550	Ν	
AHU-3 Supply	30	24,000	36	Y
AHU-1 Return	15	25,550	38.32	Y
AHU-2 Return	15	25,550	38.32	Y
E/F-1	1⁄4	1,367	2.05	Y
E/F-3	1/4	1,367	2.05	Y
E/F-4	1/6	1,095	1.64	Y
E/F-5	1/6	1,095	1.64	Y
E/F-6	2	4,500	6.75	Y
E/F-7	3	6,500	9.75	Y
E/F-8	1 ½	4,050	6.08	Y
E/F-9 A,B,C	20	24,050	36.08	Y

Table 6 – Life Sciences Building Fan

# 6.7 Submittals

A complete set of construction documents including operating manuals and sequence of operation will be handed to Nassau Community College upon completion of the Life Sciences Building. There will also be a balancing report of both the air and hydronic systems. The Life Sciences Building has submitted an application for LEED certification, therefore commissioning will we completed at the end of construction.

# Section 7 – Service Water Heating

The Life Sciences Building does not contain combustion equipment for service water heating. Hot water that is supplied to the air handlers, perimeter radiation and to other various hydronic heating equipment is produced via heat exchanger by campus provided high temperature hot water. The sole combustion element of the mechanical system is the emergency generator that does not produce hot water in the event of an emergency.

# Section 8 - Power

The Life Sciences Building electrical system is specified to comply with the National Electric Code (NEC), which states that feeder conductors are to have a maximum voltage drop of 2% and a maximum branch voltage drop of 3% at the design load condition. Therefore, the Life Sciences Building complies with this section. Furthermore, the construction drawings, including the single-line diagrams of the building electrical distribution as well as the floor plans, along with operating and maintenance manuals will be turned over to Nassau Community College at the completion of construction.

# Section 9 – Lighting

# 9.2 Compliance Path

In Standard 90.1 there are two different methods to determine the compliance of the Life Sciences Building with the maximum lighting power density: the Building Area Method or the Space-by-Space Method. The Building Area Method involves totaling up the power consumed by all lighting fixtures used in the building during normal operating hours and dividing by the total building area. The Building Area Method will be used for this analysis.

# 9.4 Mandatory Provisions

The Life Sciences Building contains occupancy sensors in all spaces. The sensors are combined with locally controlled switches for each space.

# 9.5 Building Area Method Compliance Path

The Life Sciences Building falls into the category of school/university on ASHRAE Standard 90.1 Table 9.5.1. The Lighting Power Density (LPD) is designated to be no higher than 1.2 W/ft<sup>2</sup> for this category. Table 8 below gives a summary of the breakdown of the lighting density for the Life Sciences Building by providing the number of each fixture per floor and the number of Watts per each fixture. The calculated W/ft<sup>2</sup> is 0.90, which is well below the mandated maximum of 1.2 W/ft<sup>2</sup>.

	Lighting Density ComplianceFixtureBasement1st2nd3rdPenthouseW/fixt.Total W														
Fixture	ixture         Basement         1 <sup>st</sup> 2 <sup>nd</sup> 3 <sup>rd</sup> Penthouse         W/fixt.           FK1         -         29         32         32         -         63														
FK1	-	29	32	32	-	63	5859								
FK2	-	46	62	85	-	63	12159								
FK3	-	-	I	101	-	63	6363								
FL2	1	-	I	-	-	79	79								
FL3	-	1	-	-	-	79	79								
FL4	3	10	7	7	2	79	2291								
FL5	-	-	-	-	1	63	63								
FN1	-	22	22	22	-	63	4158								
FN2	-	4	4	4	-	63	756								
FN3	-	19	12	12	-	63	2709								
FP1	-	30	-	-	-	63	1890								
FP2	-	-	25	1575											
FP5	-	24	I	-	-	63	1512								
FP6	-	24	-	-	-	63	1512								
FP7	-	-	26	-	-	63	1638								
FP8	-	-	24	-	-	63	1512								
FR4	15	-	-	-	-	79	1185								
FR5	62	4	4	4	40	79	9006								
FR6	-	4	I	-	-	79	316								
FT6	-	-	7	-	-	117	819								
PB1	-	36	38	20	-	26	2444								
PU2	2	-	-	-	-	26	52								
PU3	6	-	-	-	-	42	252								
						Total=	58229								
			Building Area = 64,563												
						W/SF =	0.90								
			Sta	ndard	90.1 Complia	int (Y/N)	Υ								

Table 7 – Life Sciences Building Power Density

# Section 10 – Other Equipment

All other pieces of mechanical equipment that have electrical motors are subject to this section, which defines minimum efficiencies for motors based upon rated horsepower and motor speed. There are a series of pumps used in the Life Sciences Building, none of which comply with the required minimum efficiencies of this section. Of the motors listed in Table 9, all utilize variable frequency drives (VFD) except pumps P-5, P-6A, B and P-11. Heat recovery pump P-11 does not have a VFD due to the nature of its operation. Pump P-11 is specified to operate continuously at a constant speed whenever the outside air temperature is below 55°F or above 80°F. Furthermore, all pumps serving air hander pre-heat coils operate in the same manner; when the outside air temperature is below 55°F, they run at constant speed.

	Pump Motor Efficiency Compliance														
Pumn	Service	НР	Efficiency	RPM	Min. Efficiency	Standard 90 1 Compliance									
P-1.2	CHW Booster	15	82.4	1750	91	N									
P-3, 4	CHW Service	15	82.8	1750	91	N									
P-5	Glycol	1.5	66.5	1750	84	Ν									
P-6A, B	AHU-Circulation	3/4	62.4	1750	-	N									
P-7, 8	Radiation	5	65.8	1750	87.5	Ν									
P-9, 10	Re-heat	3	62.6	1750	86.5	Ν									
P-11	Heat Recovery	2	69.2	1750	84	Ν									

Table 8 – Life Sciences Building Pump Motor Efficiency Compliance

# ASHRAE 90.1-2007 Summary

In order to determine compliance with ASHRAE Standard 90.1-2007, the prescriptive performance evaluation method was used for all sections. All things considered, the Life Sciences Building complies with this standard with some minor exceptions. The two major failures, according to Standard 90.1, are the overall glazing percentage of exterior wall area and exterior wall U-values and fan power usage.

The overall glazing percentage is over the acceptable limit by only a fraction of a percent and could be corrected with a slight sacrifice to aesthetics. The exterior walls, both above and below grade, have U-values that fall below the maximum. The walls above grade are constructed of copper rain screen panels and metal studs with a layer of insulation. This construction serves as a more aesthetic appeal rather than a functional thermal boundary. However, the large glazing areas have U-values and SHGC's that far surpass the requirements of this standard. The increase in thermal properties for the exterior glazing is to compensate for the below minimum requirements of the walls.

The supply fans for air handlers AHU-1 and AHU-2 are the only two fans that do not comply with this standard. These fans have a high external static pressure to overcome due to the long runs of ductwork to the building's extremities. A small adjustment in ductwork sizing and routing would allow for the supply fan to overcome a smaller external pressure drop. The return fans for these respective units are used for a plenum return, which is why their power requirements are much less.

The Life Sciences Building has submitted is application for LEED certification with a maximum of 69 potential points, which would yield a LEED Platinum rating. As a result, energy efficiency was a major design consideration where the majority of ASHRAE Standard 90.1 was followed. With a few minor adjustments, the Life Science Building would be compliant in all aspects of ASHRAE Standard 90.1.

# References

ANSI/ASHRAE. (2007). *Standard 62.1 – 2007, Ventilation for Acceptable Indoor Air Quality*. Atlanta, GA: American Society of Heating Refrigeration and Air Conditioning Engineers, Inc.

ANSI/ASHRAE. (2007). *Standard 90.1 – 2007, Energy Standard for Buildings Except Low-Rise Residential Buildings*. Atlanta, GA: American Society of Heating Refrigeration and Air Conditioning Engineers, Inc.

Cannon Design. <u>Architectural Construction Documents.</u> Cannon Design, New York, NY.

Cannon Design. Electrical Construction Documents. Cannon Design, New York, NY.

Cannon Design. Mechanical Construction Documents. Cannon Design, New York, NY.

# **Appendix A – Minimum Ventilation Calculation**

OAT below which OA Intake flow is @ minimum	OA Temp at which Min OA provides all cooling	OA Intake red'd as a fraction of primary SA (Table 6.3 Method)	Outdoor Air Intake Flow required to System (Table 6.3 Method)	Outdoor Air Intake Flow required to System OA Intake rept as a traction of orimany SA	Vertuatori System Enioenty (Table ota Mediod) Minimum outdoor air Intake airflow	System Ventilation Efficiency (App A Method)	Zone Ventilation Efficiency (App A Method)	Unused OA fraction required in primary air to zone	Unused OA fraction required in supply air to zone	Fraction of zone OA not directly recirc, from zone	Fraction of zone supply the directly featibulier at a	Unused UA requirement for zone	Unused OA req'd to breathing zone	Total supply air to zone (at condition being analyzed)	OA rate per person	OA rate per unit area for zone	Initial Calculations for Individual zones	UncorrectedOA requirement for system	Primary supply air flow to system at conditioned analyzed	Detailed Calculations Initial Calculations for the System as a whole	and fulfilles frammed officers and a second second	Outdoor allr as a % of design primary supply allr	Outdoor air per unit floor area	Outdoor air intake required for system	Results Ventilation System Efficiency	Primary air fraction of supply air at conditioned analyzed	Zone air distribution effectiveness at conditioned analyzed	Percent of total design almow rate at conditioned analyzed Air distribution type at conditioned analyzed	Inputs for Operating Condition Analyzed	Local redirc. air % representative of ave system return air	Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?	Design population of zone Design total supply to zone (reference his local regionalized)	Floor Area of zone	space type		Zone Tag		Zone Name	inputs for Potentially Critical zones	OA red per person for system area (Weighted average)	OA regid per unit area for system (Weighted average)	Population of area served by system (including diversity)	Inputs for System Floor area served by system		Operating Condition Description:	Building: System Tag/Name:	
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Total supply air to zone (at condition being analyzed)		an p				350	350	350	350	350	350	50
Unused OA requirement for zone		89		PZ + Raz AZ		11.3	113	11.3	11.3 11	11.3	11 <sup>11</sup> 4	یں 4 س
Fraction of zone supply not directly redire, from zone	27			+ (1-Ep)Er -	Ī	1.00	1.00	1.00	1.00	1.00	1.00	1.0
Fraction of zone supply from tury mixed primary air Fraction of zone OA not directly redire. from zone	2, 2		•• 조망	-Ez)(1-Ep)(1-Er) -		1.00	1.00	1.00	1.00	1.00	1.00	1.00
Unused OA fraction required in supply air to zone	N		- Voz	/Vdz -		0.03	0.03	0.03	0.03	0.03	0.03	0.07
Unused OA fraction required in primary air to zone System Ventilation Efficiency	¥		- Voz	/ Vpz	-	0.03	0.03	0.03	0.03	0.03	0.03	0.07
Zone Ventilation Efficiency (App A Method)	2		1	+ FbXs - FcZ) / Fa		1.12	1.12	1.12	1.12	1.12	1.12	1.08
System Ventilation Emclency (App A Method) Ventilation System Efficiency (Table 6.3 Method)	<b>9</b> 9		- Val	(EVZ) Je from Table 6.3	0.42	-						
Outdoor Air Intake Sign required to System	Vot			-	928							
OA intake req'd as a fraction of primary SA	4		Vot	- Vps	0.3							
Output wit make mow required to system (if able 6.3 Method) OA intake req'd as a fraction of primary SA (Table 6.3 Method)	× ۽	G	· · ·	/Vps	8.8							
OA Temp at which Min OA provides all cooling OAT below which OA Intake flow is gt minimum		Deq F	- (Tp	-dTsf)-(1-Y)"(Tr+dTr -	22							

Building: eventan Tanilama	Nassau	Commu	nity Coll	ge Life S	clences E	Building							
Operating Condition Description: Units (select from pull-down list)	Design IP	Peak Co	oling Lo	ad Condit	lon								
Inputs for System Floor area served by system Population of area served by system (including diversity) Design primary supply fan ainflow rate OA regdp per unit area for system area (Weighted average) OA regdp per person for system area (Weighted average)	Name As Ps Vpsd Ras Rps	dm ofm ofm		100% dv	ersity	<u> </u>	8tem 19053 328 27,500 0.08 8.0						
Zone Name								Fac. Office					
Zone Tag	Zone tit	e turns pu	urple Nalk	: for critica	l zone(s)			Third 35	Third 36	Third 37	Third 38	Third 39	Third 40
Space type							_	ande animo	onne space	Once space	onne space	Onice space	Once abace
Floor Area of zone	R	SI	om pui-o	OWD ISI				102	15	106	105	105	102
Design population of zone Design total supply to zone (notimany plus local review/lated)	52	3	(default v	alue listeo	t; may be	overridde	2	175	175	1	1	1	1
Induction Terraneously is a some formary primary induction Terraneter Fan? Induction Terraneter Note: Dual Fan Dual Duct or Transfer Fan? Local rectire, air % representative of ave system return air	Π.	Select fro	om pull-d	own list or	leave bla	nk IT N/A		2	3	201	101	10	20
Inputs for Operating Condition Analyzed Percent of total design almow rate at conditioned analyzed	Ds	*					100%	100%	100%	100%	100%	100%	100%
Zone air distribution effectiveness at conditioned analyzed Primary air fraction of supply air at conditioned analyzed	80							1.00	1.00	1.00	1.00	1.00	1.00
Ventilation System Efficiency Outdoor all inside naminal for system	ĮD						0.42						
Outdoor air per unit floor area	VotiAs	olimist					0.51						
Outdoor air per person served oy system (introduing oversity) Outdoor air as a % of design primary supply air	Ypd Notice	an p					35%						
Detailed Calculations Initial Calculations for the System as a whole		ſ											
Finnally supply air now to system at condutories and yzes Uncorrected OA requirement for system Uncorrected OA requirements	X 일 년	of m		Ps + Ras / Vps	As	•••	4113 0.15						
OA rate per unit area for zone	Raz	cimist						0.06	0.06	0.06	0.06	0.06	0.06
Total supply air to zone (at condition being analyzed)		an a						175	175	175	175	175	175
Unused OA requirement for zone		8		Pz + Raz /Ez	R	•••		<b>⊒</b> Ξ	11.3	114	11.3	11.3	±Ξ
Fraction of zone supply not directly reduc, from zone	9 27			+(1-Ep)B		•			10		1.0		
Fraction of zone OA not directly redire. from zone	2.5		• • 동태	-Ez)(1-Ep		•		10	100	1.00	1.00	100	1.00
Unused OA fraction required in supply air to zone	3 6			Vdz		• •		0.06	0.06	0.06	0.06	0.06	0.06
System Ventilation Endourne und Annual Ventilation	9 9			T APT		•				0.00			
System Ventilation Efficiency (App A Method)	₽ Ş		- I Min	(Evz)	11/20	•	0.42	50.1	1.00	1.00	1.00	1.00	
Ventilation System Efficiency (Table 6.3 Method) Minimum outdoor air Intake airflow	Q		- Val	Je from Ta	ible 6.3	ł	n/a						
OA Intake rend as a traction of mimary SA	≺ ot	of m	 ≨§			•••	9687						
On make requise a nation of primary on Outdoor Air Intake Flow required to System (Table 6.3 Method)	ĕ-	offin				• •	Na o						
OA Intake regid as a fraction of primary SA (Table 6.3 Method) OA Temp at which Min OA provides all cooling	۲		- Vot	/Vps		ł	n/a						
OAT below which OA Intake flow is gt minimum		Deg F	· ①	HULSUN 1-	Y)"(Tr+dT	•	24						

Building: System Taginame: Operating Condition Description: Units issued from null-frown lish	Nassa AHU-1 Desigr	1 Peak C	ooling Load Condition	Ilding			
Inputs for System Floor area served by system Population of area served by system (including diversity) Design primary supply fan altriow rate OA regid per unit near for system (Weighted average) OA regid per person for system area (Weighted average) inputs for Potentially Critical zones	Name As Ps Vpsd Ras Rps	Units P cfm cfm/sr cfm/sr	100% diversity	5ya	9053 7,500 8,0 328 0.08 328 0.08 328 0.08 328 0.08 328 0.08 328 0.08 328 0.08 328 0.08 328 0.08 328 0.09 328 0.00 0.00 328 0.00 0.00 328 0 328 0 328 0 0 328 0 3 0 3 3 0 0 0 3 3 0 0 3 3 0 0 0 3 0	res 111000 sf timisf we ofmisf	
Zone Name			numin Bally for others' month's		4		
Zone Tag	Zone t	tle turns	purple Italic for critical zone(s)		3	ages	
Space type		Select	from pull-down list				
Floor Area of zone Design population of zone	28	υщ	(default value listed; may be o	verridden	ਂ ਭ ਭ	otal si	
Lossign rocal supply to zone (primary plus local restructured) Induction Terminal Unit, Dual Fan Dual Duc; or Transfer Fan? Local rectirc. al: % representative of ave system return air	D, Maza	Select	from pull-down list or leave blan	k IT N/A	<u>م</u> ج	verage	
Inputs for Operating Condition Analyzed Percent of total design almow rate at conditioned analyzed Air reteribution who all conditioned analyzed	8	8 % 1	from pull_down list		100% a	werage	make that primary over desi
Zone air distribution effectiveness at conditioned analyzed Primary air fraction of supply air at conditioned analyzed	<b>8 1</b>					werage	Primary airflow rate to zones 27500 cfm
Results Ventilation System Efficiency	2				0.42		
Ouldoor air intake required for system Ouldoor air per unit floor area	Voti/As	ofmist			9687		
Oudoor air per person served by system (including diversity) Oudoor air as a % of design primary supply air	Ypd Ypd	an an			29.5 35%		
Detailed Calculations Initial Calculations for the System as a whole							
Primary supply air flow to system at conditioned analyzed UncorrectedOA requirement for system Uncorrected OA req'd as a fraction of primary SA	Xou		<ul> <li>VpdDs</li> <li>Rps Ps + Ras As</li> <li>Vou / Vps</li> </ul>		4113 S	ystem pop	ulation without diversity ulation diversity, D
Initial calculations for informations for zone OA rate per unit area for zone OA rate per person		ofmisi I					
Total supply air to zone (at condition being analyzed)	Ā	ŝ,					
Unused OA requirement for zone		88	<ul> <li>Rpz Pz + Raz Az</li> <li>Vbz/Ez</li> </ul>	••			
Fraction of zone supply not directly redire. from zone	7 27		- Ep + (1-Ep)Er	•			
Fraction of zone supply from fully mixed primary an Fraction of zone OA not directly redire. from zone	3,9		<ul> <li>tp</li> <li>1-(1-Ez)(1-Ep)(1-Er)</li> </ul>				
Unused OA fraction required in supply air to zone	18		<ul> <li>Voz / Vdz</li> </ul>	•		Aaximum Z	
System Ventilation Efficiency	8		<ul> <li>V0Z / VDZ</li> </ul>			Value Value	
Zone Ventiliation Efficiency (App A Method)	2		<ul> <li>(Fa + FbXs - FcZ) / Fa</li> <li>min (Ecz)</li> </ul>		3		
System veritiaturi Enidericy (App A wethod) Ventilation System Efficiency (Table 6.3 Method)	<b>Q</b> Q		<ul> <li>mm (evz)</li> <li>Value from Table 6.3</li> </ul>	•	N/42		
Minimum outdoor air intake airflow	i	ł					
Outdoor Air Intake Flow required to system OA Intake regid as a fraction of primary SA	Yot	8	<ul> <li>Vot / Vps</li> </ul>	• •	0.35		
Outdoor Air Intake Flow required to System (Table 6.3 Method) OA Intake ren't as a fraction of orimary SA (Table 6.3 Method)	< ĕ	alm	- Vou / Ev	• •	33		
OA Temp at which Min OA provides all cooling		5		•	2		
ON DERVISION WITCH ON INJAKE HOW IS (2) INTRIBUTION		ued L	- 110H11)(1-1)(10H01)	•	5		

Building: System TagName: Operating Condition Description: Units (select from pull-down list)	Nassau AHU-2 Design IP	Peak Coolin	College Life Sciences Buil g Load Condition	lding								
Inputs for System Floor area served by system Population of area served by system (including diversity) Design primary supply fan airflow rate OA req'd per unit area for system (Weighted average) OA req'd per person for system area (Weighted average) OA reqd per person for system area (Weighted average) Inputs for Potentially Critical zones	As As Ps Ps Ras Ras	Units sf cfm cfm/sf cfm/p	100% diversity	Syster 194 27,6								
Zone Name	Zone liit	le hims num	e italic for critical zone/s)		Corr. #1	General	Clar Ge	sroom (	General	General	Men	Women
Zone Tag					First 01	First 03	L II	st 04	First 05	First 06	First 08	First 09 Storage
Space type		Select from	pull-down list			classroon	clas	sroom	lassroom	classroom	rooms	rooms
Floor Area of zone	P2	5			1,492	10	74	755	1067	1056	243	314
Design population of zone	2	P (de	fault value listed; may be ove	inidden)	75		38	1100	8	30	30n	3 3 7 0
Lesign todal supply to zone (primary plus todal reconstructed) Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan? Local reader air % nonceantative of also suction return air	Fr VQ2Q	am Select from	pull-down list or leave blank	ifNIA	ja ja		8		Iou	ISU	c21	626
Inputs for Operating Condition Analyzed	'											-
Air distribution type at conditioned analyzed Zone air distribution type at conditioned analyzed Zone air distribution effectiveness at conditioned analyzed Primava air fraction of supply air at conditioned analyzed	5 7A 13	Select from	pull-down list	ī	1.0	1 0 5	883	1.00	1.00	1.00	1.00	1.00
Results Ventilation System Efficiency	F			0.7	20							
Outdoor air intake required for system Outdoor air per unit floor area	Vot Vot/As	ofm ofm/sf		o. 48	64							
Outdoor air per person served by system (including diversity) Outdoor air as a % of design primary supply air	Ypd	dm/p		# <sup>35</sup>	*→							
Detailed Calculations Initial Calculations for the System as a whole												
Primary supply air flow to system at conditioned analyzed UncorrectedOA requirement for system	Vou	ofim =	VpdDs Rps Ps + Ras As	= 2/0	88							
Uncorrected OA regid as a fraction of primary SA Initial Calculations for individual zones	Xs	"	Vou / Vps	=	4							
OA rate per unit area for zone	Raz	cfm/sf			0.00	10	38	0.06 7.50	7.50	0.08	0.12	0.12
Total supply air to zone (at condition being analyzed)	A 1	et n			750	18	88	1100	1600	1300	225	325
Unused OA req'd to breathing zone			Rpz Pz + Raz Az		89.5	334	2 4	225.3	334.0	333.4	20.2	37.7
Unused UA requirement for zone Fraction of zone supply not directly regire, from zone	Fa	9000 = =	Vozrez Ep + (1-Ep)Er		1.00		8\$	1.00	1.00	1.00	1.00	1.00 %
Fraction of zone supply from fully mixed primary air Fraction of zone OA not directly regime from zone	7 J		Ep 1-(1-E>V1-EnV1-Er)		1.00		88	1.00		1.00	1.1	1.1
Unused OA fraction required in supply air to zone	2		Voz /Vdz	"	0.13		21	0.20	0.21	0.26	0.13	0.12
Unused OA fraction required in primary air to zone System Ventilation Efficiency	ţ,		Voz / Vpz	"	0.12	0	21	0.20	0.21	0.26	0.13	0.12
Zone Ventilation Efficiency (App A Method)	Evz		(Fa + FbXs - FcZ) / Fa	"	1.02	2 0	83	0.93	0.93	0.88	1.01	1.02
System Ventilation Efficiency (App A Method) Ventilation System Efficiency (Table 6.3 Method)	Ψ.Ω		mn (Evz) Value from Table 6.3	= = 8.5	<b>~</b> «							
Minimum outdoor air intake airflow Outdoor Air Intake Flow required to System	Vot	efm =	Vou / Ev	= 48	4							
OA intake regid as a fraction of primary SA	1	•	Vot / Vps			•						
Outdoor Air intake Flow required to System (Table 6.3 Method) OA intake req'd as a fraction of primary SA (Table 6.3 Method)	Y VO	9	Vot / Vps		0.02							
OA Temp at which Min OA provides all cooling OAT below which OA Intake flow is @ minimum		Deg F =	{(Tp-dTsf)-(1-Y)*(Tr+dTr	" 	8							

Building: System Tag/Name: Operating Condition Description: Units (select from pull-down list)	Nassau AHU-2 Design IP	Commun Peak Coo	ity College Life Sciences Bu ling Load Condition	iilding								
Inputs for System Floor area served by system Population of area served by system (including diversity) Design primary supply fan airflow rate OA req'd per unit area for system (Weighted average) OA req'd per person for system area (Weighted average) Inputs for Potentially Critical zones	As As Ps Ps Ras Ras	<u>Units</u> sf cfm cfm/sf cfm/p	100% diversity	Syste	7.080001							
Zone Name	Zone Hill	a frames nu	mle italic for oritical zone/s)			Elec.	Tele.	Vending	Fac. Office	Fac. Office	Fac. Office	Fac. Office
Zone Tag					핆긔	rst 10 etrical	First 15 Electrical	First 40 Coffee	First 41 Office space	First 42 Office space	First 43 Office space	First 44
Space type		Select fro	m pull-down list		ed in	ipment (	equipment	Stations	oune share	Cilice apare	Office share	outre share
Floor Area of zone Design population of zone	ያ ይ	د ۲۵ م	default value listed: may be ov	verridden)		0	-8	203	106	105	105	105
Design total supply to zone (primary plus local recirculated) Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?	Vdzd	ofm Select fro	m pull-down list or leave blank	cifN/A		100	8	225	325	325	325	325
Inputs for Operating Condition Analyzed	ц				$\mid$	75%	15%	15%	75%	75%	75%	75%
Percent of total design airflow rate at conditioned analyzed Air distribution type at conditioned analyzed Zone air distribution effectiveness at conditioned analyzed Drivene air fraction of supply and provide analyzed	<b>, ,</b>	% Select fro	m pull-down list	10	8	100%	100% 1.00	100% CS 1.00	100% CS	100% CS 1.00	100% 1.00	100% CS 1.00
Results Ventilation System Efficiency	Ē				78							
Outdoor air intake required for system Outdoor air per unit floor area	Vot/As	cfm/sf		0.48	84							
Outdoor air per person served by system (including diversity) Outdoor air as a % of design primary supply air	Ypd Ypd	dim/p		→ <i>t</i> i	8%							
Detailed Calculations Initial Calculations for the System as a whole	1											
Primary supply air flow to system at conditioned analyzed UncorrectedOA requirement for system	Vou		<ul> <li>VpdUs</li> <li>Rps Ps + Ras As</li> </ul>	= = 31	88							
Initial Calculations for individual zones	S S	offensler f	= vou / vps		-	0.08	0.08	0.08	0.08	0.08		D
OA rate per person	Rpz	cfm/p				0.00	0.00	5.00	5.00	5.00	5.00	5.00
Lotal supply air to zone (at condition being analyzed) Unused OA regid to breathing zone		9 <b>1</b> 9	= Rpz Pz + Raz Az	"		6.6	≛ e	32.2	320 11.4	320 11.3	320 11.3	320 11.3
Unused OA requirement for zone Fraction of zone supply not directly recirc. from zone	Fa∕oz	đ	= Vbz/Ez = Ep + (1-Ep)Er			1.00	1.00 4	1.00	1.00 11	1.00	1.00	1.00
Fraction of zone supply from fully mixed primary air	η 37		= Ep = 1/1_E=V1_E=V1_E=V			1.00	1.0	1.00	1.8	1.00	1.00	1.1
Unused OA fraction required in supply air to zone	23		= Voz / Vdz	"		0.07	0.08	0.14	0.03	0.03	0.03	0.03
Unused OA fraction required in primary air to zone System Ventilation Efficiency	4		= Voz / Vpz	"		0.07	0.08	0.14	0.03	0.03	0.03	0.03
Zone Ventilation Efficiency (App A Method)	Evz		= (Fa + FbXs - FcZ) / Fa		\$	1.07	1.05	0.99	1.10	1.10	1.10	1.10
System verturduori Eluciency (App A menuou) Ventilation System Efficiency (Table 6.3 Method)	5 S		<ul> <li>mm (Ev2)</li> <li>Value from Table 6.3</li> </ul>		83							
Minimum outdoor air intake Flow required to System	Vot	đ	= Vou / Ev	" 4	Ŧ							
OA intake req'd as a fraction of primary SA	₹~	ł	= Vot / Vps		8 18							
Outwoor An intexe from required to system (Later ous Method) OA intake regid as a fraction of primary SA (Table 6.3 Method)	Y y	GIII	<ul> <li>vou/ ev</li> <li>Vot / Vps</li> </ul>		17 8							
OA Temp at which Min OA provides all cooling OAT below which OA Intake flow is @ minimum		Deg F	= {(Tp-dTsf)-(1-Y)'(Tr+dTr		ĊS							

Building: System TagName: Operating Condition Description: Units (select from pull-down list)	Nassau AHU-2 Design IP	Commur Peak Coc	nity College Life Sciences Bu oling Load Condition	ilding							
Inputs for System Floor area served by system Population of area served by system (including diversity) Design primary supply fan artifow rate OA req'd per unit area for system (Weighted average) OA req'd per person for system area (Weighted average) Inputs for Potentally Critical zones	Name As Ps Ps Ras Ras	Units sf ofm ofm/sf	100% diversity	System 1840 27,88 27,88 7							
Zone Name	Zono Hit		unda italia far antical meno/e)		Fac. Office	Fac. Office	Fac. Office	Fac. Office	Fac. Office	Fac. Office	Fac. Office
Zone Tag		e unite pu	abic voice of chinese second of		First 45	First 46	First 47	First 48	First 49	First 50 Office snace	First 51
Space type		Color for			Office share	onice space	onice space	ounce share	ounce share	Office share	Office space
Floor Area of zone	R	Select fro	om pull-down list		105	8	105	5	105	ŝ	105
Design population of zone	R	P	default value listed; may be ov	erridden)	_	-	_	_	_	_	_
Design total supply to zone (primary plus local recirculated) Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?	Vdzd	ofm Select fro	om pull-down list or leave blank	ifN/A	325	325	325	325	325	325	325
Local recirc. air % representative of ave system return air Inputs for Operating Condition Analyzed	ц				101	47C)	10%	101	1076	1076	10%
Percent of total design arflow rate at conditioned analyzed Air distribution type at conditioned analyzed Zone air distribution effectiveness at conditioned analyzed Primaw air fraction of supply at conditioned analyzed		% Select fro	om pull-down list	100	1.00%	100%	100%	100%	100%	1.00%	100% CS
Kesuits Ventilation System Efficiency	Ÿ			0.7							
Outdoor air intake required for system Outdoor air per unit floor area	Vot/As	of in St		484							
Outdoor air per person served by system (including diversity) Outdoor air as a % of design primary supply air	Ypd Ypd	dim (p		a 5	8						
Detailed Calculations Initial Calculations for the System as a whole											
Primary supply air flow to system at conditioned analyzed UncorrectedOA requirement for system	V vo	at at	= VpdDs = Rps Ps + Ras As	= 2/00 = 370	66						
Uncorrected OA req'd as a fraction of primary SA Initial Calculations for individual zones	Xs		= Vou / Vps	= 0.1	4						
OA rate per unit area for zone	Raz	ofm/sf			5 D.O8	5 D.06	ž 0.06	5 O.O8	5 O.O8	5.00	7 D.06
Total supply air to zone (at condition being analyzed)	Ndz 1	ofin .			325	325	325	325	325	325	325
Unused OA req'd to breathing zone		t St	= Rpz Pz + Raz Az		11.3	:11.3	11.3	:11.3	. 11.3	11.3	11.3
Unused UA requirement for zone Fraction of zone supply not directly regire. from zone	Fa	quin	= Vozvez = Ep + (1-Ep)Er		1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fraction of zone supply from fully mixed primary air Fraction of zone OA not directly regime from zone	5" J"		= Ep = 1./1.F>V1.FnV1.Fr)		1.00	1.0	1.1	1	1 1	1.0	1.00
Unused OA fraction required in supply air to zone	24		<ul> <li>Voz / Vdz</li> </ul>	"	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Unused OA fraction required in primary air to zone Suctom Ventilation Efficiency	4		= Voz / Vpz	"	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Zone Ventilation Efficiency (App A Method)	Evz		= (Fa + FbXs - FcZ) / Fa	"	1.10	1.10	1.10	1.10	1.10	1.10	1.10
System Ventilation Efficiency (App A Method) Ventilation System Efficiency (Table 6.3 Method)	5 5 5		<ul> <li>min (Evz)</li> <li>Value from Table 6.3</li> </ul>								
Minimum outdoor air intake airflow Outdoor Air Intake Elow required to Sustem	ş	1		-	<b>-</b>						
OA intake req'd as a fraction of primary SA	~		= Vot / Vps	=	0						
Outdoor Air Intake Flow required to System (Table 6.3 Method) OA intake req'd as a fraction of primary SA (Table 6.3 Method)	× s	đ	= Vou / Ev = Vot / Vps	= = 9,1	-18						
OA Temp at which Min OA provides all cooling OAT below which OA Intake flow is @ minimum		Deg F	= {(Tp-dTsf)-(1-Y)*(Tr+dTr	н 45	5						

OAT below which OA Intake flow is @ minimum	OA intake req'd as a fraction of primary SA (Table 6.3 Method)	Outdoor Air Intake Flow required to System (Table 8.3 Method)	OA intake req'd as a fraction of primary SA	Outdoor Air Intake Flow required to System	Ventilation System Efficiency (Table 6.3 Method)	System Ventilation Efficiency (App A Method)	Zone Ventilation Efficiency (App A Method)	Unused OA traction required in primary air to zone Suctom Ventilation Efficiency	Unused OA fraction required in supply air to zone	Fraction of zone OA not directly recirc. from zone	Fraction of zone supply from fully mixed primary air	Fraction of zone supply not directly regire, from zone	Unused OA requirement for zone	I out supply all to zone (at containent being analyzeu) Unused OA rea'd to breathing zone	UA rate per person Total conduction for another bound state of the second	UA rate per unit area for zone	Initial Calculations for individual zones	Uncorrected OA regid as a fraction of primary SA	UncorrectedOA requirement for system	Primary supply air flow to system at conditioned analyzed	Detailed Calculations Initial Calculations for the System as a whole	Outdoor air as a % of design primary supply air	Outdoor air per unit floor area	Outdoor air intake required for system	Ventilation System Efficiency	Results	Zone air distribution effectiveness at conditioned analyzed	Air distribution type at conditioned analyzed	Percent of total design airflow rate at conditioned analyzed	Inputs for Operating Condition Analyzed	Induction terminal only, buar can buar buck of transfer can:	Design total supply to zone (primary plus local recirculated)	Design population of zone	Floor Area of zone	chance shee	Shape the	Zone Tag	Zone Name	citical control of the citical control	UA req d per person for system area (weighted average)	OA req'd per unit area for system (Weighted average)	Design primary supply fan airflow rate	Population of area served by system (including diversity)	Inputs for System	Uperating Condition Description: Units (select from pull-down list)	System Tag/Name:	Building:
	Y	Vot	~	Vot	Ę	P	Evz	4	Z	5	3	27 ș				Haz	,	Хs	<b>≥</b> .	Vps			Vot/As	Vot	Ā	Ę	7 N		D		Π	Vdzd	Pz	2				Zone title		Nps	Ras	Vpsd	<u>چ</u>	Name	Uesign IP	AHU-2	Nassau
Deg F		efm		đ								-	}	1	cimp	crim/st			đ	at the			cfm/sf	Î				Select fn	%		opiech II.		-0	। ব	Select fn			e turns pi		cimp	ofm/sf	ofm	10 1	4 Units	Peak Co		Commu
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p-dTsf)-(1-Y)*(Tr+dTr	t / Vps	u/Ev	t / Vps	u/Ev	lue from Table 6.3	n (Evz)	a + FbXs - FcZ) / Fa	z / Vpz	₂/Vdz	1-Ez)(1-Ep)(1-Er)		+ (1-Ep)Er	olEs	7 P7 1 P37 A7				u/Vps	is Pis + Ras As	ġ.								down list			DOMINIST OF LEAVE DIGITS	daug list or losur black	value listed; may be ov		down list		:	ic for critical zone(s)					100% diversity		ad Condition		lege Life Sciences Bu
"			"	"		"	II	"	"	"	"	"		"				"	"	" 2				•	_							- FNIA	erridden							ſ	Γ	27		Sys			ilding
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							1.10	0.03	0.03	1.00	1.00	1.00	=	11.3	0.00	0.06	2										1.00	8	100%	14,00	1681	325		105		flice space	First 52	av. Other	an Office								
							1.10	0.03	0.03	1.00	1.00	1.00	3	11.5	2000	0.06	2										1.00	8	100%	12.00	76.87	350		109		office space	First 53		Fac Office								
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							1.02	0.11	0.11	1.00	1.00	1.09	24	27.5	300	0.12	;										1.00	8	100%	10		325	0	310	BIDOUIS	Storage	Second 08		Women								
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							1.05	0.08	0.08	1.00	1.00	1.00		4 8		0.08	2										1.00	38	100%		1631	50	0	69	rooms	Electrical	Second 14		Tele								
							0.99	0.14	0.14	1.00	1.00	1.00	3	20 1	300	0.08	2										1.00	88	100%	2	1847	225	4	201	STATION	Coffee	Second 40	Bunna	Vending								

OAT below which OA Intake flow is @ minimum	OA intake regid as a fraction of primary SA (Table 6.3 Method) OA Team at which Win OA provides all propling	UA Intake regio as a traction of primary SA Outdoor Air Intake Flow required to System (Table 8.3 Method)	Outdoor air intake airtiow Outdoor Air Intake Flow required to System	Ventilation System Efficiency (Table 6.3 Method)	Zone Ventilation Efficiency (App A Method)	System Ventilation Efficiency	Unused OA traction required in primary sinto zone	Fraction of zone CA not directly recirc. from zone	Fraction of zone supply from fully mixed primary air	Fraction of zone supply not directly regire, from zone	Unused OA requirement for zone	Unused OA rea/d to breathing zone	UA rate per person Total supply air to some /at condition being analyzed)	OA rate per unit area for zone	Initial Calculations for individual zones	Uncorrected OA regid as a fraction of primary SA	I hoomestedOA requirement for system	Initial Calculations for the System as a whole	Detailed Calculations	Outdoor air as a % of design primary supply air	Outdoor air per person served by system (including diversity)	Outdoor air natae required for system	Outdoor sizing take required for system	Results	Zone air distribution effectiveness at conditioned analyzed Primary air fraction of sunply air at conditioned analyzed	Air distribution type at conditioned analyzed	Inputs for Operating Condition Analyzed Percent of total design airflow rate at conditioned analyzed	Local recirc. air % representative of ave system return air	Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?	Design total supply to zone (namery plus local review)sted)	Floor Area of zone Design population of zone	adia apede		Zone Tag	Zone Name	Inputs for Potentially Critical zones	OA req'd per person for system area (Weighted average)	OA regid per unit area for system (Weighted average)	Population of area served by system (including diversity) Design primary supply fan airflow rate	Floor area served by system	Inputs for System	Units (select from pull-down list)	Operating Condition Description:	Building: Sutem TaoName
	1	S T	Vot	δ. 1 Γ		f	3 6	5 2	ישי	- <del></del>	S R			Raz	1	<u>ک</u>		5		Ř	Vot/Ps	Vot/As	Į	L.	7 <b>7</b>		<b>D</b>	ф	V ULLU	N i	ያጽ				Zone title		Rps	Ras	in the	ŝ	Name	d	Design I	Nassau
Deg F		₿	đ								ar I		omp	cfm/sf				ŀ		ŝ,	ofm/p	ofm/sf	ŀ			Select fro	*		Select fro	}	0 <i>d</i>	Select fro			turns pu		ofm/p	ofin/sf	<u>з</u> , т	יזי ג <b>ל</b>	Units		Peak Co	Commu
= {(Tp	= Vot		= Vou	= Val	" " "	1		- " []	۳ ۳	۳ ۳		= Roz				" 		Í								om pull-d			om pull-d	actions a	/default v	om pull-d			vrole itali				Γ	1			oling Lo:	nity Colle
o-dTsf)-(1-Y)"(Tr+d	/ Vps	/ Vps	I/Ev	ue from Table 6.3	+ FbXs - FcZ) / Fa	and a re-		1-Ez)(1-Ep)(1-Er)		+ (1-Ep)Er		Pz + Raz Az				/ Vps	: Pe + Rae Ae	7								lown list			lown list or leave bl	mac more, may be	ralue listed: may be	lown list			c for critical zone/s)				100% diversity				ad Condition	ege Life Sciences
-	0									"	"	"				"		•								ſ			ank if N/		merrida							_	Т	Г	10			Building
-25	0.17	4766	4844	0.80	0 78											0.14	1703	TRED		18%	15.1	0.26	0.78				100%		×	1	5					_	7.3	0.08	97 ASD	18401	sytem			
					1.10	0.00	0.03	1.00	1.00	1.00	=	11.4	205	0.06											1.00	ន	100%	75%	0.40	3.	106		Office space (	Second 41	Fac. Onlice									
					1.10	0.00	curo	1.00	1.00	1.00	=	11.3	200	0.06											1.00	ន	100%	75%	260	205	105		Office space 0	Second 42	Fac. Office	En Office								
					1.10	0.00	0.02	1.00	1.00	1.00	=	11.3	205	0.06											1.00	ន	100%	75%	980	205.	105		Office space (	Second 43	Fac. Office	Eno Office								
					1.10			1.00	1.00	1.00	=	11.3	305	0.08											1.00	ន	100%	75%	960	205	105		Office space	Second 44	rac. Office	Potentially Cri								
					1.10	0.00	n na	1.00	1.00	1.00	=	11.3	205	0.08											1.00	ន	100%	75%	5	37.	105		Office space	Second 45	Fac. Office	Itical Zones								
					1.10	0.00	0.03	1.00	1.00	1.00	=	11.3	205	0.08											1.00	ន	100%	75%	000	205	105		Office space	Second 46	Fac. Office	Eno Office								
					1.10	0.00	0.00	1.00	1.00	1.00	=	11.3	205	0.06											1.00	ន	100%	75%	0.20	235	105		Office space	Second 47	Fac. Office									

Building: System TagName: Operating Condition Description: Units (select from pull-down list)	Nassau AHU-2 Design IP	Peak Co	nity College Life Sciences Bui oling Load Condition	Iding							
Inputs for System Floor area served by system Population of area served by system (including diversity)	<u>Name</u> As Ps	<u>Units</u> sf	100% diversity	Syster 184	891-1						
Design primary supply fan airflow rate OA req'd per unit area for system (Weighted average) OA req'd per person for system area (Weighted average) Inputs for Potentially Critical zones	Ras Rps	dim/sf dim/p		27,8 0.1 7			2		1		
Zone Name	Zone tit	le hims n	unde italic for critical zone/s)		Fac. Office	Fac. Office	Fac. Office	Fac. Office	Fac. Office	Fac. Office	Corr. #1
Zone Tag					Second 48	Second 49	Second 50	Second 51	Second 52	Second 53	Third 01
Space type					Office space	onice space	villoe space	onnoe space	Onlice space	Office space	COLLING
Floor Area of zone	2	sf	om pull-down list		105	105	105	105	105	109	1501
Design population or zone (primary plus local recirculated)	√dzd	° €	(default value listed; may be ove	emodenj	325	325 -	325	325	325	350	700
Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan? Local recirc, air % representative of ave system return air	Ψ	Select th	om pull-down list or leave blank	INA	76%	75%	75%	75%	75%	75%	75%
Inputs for Operating Condition Analyzed Percent of total design airflow rate at conditioned analyzed	₿ B	%		100	% 100%	100%	100%	100%	100%	100%	100%
Air distribution type at conditioned analyzed Zone air distribution effectiveness at conditioned analyzed Primary air fraction of surbuy air at conditioned analyzed	5 17	Select fr	om pull-down list	[	1.00	1.8 %	. <mark>8</mark> 6.	1.00	1.00 201	.1. 1.12 1.12	.1 19 19
Results	7										
Outdoor air intake required for system	Vot	din .		3 42 1							
Outdoor air per unix now served by system (including diversity) Outdoor air as a % of design primary supply air	Yot/Ps	atin bi		: ::::::::::::::::::::::::::::::::::	8-10						
Detailed Calculations	Î	ł		278	5						
UncorrectedOA requirement for system	i Si	ofin 1	= Rps Ps + Ras As	33	: 81						
Initial Calculations for individual zones	Raz	cfm/sf		,	0.08	0.06	0.06	0.08	0.08	0.08	0.08
OA rate per person	Rpz	ofm/p			5.00	5.00	5.00	5.00	5.00	5.00	0.00
Total supply all to zone (at contribution period analyzed) Unused OA regid to breathing zone		in a	= Rpz Pz + Raz Az	"	11.3	940 11.3	320 11.3	11.3	11.3	11.5	90.1
Unused OA requirement for zone Fraction of zone supply not directly recirc, from zone	₽g	đ	= Vbz/Ez = Ep+(1-Ep)Er		1.00	1.0 11	1.011	8 1	1.00	1.00	
Fraction of zone supply from fully mixed primary air	5 J				1.00	1.0	1.00	18	1.00	1.00	1.0
Intervention of Zone On not unevery reads, from Zone Unused OA fraction required in supply air to zone	2.5		= Voz / Vdz		0.03	0.03	0.03	0.03	0.03	0.03	0.13
Unused OA fraction required in primary air to zone System Ventilation Efficiency	4		= Voz / Vpz	"	0.03	0.03	0.03	0.03	0.03	0.03	0.13
Zone Ventilation Efficiency (App A Method)	Evz		= (Fa + FbXs - FcZ) / Fa		1.10	1.10	1.10	1.10	1.10	1.10	1.01
System ventilation Efficiency (App A wernod) Ventilation System Efficiency (Table 6.3 Method)	5.6		<ul> <li>mn (Evz)</li> <li>Value from Table 6.3</li> </ul>		0.0						
Minimum outdoor air intake airflow Outdoor Air Intake Flow required to System	Vot	ŝ	= Vou / Ev	" 48	3						
OA intake req'd as a fraction of primary SA	<b>₹</b> ≺	ł	= Vot / Vps		" œ						
OA intake red as a fraction of primary SA (Table 6.3 Method)	1	1	= Vot / Vps								
OA Lemp at which Min OA provides all cooling OAT below which OA Intake flow is @ minimum		Deg F	= {(Tp-dTsf)-(1-Y)*(Tr+dTr	н 2.	8						

Bindiance Constants Constant Constants												
Image: Control of Contro Of Contro Of Control Of Control Of Control Of Control Of Cont	Building: System RagName: Operating Condition Description: Units (select from pull-down list)	Nassau AHU-2 Design IP	Commur Peak Coo	nity College Life Sciences Bu oling Load Condition	ilding							
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		1	i			-1						
$ \begin{array}{c} \label{constraints} constraints$	Floor area served by system	As	, st land	1000	1840	1-1-						
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Population of area served by system (including diversity) Desiren mineare superly fan airflew rate	Vinci	3	100% diversity	97 R							
$ \begin{array}{c} \operatorname{restrict} restrict$	OA req'd per unit area for system (Weighted average) OA req'd per unit area for system (Weighted average) OA req'd per person for system area. (Weighted average)	Ras	ofini)sf		21,00							
Dark Name         Dark Name         The Name Name Name Name Name Name Name Nam	Inputs for Potentially Critical zones					200						1
	Zone Name	Zone tit	le turns pu	uple italic for critical zone(s)		Training	Training	lac, Halling	Lieb Mooin	MCI	TOUR	Elev.
	Zone Tag			:		Third 03	Third 04	Third 05	Third 06	Third 07	Third 08	Third 09
	Space type					(age 9 plus)	(age 9 plus)	(age 9 plus)	onnoe space	rooms	rooms	equipment
			Select fro	om pull-down list								rooms
Display         Display <t< td=""><td>Floor Area of zone Design population of zone</td><td>ፍ ፍ</td><td>פיס</td><td>(default value listed: may be ov</td><td>erridden)</td><td>1420</td><td>1419</td><td>36</td><td>288</td><td>243</td><td>5</td><td>110</td></t<>	Floor Area of zone Design population of zone	ፍ ፍ	פיס	(default value listed: may be ov	erridden)	1420	1419	36	288	243	5	110
$ \begin{array}{                                    $	Design total supply to zone (primary plus local recirculated)	Vdzd	Î			1500	1500	1500	300	225	325	100
	Local recirc. air % representative of ave system return air	Ψ	Conces in	and part of the state of the		75%	75%	75%	75%	75%	75%	75%
Are disclution by part doubling without analyzed Thrae at structure at an outcome analyzed Thrae at structure at an outcome analyzed Thrae at structure at an outcome analyzed Part at structure at an outcome analyzed Part at structure at an outcome analyzed Notice at a function of super at a conditione analyzed Notice at a function of super at a conditione analyzed Notice at a function of super at a conditione analyzed Notice at a function of super at a conditione analyzed Notice at a function of super at a conditione analyzed Notice at a function of super at a conditione analyzed Notice at a function of super at a conditione analyzed Notice at a function of super at a conditione analyzed Notice at a function of super at a conditione analyzed Notice at a function of super at a conditione analyzed Notice at a function of super at a conditione analyzed Notice at a function of super at a conditione analyzed Notice at a function of super at a conditione analyzed Notice at a function of primary Super at conditione analyzed Notice at a function of primary Super at conditione analyzed Notice at a function of primary Super at conditione analyzed Notice at a function of primary Super at conditione analyzed Notice at function of primary Super Attractions function of primary Super Attraction of primary Super Attraction	Inputs for Operating Condition Analyzed Percent of total design airflow rate at conditioned analyzed	2	%		100	100%	100%	100%	100%	100%	100%	100%
	Air distribution type at conditioned analyzed	2	Select fro	om pull-down list		ន	ន	ន	ន	ទំន	ន	ន
BestMan         Evaluation System (Enclosing)         Evaluation System (Including diversity)         Vice draft $1/2$ $43.4$ Custor air rinks required to system (Custor air rinks required to system (Including diversity)         Vice draft $1/2$ $1/2$ $1/2$ Press System Source (Including diversity)         Vice draft $1/2$ $1/2$ $1/2$ Instant Characteristics         Vice draft $1/2$ $1/2$ $1/2$ Instant Characteristics         Vice draft $1/2$ $1/2$ $1/2$ Instant Characteristics         Vice draft $1/2$ $1/2$ $1/2$ $1/2$ Instant Characteristics         Vice draft $1/2$ $1/2$ $1/2$ $1/2$ $1/2$ Instant Characteristics         Vice draft $1/2$ <td>Primary air fraction of supply air at conditioned analyzed</td> <td>9 F</td> <td></td> <td></td> <td></td> <td></td> <td>1.00</td> <td>1.00</td> <td>1.90</td> <td>00.1</td> <td></td> <td>1.00</td>	Primary air fraction of supply air at conditioned analyzed	9 F					1.00	1.00	1.90	00.1		1.00
Outcoor Outcoor and Dubor and are required by system (notiving funersity) viewsor wind wind wind wind wind wind windor wind wind wind wind wind wind windor wind win	Results Vestilation Conton Efficiency	P			0.7							
Outloor air per per one analytic of design primary supply air         Yurib         dns         151           Decision of air be system (nobuling diversity) yurib         winit in the system standard analytic of the system standard a	Outdoor air intake required for system	Ş.	ofm		484							
Character is a 3 v of decision per y supply arm with y in a line         Yey in a line         Yey in a line         Yey in a line           Character Calculations Intra Calculations for the System at conditioned analysed Uncorrected OL requirement for system Uncorrected OL requirement for system Unused OL requirement for system Unused OL requirement for some Fraction of zone supply from fully muel pomary at the system Vertication required in pimary at to zone Fraction of zone supply from fully muel pomary at the system Vertication required in pimary at to zone Fraction of zone supply from fully muel pomary at the system Vertication required in pimary at to zone Unused OL requirement for zone Fraction of zone supply from fully muel pomary at the system Vertication required in pimary at to zone Unused OL requirement for zone Fraction of zone supply from fully muel pomary at the system Vertication required in pimary at to zone Unused OL required in pimary at to zone System Vertication Fille Site Unused OL requirement for zone Unused OL requirement for zone System Vertication Fille Site Unused OL requirement for zone Unused OL requirement for zone System Vertication Fille Site Unused OL required to System Vice OL requirement for zone Unused OL requirement for zone Unused OL requirement for zone Unused OL requirement for zone Unused OL requirement Site Vice Vice Vice Vice Vice Vice Vice Vice Vice Vice	Outdoor air per unit floor area Outdoor air per percen canad by system (including diversity)	Viot/As	ofm/sf		15 20	- 0,						
Detailed Calculations         Visit Calculations         Visi	Outdoor air as a % of design primary supply air	Ъ	St.		18	8.						
Primary supply all noith operation of control analyzed Uncorrected OA requirement for system Uncorrected OA requirement for system Uncorrected OA requirement for system OA rate per per vial as a faction of primary SA         Vision XX         Primary SA (X)         Primary SA (X)         Vision Register Fraction of zone supply all no zone Unused OA requirement for zone Fraction of zone supply from tuber in primary all no zone Unused OA requirement for zone Fraction of zone supply from tuber in primary all no zone Unused OA requirement for zone (Inused OA requirement for zone Unused OA requirement for zone Unused OA requirement for zone (Inused OA requirement for zone Unused OA requirement for zone Unused OA requirement for zone (Inused OA requirement for zone (	Detailed Calculations Initial Calculations for the System as a whole											
Investeed OA regit as a fraction of primary SA         Xs         Test Subject All total Zames         Test Subject All total Zame	Primary supply air flow to system at conditioned analyzed UncorrectedOA requirement for system		₿₿	= VpdDs = Rns Ps + Ras As	= 2765 379	20						
Instructiviality         Call of the per vinit area for zone OA rate per vinit area supply air to zone (a condition being analyzed)         Raz Raz Mark         dinity of the character for an supply air to zone (nused OA requirement for zone supply not directly resine, from zone Fraction of zone supply not directly resine, from zone Fraction of zone supply into directly resine, from zone Unused OA racteo required in primary air Fraction of zone supply into directly resine, from zone Unused OA fracteo required in primary air Fraction of zone supply into directly resine, from zone Unused OA fracteo required in primary air Unused OA fracteo required in primary air to zone Unused OA fracteo required in primary air Unused OA fracteo required in primary air OA fracteo required in primary SA (Table 6.3 Method) Victor of in trabe regired as a fraction of primary SA OA indue regired as a fraction of primary SA OA	Uncorrected OA regid as a fraction of primary SA	Xs		= Vou / Vps	= 0.1	4						
	OA rate per unit area for zone	Raz	cfm/sf			0.12	0.12	0.12	0.08	0.12	0.12	0.06
$ \begin{array}{rcrc} \mbod{rule} \mbod{supp} s$	OA rate per person	Rpz	cfm/p			10.00	10.00	10.00	, 5 8 8	200	0.00	0.00
	Unused OA regid to breathing zone		aft i	= Rpz Pz + Raz Az	"	531.1	530.3	527.5	27.9	29.2	37.2	6.6
Fraction of zone supply from times primary air to zone         Fraction of zone supply from times primary air to zone         Fraction of zone supply from times primary air to zone         Fraction of zone supply from times primary air to zone         Fraction of zone supply from times primary air to zone         Fraction of zone supply from times primary air to zone         Fraction of zone supply from times primary air to zone         Fraction of zone supply from times primary air to zone         Fraction of zone supply air to zone         Fractin of zone suply air to zone         Fraction of zone s	Unused OA requirement for zone		ofm			531	530	528			39	
Fraction of zero CAPP / Integration Encircles / Integration         Fraction required in supply air to zone         Fraction required in primary air to zone         Fraction required in primary air to zone         Fraction required in primary air to zone         The primary air to zone         The primary air to zone         Fraction required in primary air to zone         The primary air t	Fraction of zone supply not directly reals. Itom zone Fraction of zone supply from fully mixed minute air	93		= Ep + (1-Ep)Er		1.00	1.00	1.00	38	1.0	1.00	1.00
Unused CA fraction required in supply air to zone         Zd         =         Voc / Vdz         =         0.35         0.35         0.35         0.09         0.11         0.11           System Ventilation Efficiency Unused CA fraction required in primary air to zone         Zp         =         Voc / Vpz         =         0.35         0.35         0.35         0.09         0.13         0.11           System Ventilation Efficiency System Ventilation System Efficiency (App A Method)         Evz         =         (Fa + FbXs - FcZ) / Fa         =         0.78         0.78         0.79         1.04         1.01         1.02           System Ventilation System Efficiency (App A Method)         Ev         =         (Voz / Vpz         =         0.78         0.78         0.79         1.04         1.01         1.02           Winimum outdoor air Intake afflow Outdoor Air Intake Felor required to System (Table 6.3 Method) Vot OL intake req'd as a fraction of primary SA (Table 6.3 Method) Vot OA intake req'd as a fraction of primary SA (Table 6.3 Method) Vot OA intake req'd as a fraction of primary SA (Table 6.3 Method) Vot OA intake req'd as a fraction of primary CA (Table 6.3 Method) Vot OA intake req'd as a fraction of primary CA (Table 6.3 Method) Vot OA intake req'd as a fraction of primary CA (Table 6.3 Method) Vot OA intake req'd as a fraction of primary CA (Table 6.3 Method) Vot OA intake req'd as a fraction of primary CA (Table 6.3 Method) Vot OA intake req'd as a fraction of primary CA (Table 6.3 Method) Vot OA intake req'd as a fracti	Fraction of zone OA not directly regire, from zone	5.9		= 1-(1-Ez)(1-Ep)(1-Er)		1.00	1.00	1.00	10	1.00	1.00	1.00
System Ventilation Efficiency System Ventilation Efficiency (App A Method)         Evz Ev         =         (voz. / Vpz Fa + FbXS - FcZ) / Fa Ev         =         0.35         0.35         0.09         0.13         0.11           System Ventilation Efficiency (App A Method)         Ev         =         (Fa + FbXS - FcZ) / Fa Ev         =         0.78         0.78         0.79         1.04         1.01         1.02           System Ventilation System Efficiency (App A Method)         Ev         =         0.78         0.78         0.79         1.04         1.01         1.02           Minimum outdoor air intake airflow Outdoor Air Intake Flow required to System Outdoor Air Intake Flow required to System (Table 6.3 Method) Vc         vt         ifm<=	Unused OA fraction required in supply air to zone	Zd		= Voz / Vdz	"	0.35	0.35	0.35	60.09	0.13	0.11	0.07
System Verifiation Efficiency (App A Method)     Evz     =     (Fa + FbXs - Fc2) / Fa     =     0.78     0.79     1.04     1.01     1.02       System Verifiation Efficiency (App A Method)     Ev     =     min (Evz)     =     0.78     0.78     0.79     1.04     1.01     1.02       Winimum outdoor Air Intake Filow required to System     Vot     Ev     =     min (Evz)     =     0.80       Minimum outdoor Air Intake Flow required to System     Vot     dm     =     Vot / Ev     =     4844       OA intake reqd as a fraction of primary SA     Y     dm     =     Vot / Vps     =     4768       OA rimake reqd as a fraction of primary SA     (Table 6.3 Method)     Vot     dm     =     Vot / Vps     =     4768       OA frame eff wis db minimum     Cod for its db minimum     Ever (Table 6.3 Method)     Vot     dm     =     Vot / Vps     =     4.178       OA frame eff wis db minimum     Deg F     =     (Tb-dTs)/(1Y)/(Tr+dTr     =     -25	Unused OA fraction required in primary air to zone	4		= Voz / Vpz	"	0.35	0.35	0.35	60.0	0.13	0.11	0.07
System Ventilation Efficiency (App A Method)     Ev     = inin (Evz)     = 0.78       Winimum outdoor air intake airlow     Ev     = Value from Table 6.3     = 0.78       Outdoor Air Intake Flow required to System     Vot     cfm     = Vot / Ev     = 4844       Outdoor Air Intake Flow required to System (Table 6.3 Method)     Vot     cfm     = Vot / Ev     = 4144       Outdoor Air Intake Flow required to System (Table 6.3 Method)     Vot     cfm     = Vot / Vps     = 0.178       Outdoor Air Intake Flow required to System (Table 6.3 Method)     Vot     cfm     = Vot / Vps     = 0.178       Outdoor Air Intake Flow required to System (Table 6.3 Method)     Vot     cfm     = Vot / Vps     = 0.178       Outdoor Air Intake Flow required to System (Table 6.3 Method)     Vot     cfm     = Vot / Vps     = 0.178       OA Temp at which Min OA provides all cooling     Ceg F     = (TD-dTsh/11-V)/(Tr+dTr     = .25	System ventilation Efficiency (App A Method)	Evz		= (Fa+FbXs-FcZ)/Fa	"	0.78	0.78	0.79	1.04	1.01	1.02	1.07
Winimum outdoor air intake airflow       Ev       =       Value from Table 6.3       =       0.50         Minimum outdoor air intake airflow       Outdoor Air Intake Flow required to System       Vot       ofm       =       Vot / Ev       =       4844         Outdoor Air Intake Flow required to System       Vot       ofm       =       Vot / Vps       =       0.18         Outdoor Air Intake Flow required to System (Table 6.3 Method)       Vot       ofm       =       Vot / Vps       =       0.18         Outdoor Air Intake Flow required to System (Table 6.3 Method)       Vot       ofm       =       Vot / Vps       =       0.18         Outdoor Air Intake Flow required to System (Table 6.3 Method)       Vot       ofm       =       Vot / Vps       =       0.18         OA Temp at which Min OA provides all cooling        =       Vot / Vps       =       0.17         OAT below which OA Intake flow is do minimum       Deg F       =       ([Tp-dTsf)-(1-Y)/(Tr+dTr       =       -25	System Ventilation Efficiency (App A Method)	V		= min (Evz)	= 0.7	ũ						
Minimum outdoor air intake airliow     Vot     dfm     Vot     Flow required to System       OUtdoor Air Intake Flow required to System     V     dfm     Vot / Vps     a       0A intake red as a fraction of primary SA     V     dfm     Vot / Vps     a       0A intake red as a fraction of primary SA     V     dfm     Vot / Vps     a       0A intake red as a fraction of primary SA     V     dfm     Vot / Vps     a       0A intake red as a fraction of primary SA     V     dfm     Vot / Vps     a       0A Temp at which Min 0A provides all cooling     V     a     Vot / Vps     a     0.17       0A Temp at which Min 0A provides all cooling     Deg F     = ((Tp-dTsf)-(1-Y)/(Tr+dTr     -25	Ventilation System Efficiency (Table 6.3 Method)	ų.		= Value from Table 6.3	= 0.8	Ŭ						
OA intake red(d as a fraction of primary SA     Y     =     Vor/Vps     =     0.18       Outdoor Air Intake Fedv required to System (Table 6.3 Method)     Vor     dfm     =     Vor/Vps     =     4.768       OA intake reqd as a fraction of primary SA (Table 6.3 Method)     Vor     dfm     =     Vor/Vps     =     4.768       OA Temp at which Min OA provides all cooling     OA (Table 6.3 Method)     Y     =     Vor/Vps     =     0.17       OAT below which OA Intake flow is do minimum     Deg F     =     ([Tp-dTsf)-(1-Y)/(Tr+dTr     =     -25	Minimum outdoor air intake airflow Outdoor Air Intake Flow required to System	Y <sub>ot</sub>		= Vou/Ev	= 484	4						
Outdoor Air Intake Flow required to System (Table 6.3 Method) Vot dfm = Vou / Ev = 4.768 OA intake red as a fraction of primary SA (Table 6.3 Method) Y = Vot / Vps = 0.17 OA Temp at which Min OA provides all cooling OAT below which OA Intake flow is do minimum Deg F = {(Tp-dTsf)-(1-Y)/(Tr+dTr = -25	OA intake regid as a fraction of primary SA	4	1	= Vot / Vps	=	œ i						
OA Intrave req of as a tradition of primary SA (Lable 0.3 Metricol) 1 = Vor/ vps = 0.17 OA Temp at which Min OA provides all cooling OAT below which OA Intake flow is @ minimum Deg F = {(Tp-dTsf)-(1-Y)'(Tr+dTr = -25	Outdoor Air Intake Flow required to System (Table 6.3 Method	< or	đ	= Vou/Ev	- 476	199						
OAT below which OA Intake flow is @ minimum Deg F = {(Tp-dTsf)-(1-Y)'\Tr+dTr = -25	OA Temp at which Min OA provides all cooling	1		= vot / vps								
	OAT below which OA Intake flow is @ minimum		Deg F	= {(Tp-dTsf)-(1-Y)*(Tr+dTr	۳ خ	ъ л						

Building: System TagName: Operating Condition Description: Units (select from pull-down list)	Nassau AHU-2 Design IP	Commur Peak Coo	vity College Life Sciences Bu Sling Load Condition	ilding								
Inputs for System Floor area served by system Population of area served by system (including diversity) Design primary supply fan airflow rate OA req'd per unit area for system (Weighted average) OA req'd per person for system area (Weighted average) Inputs for Potentially Critical zones	As As Ps Vpsd Ras Rps	sf P cfm/sf cfm/sf	100% diversity	Syste 184 27.6								
Zone Name	Jana Hi		under Halin for ordinal monotel		1	ele.	Vending	Fac. Office	Fac. Office	Fac. Office	Fac. Office	Fac. Office
Zone Tag			a bar anna an annan martal			rd 14	Third 41	Third 42	Third 43	Third 44	Third 45	Third 46
Space type		Select fro	ym pull-down list		equi	pment	Stations	omoe space	Office space	Office space	Office space	Office space
Floor Area of zone	2	st of the				8	202	106	105	105	105	105
Design total supply to zone (primary plus local recirculated)	Vdzd	₽ 7 -	oelault value listed, may be o	ennuenj		8.	175	350	350	350	350	350
Induction Lemninal Unit, Dual Fan Dual Duct or Transfer Fan? Local recirc. air % representative of ave system return air	Ψ	Selectific	om pull-down list or leave blan	CIT N/A		75%	75%	75%	75%	75%	75%	75%
Inputs for Operating Condition Analyzed Percent of total design airflow rate at conditioned analyzed	Ds	%		10		100%	100%	100%	100%	100%	100%	100%
Air distribution type at conditioned analyzed Zone air distribution effectiveness at conditioned analyzed	7 <b>57</b>	Select fro	m pull-down list			1.00	1.00	1.00	1.00	1.00	1.00	1.00
Results	1											
Ventilation System Efficiency Outdoor air intake required for system	<pre>Cot</pre>	đ		48 .0	5 2							
Outdoor air per unit floor area Outdoor air per person served by system (including diversity)	Vot/As Vot/Ps	ofm/sf			- 8							
Outdoor air as a % of design primary supply air	ğ	đ		=	*							
Detailed Calculations Initial Calculations for the System as a whole												
Primary supply air flow to system at conditioned analyzed UncorrectedOA requirement for system	Vor Vps		= VpdUs = Rps Ps + Ras As	= 2/0	88							
Uncorrected UA regional attraction of primary SA Initial Calculations for individual zones	S		= Vou / Vps	=	14							
OA rate per unit area for zone	Raz	ofin/sf				0.06	5.06	5 O.O6	ž 0.08	5 O.O8	0.08	5 D.O8
Total supply air to zone (at condition being analyzed)		din y				50	175	350	350	350	350	350
Unused OA req'd to breathing zone	Vbz	din	= Rpz Pz + Raz Az			. 4	32.1	11.4	11.3	11.3	11.3	11.3
Unused UA requirement for zone Fraction of zone supply not directly regire, from zone	₽ S	â	= Vbz/Ez = Ep + (1-Ep)Er			1.00	1.0 %	1.00	1.00	1.00	1.00	1.00
Fraction of zone supply from fully mixed primary air	γæ		= Ep = 1/1_E=V1_EnV1_EnV			1.00	1.00	1.0	1.8	1.00	1.8	1.00
Unused OA fraction required in supply air to zone	23		<ul> <li>Voz / Vdz</li> </ul>			0.08	0.18	0.03	0.03	0.03	0.03	0.03
Unused OA fraction required in primary air to zone	ţ		= Voz / Vpz	"		0.08	0.18	0.03	0.03	0.03	0.03	0.03
System Ventilation Efficiency (App A Method)	Exz		= (Fa + FbXs - FcZ) / Fa	II		1.05	0.95	1.10	1.10	1.10	1.10	1.10
System Ventilation Efficiency (App A Method)	V		= min (Evz)	" 0	8							
Ventilation System Efficiency (Table 0.3 Method)	ų		= Value from Table 6.3	= 0.0	8							
Minimum outdoor air intake airflow Outdoor Air Intake Flow required to System	√ot	Ĵ	= Vou / Ev	" 48	4							
OA intake regid as a fraction of primary SA	~	•	= Vot / Vps	"	18							
Outdoor Air Intake How required to System (Table 6.3 Method) OA intake registers a fraction of primary SA (Table 8.3 Method)	< 8	đ	= Vou / Ev		18							
OA Temp at which Min OA provides all cooling	1		eda una -	,								
OAT below which OA Intake flow is @ minimum		Deg F	= {(Tp-dTsf)-(1-Y)'(Tr+dTr	"	26							

Building: System TagName: Operating Condition Description: Units (select from pull-down list)	Nassau AHU-2 Design IP	Communi Peak Cool	ty College Life Sciences Buil	ding							
Inputs for System Floor area served by system	<u>Name</u> As	<u>Units</u> sf		System 18401							
Population of area served by system (including diversity) Design primary supply fan arflow rate OA req'd per unit area for system (Weighted average) OA req'd per person for system area (Weighted average) DA reqt per person for system area (Weighted average)	Ps Vpsd Ras Rps	P cfm/sf cfm/p	100% diversity	320 27,650 0.08 7.3							
Zone Name	Zone Hill	e hume nun	nle italic for oritical zone/s)		Fac. Office	Fac. Office	Fac. Office	Fac. Office	Fac. Office	Fac. Office	Fac. Office
Zone Tag					Third 47	Third 48	Third 49	Third 50	Third 51	Third 52	Third 53
Space type					Office space	onice space	onice space	onice space	Onlice space	Office space	Office share
Floor Area of zone	P2	Select from	n pull-down list		105	105	105	105	105	105	105
Design population of zone	Ĩ	) P (a	efault value listed; may be ove	midden)	350 -1	250	1	1	- 100	280 -1	250
Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?	T UEU	Select from	n pull-down list or leave blank	f N/A	20	2	20	50	20	000	000
Inputs for Operating Condition Analyzed						10		10	1000	1000	10.00
Federation of our one segment and we consultation of analyzed Air distribution type at conditioned analyzed Zone air distribution effectiveness at conditioned analyzed	5 12	% Select from	n pull-down list	100 %	1.00	1.00	1.00	1.00	1.00	1.00	1.00
r rinnar y air maccion or supply air at containonteu anaryzeu Results	Ę										
Ventilation System Efficiency Outdoor air intake required for system	g ₽	ŝ		0.78							
Outdoor air per unit floor area	Vot/As	cfm/sf		0.26							
Outdoor air ber person serve oy system (mouoning uiversity) Outdoor air as a % of design primary supply air	Ypd Yours	dim p		13.1 18%	-						
Detailed Calculations Initial Calculations for the System as a whole											
Primary supply air flow to system at conditioned analyzed UncorrectedOA requirement for system	Vou		= VpdUs = Rps Ps + Ras As	= 2/600 = 3793							
Uncorrected OA req'd as a fraction of primary SA Initial Calculations for individual zones	Xs		= Vou / Vps	= 0.14							
OA rate per unit area for zone	Raz	cfin/sf			0.06	0.06	0.06	0.08	0.06	0.06	0.06
UA rate per person Total supply air to zone (at condition being analyzed)	<b>₹</b> ₹	ofini p			350	350	350	350	320	350	350
Unused OA req'd to breathing zone	N <sub>DZ</sub>	ofin	Rpz Pz + Raz Az	"	11.3	11.3	11.3	11.3	11.3	11.3	11.3
Unused OA requirement for zone Fraction of zone supply not directly recirc. from zone	F⊌⊘z	đm	= Vbz/Ez = Ep + (1-Ep)Er		1.00	1.00	1.00	1.00	1.00	1.00	1.01
Fraction of zone supply from fully mixed primary air	7 27				1.00	1.00	1.00	1.8	1.00	1.00	1.00
Fraction of zone QA not directly rears. from zone Unused OA fraction required in supply air to zone	7 2		= 1-(1-EZ)(1-EP)(1-Er)		0.03	0.03	0.03	0.00	0.03	0.00	0.03
Unused OA fraction required in primary air to zone	61		= Voz / Vpz	"	0.03	0.03	0.03	0.03	0.03	0.03	0.03
System Ventilation Efficiency Zone Ventilation Efficiency (App A Method)	Evz		= (Fa+FbXs-FcZ)/Fa	"	1.10	1.10	1.10	1.10	1.10	1.10	1.10
System Ventilation Efficiency (App A Method)	Ev		= min (Evz)	= 0.78							
Ventilation System Efficiency (Table 6.3 Method)	ę		= Value from Table 8.3	= 0.80							
Minimum outdoor air intake airtiow Outdoor Air Intake Flow required to System	Vot	efin	= Vou / Ev	= 4844							
OA intake regid as a fraction of primary SA	~	•	= Vot / Vps	= 0.18							
Outdoor Air Intake Flow required to system (Lade 0.3 Method) OA intake regid as a fraction of primary SA (Table 6.3 Method)	× s	gin	= Vot / Vps	= 4/00 = 0.17							
OA Temp at which Min OA provides all cooling			= //TrudTeft/1_VN//TrudTr	5							
OTH SCOTTON OF MANY NOT DESIGN TO BE	I		and the state of the state of the								

OA rate per person     Rpz     dimp     500       Total supply air to zone (at condition being analyzed)     Vbz     dim     Fraction of zone supply into timestry recirc. from zone     Vbz     dim     Fraction of zone supply into timestry recirc. from zone     Vbz     dim     Fraction of zone supply into timestry recirc. from zone     Vbz     dim     Fraction of zone supply into timestry recirc. from zone     Vbz     dim     Fraction of zone supply into timestry recirc. from zone     Fraction of zone CA not directly recirc. from zone     Fra	Detailed Calculations         Detailed Calculations         State of the System as a whole         State of the System as a system as a system and the System and the System and the System as a system as a system as a system and the System as a system as	Percent of total design airlow rate at conditioned analyzed     Ds     %     100%     100%     100%     100% average       Air distribution type at conditioned analyzed     Ex     Select from pull-down list     CS     100     100     waverage     Primary airlow rate to zones       Primary air fraction of supply air at conditioned analyzed     Ex     Select from pull-down list     CS     100     100% average     Primary airlow rate to zones       Nemative     Ventilation System Efficiency     Ev     0.78     0.78     100 average     27650 cfm       Outdoor air per unit floor area     Vot     cfm     4844     0.26     100     27650 cfm     102       Outdoor air per person served by system (including diversity)     Vot     cfm     0.26     0.26     105     105       Outdoor air as a % of design primary supply air     Vpd     cfm     18%     18%     18%     18%	Zone Tag     Third 54       Space type     Space type       Floor Area of zone     Select from pull-down list       Design population of zone     Az       Spece type     Select from pull-down list       Design population of zone     Pz       P     (default value listed; may be overridden)       1     320 total P       Design total supply to zone (primary plus local recirculated)     Vozd       Vizzd     dfm       Induction Terminal Unit; Dual Fan Dual Duct or Transfer Fan?     Select from pull-down list or leave blank if N/A       Local merice:     air:       Inputs for Operating Condition Analyzed     To	Inputs for System     Name     Units     System       Floor area served by system     As     si       Population of area served by system (including diversity)     Ps     P     100% diversity     18401       Population of area served by system (including diversity)     Ps     P     100% diversity     17.4       Design primary supply fan artflow rate OA red'd per unit area for system (Weighted average)     Pas     dm/s     27.860     0.08 or dm/st       OA red'd per unit area for system area (Weighted average)     Ras     dm/st     10.09% diversity     27.800     0.050 or dm/st       OA red'd per protectial zones     To Potentially Critical zones     To 30 ave cfm/st     0.030 or dm/st     0.050 or dm/st       Inputs for Potentially Critical zones     Zone Name     Too official zone/st     Fac. Office     Totals/average	Building:     Nassau Community College Life Sciences Building       System TayName:     AHU-2       Operating Condition Description:     Design Peak Cooling Load Condition       Units (select from pull-down list)     IP
	yiision	make that primary over design te to zones			

Building: System Tag/Name: Oberating Condition Description:	Nassau AHU-3 Design	J Commu	nity College Life Sciences Bi oling Load Condition	uilding								
Units (select from pull-down list)	IP IP				μ							
Inputs for System	Name	Units		Sys	ien i							
Population of area served by system (including diversity)	ጉን	, TO 9	100% diversity		143							
OA need per unit area for system (Weighted average)	Ras	din si		8	0.10							
Inputs for Potentially Critical zones	ceb a	cine P		ſ	8							
Zone Name	Zone tit	le turns pu	inple italic for critical zone(s)			Corr. #1	inorgan. Chem Lab	Inorgan. Chem Lab	Chem Lab	Stockroom	Office	Storage
Zone Tag			:		5	econd 01	Second 03	Second 04	Second 05	Second 06	Second 06A	Second 17
Space type					_		age 9 plus)	(age 9 plus)	(age 9 plus)	rooms	Office space	rooms
	ĩ	Select fro	om pull-down list			53	100	1074	1075	500	9	2
Privot Area of Zone Design population of Zone	ያ ያ	ש סר	(default value listed; may be o	verridden	Т	0	26	26	26	2	1	0
Design total supply to zone (primary plus local recirculated)	Vdzd		en sull down list or losus blan			1,000	2500	2500	2500	750	100	350
Local recirc: air % representative of ave system return air	Ψ				H	75%	75%	75%	75%	75%	75%	75%
Inputs for Operating Condition Analyzed Percent of total design airflow rate at conditioned analyzed	<u>0</u>	*		_	80%	100%	100%	100%	100%	100%	100%	100%
Air distribution type at conditioned analyzed Zone air distribution effectiveness at conditioned analyzed	1	Select fro	om pull-down list			1.00	1.00	1.00	1.00	1.00	1.00	1.00
Results	ł				+							
Ventilation System Efficiency Outdoor air intake required for system	≦ ₽	f		N -	75 S							
Outdoor air per unit floor area	Vot/As	ofinisi			23							
Outdoor air as a % of design primary supply air	Ypd	đđ (			12%							
Detailed Calculations Initial Calculations for the System as a whole												
Primary supply air flow to system at conditioned analyzed Uncorrected/OA neguirement for system	S PS	₿₿	= VpdDs = Rns Ps + Ras As	" " . N	38							
Uncorrected OA regid as a fraction of primary SA	š		= Vou / Vps	"								
Initial Calculations for individual zones OA rate per unit area for zone	Raz	cfm/sf				0.06	0.12	0.12	0.12	0.12	0.06	0.12
OA rate per person	Rpz	cfm/p				0.00	10.00	10.00	10.00	0.00	5.00	0.00
Total supply air to zone (at condition being analyzed) Unused OA reg'd to breathing zone		₿₿	= Rpz Pz + Raz Az	"		92.0	2500 414.0	2500 412.5	2500 413.0	64.0	102	350
Unused OA requirement for zone	Voz	đ	= Vbz/Ez	"		82	414	413	413	64	10	35
Fraction of zone supply not directly recirc. from zone	7 27		= Ep + (1-Ep)Er			1.00	1.00	. 1.	1.00	1.00	1.00	1.00
Fraction of zone Supply from fully mixed primary air Fraction of zone OA not directly regime from zone	5 J		= Ep = 1-(1-F=)(1-Fn)(1-Fr)			1 1	1.00	1.00	1.0	1.00	1.00	1.00
Unused OA fraction required in supply air to zone	23		= Voz / Vdz	"		0.09	0.17	0.17	0.17	0.09	0.10	0.10
Unused OA fraction required in primary air to zone	Ş		= Voz / Vpz	H		0.09	0.17	0.17	0.17	0.09	0.10	0.10
System Ventilation Efficiency Zone Ventilation Efficiency (Ann. & Method)	5		= /Fat PhXet Fn7) / Fa	"		103	0,5	0 05	0.05	103	1	1
System Ventilation Efficiency (App A Method)			= min (Evz)	" '	.95	20.1	0.90	0.00	0.au	en l	101	1.01
Ventilation System Efficiency (Table 8.3 Method)	<u>۳</u>		= Value from Table 6.3	"	.98							
Outdoor Air Intake Flow required to System	Vot	₽	= Vou / Ev	"	765							
OA intake req'd as a fraction of primary SA	1		= Vot / Vps	"	0.12							
Outdoor Air Intake Flow required to System (Table 6.3 Method)	Ś	đ	= Vou / Ev		2664	101.17						
OA Temp at which Min OA provides all cooling	1		= vot/vps		0.12	0.04						
OAT below which OA Intake flow is @ minimum		Deg F	= {(Tp-dTsf)-(1-Y)"(Tr+dTr	"	\$							

Building; System Tag/Name: Operating Condition Description: Units (select from pull-down list)	Nassau AHU-3 Design IP	Commun Peak Coc	nity College Life Sciences Bu bling Load Condition	liiding								
Inputs for System Floor area served by system Population of area served by system (including diversity) Design primary supply fan airflow rate OA req'd per unit area for system (Weighted average) OA req'd per person for system area (Weighted average) DA reqd per person for system area (Weighted average) Inputs for Potentially Critical zones	Name As Ps Ps Ps Ras Ras	sf P cfm cfm/sf	100% diversity	Syste 12 23,1	980054322m Pe	entially Cri	ical Zones					
Zone Name	Zone till	e turns pu	mple italic for oritical zone(s)		8	orr. 32	Chem Lab	)rgan Chem	Organ	Organ Chem	Corr. #3	Corr. #2
Zone Tag					Sec	midors	Second 19	Second 21	Second 22 Classrooms	Second 23	Second 25 Corridors	Base 01 Corridors
Space type		Select fro	om pull-down list		ç		(age 9 plus) (	age 9 plus)	(age 9 plus)	(age 9 plus)	Contracts	COLLING
Floor Area of zone	2	्र				598	1289	<b>9</b> 43	292	943	8	711
Design total supply to zone (primary plus local recirculated)	Vdzd	fr 1	oeidult value listed, illay be o	Vennoen		300	2500	3840	350	3840	350	1925
Local recirc, air % representative of ave system return air	Ψ		an purpose list of reave plan		$\left  \right $	75%	75%	75%	75%	75%	75%	75%
Inputs for Operating Condition Analyzed Percent of total design airflow rate at conditioned analyzed	<b>D</b> 2	*		=	2%	100%	100%	100%	100%	100%	100%	100%
Air distribution type at conditioned analyzed Zone air distribution effectiveness to conditioned analyzed Primary air fraction of sunoly air at conditioned analyzed	5 17	Select fro	om pull-down list			1.80	1.00	.1 <mark>8</mark> 8	1.00	1.00	1.00	1.00
Results								-			-	
Ventilation System Efficiency Outdoor air intake required for system	Ś₽	đ		27.0	ሜ ሜ							
Outdoor air per unit floor area Outdoor air per person served by system (including diversity)	Vot/As Vot/Ps	cfm/sf		± 9	ដង							
Outdoor air as a % of design primary supply air	Ypd	đ,			2%							
Detailed Calculations Initial Calculations for the System as a whole												
Primary supply air flow to system at conditioned analyzed UncorrectedOA requirement for system	Vou	함협	= VpdUs = Rps Ps + Ras As	= = 23	85							
Uncorrected UA regio as a fraction of primary SA Initial Calculations for individual zones	XS		= Vou / Vps	"	н							
OA rate per unit area for zone OA rate per person	Raz	dm/st				0.06	10.00	10.00	10.00	10.00	0.00	0.00
Total supply air to zone (at condition being analyzed)	5 <u>6</u> .	∄∄	= Rn7 P7 + R37 A7	"		350	2500	313.6	550	313.6	40.8	1925 427
Unused OA requirement for zone	Voz	ft i	= Vbz/Ez	"		36	355	314	8	314	41	43
Fraction of zone supply not directly recirc. from zone	2		= Ep + (1-Ep)Er			1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fraction of zone Supply from tuily mixed primary air Fraction of zone OA not directly regire, from zone	5, 2		= tp = 1-(1-Ez)(1-En)(1-Er)			1.00	1.0	1.0	1.00	1.00	1.0	1.00
Unused OA fraction required in supply air to zone	Zd		= Voz / Vdz	"		0.12	0.14	0.08	0.16	0.08	0.12	0.02
Unused OA fraction required in primary air to zone	ţ		= Voz / Vpz	"		0.12	0.14	0.08	0.16	0.08	0.12	0.02
System Ventilation Efficiency Zone Ventilation Efficiency (Ann A Method)	F S		= /Fat FhXet Fn71/Fa	"		000	0.97	103	0.08	103	1	1 00
System Ventilation Efficiency (App A Method)	<b>2</b>		= min (Evz)		ያ የ	0.00	0.67	1.00	0.00	1.00		1.00
Ventilation System Efficiency (Table 6.3 Method)	Ψ.		= Value from Table 6.3		8							
Outdoor Air Intake Flow required to System	Vot	at T	= Vou / Ev	= 2	8							
OA intake req'd as a fraction of primary SA	4		= Vot / Vps	"	12							
Outdoor Air Intake Flow required to System (Table 6.3 Method) OA intake regid as a fraction of primary SA (Table 6.3 Method)	< <u>o</u> t	đ	= Vou / Ev = Vot / Vos		3 <u>8</u>							
OA Temp at which Min OA provides all cooling	1		eda tros		ĥ							
OAT below which OA Intake flow is @ minimum		Deg F	= {(Tp-dTsf)-(1-Y)"(Tr+dTr	"	8							

vilding: ·stem Tag/Name:	Nassau AHU-3	Comm	unity College Life Sciences Bu	ilding				
nits (select from pull-down list)	IP IP		Suma Suma					
nputs for System	Name	Units		Syste		Check Figures		
Floor area served by system Population of area served by system (including diversity)	ጉራ	ט פו	100% diversity	Ē	<u>8</u>	11.9 P/1000 sf		
Design primary supply fan airflow rate OA req'd per unit area for system (Weighted average)	Ras	din/sf		23	100	1.91 cfm/sf 0.10 ave cfm/sf		
ophieq uper person or system area (weighted average) nputs for Potentially Critical zones	νþ2	cimp		ſ		and ave curb		
Zone Name	Zone tit	ie turns j	ourole italic for critical zone(s)		Rm Maintenance	otals/averages		
Zone Tag					Base 06 Base 15			
Space type					equipment rooms			
Floor Area of zone	R	st Selection	from pull-down list		211 101	12052 total sf		
Design population of zone	PZ	P	(default value listed; may be ov	erridden)	0	143 total P		
Design total supply to zone (primary plus local recirculated)	Vdzd	r st	from and down list or lower black		100 100	23005 total cfm		
Local recirc. air % representative of ave system return air	Ψ		non par contrat o scare plan		75% 75%	1.00 average		
nputs for Operating Condition Analyzed Percent of total design airflow rate at conditioned analyzed	2	*		=	100% 100%	100% average		make that primary ow
Air distribution type at conditioned analyzed Zone air distribution effectiveness at conditioned analyzed	Ţ	Select	from pull-down list	[		100% average	Primary airflow rate to zones	
Primary air fraction of supply air at conditioned analyzed	Ð					1.00 average	23005 cfm	
Ventilation System Efficiency	Ð				5			
Outdoor air intake required for system	Vot	đ		27	8			
Outdoor air per unit floor area Outdoor air per person served by system (including diversity)	Vot/As	ofm)st			5			
Outdoor air as a % of design primary supply air	Ypd	ŧ.		-	2%			
Detailed Calculations nitial Calculations for the System as a whole								
Primary supply air flow to system at conditioned analyzed	Vps	ר € ל	= VpdDs	1 II 23	3 8	143 System pop	ulation without diversity	
Uncorrected OA regularement for system Uncorrected OA regid as a fraction of primary SA	ζ vou	900	= Mps Ps + Mas As = Vou / Vps		3 1	nuu aystem pop	Jiation diversity, D	
nitial Calculations for individual zones								
OA rate per unit area for zone	Raz	ctm/st			0.06 0.12			
On take per person Total supply air to zone (at condition being analyzed)					100 100	23005		
Unused OA req'd to breathing zone		et e	= Rpz Pz + Raz Az	"	12.7 12.1	2822		
Unused OA requirement for zone	Voz	đ	= Vbz/Ez	"	13 12	2622		
Fraction of zone supply not directly recirc. from zone	7 27		= Ep + (1-Ep)Er		1.00 1.00			
Fraction of zone Supply itom tully mixed primary air Fraction of zone OA not directly regire, from zone	73		= tp = 1-(1-Ez)(1-Ep)(1-Er)		1.00 1.00			
Unused OA fraction required in supply air to zone	Z		= Voz / Vdz	"	0.13 0.12	0.17 Maximum Zo		
Unused OA fraction required in primary air to zone	ţ		= Voz / Vpz	"	0.13 0.12	0.17 Maximum Zp		
Zone Ventilation Efficiency (App A Method)	Evz		= (Fa + FbXs - FcZ) / Fa	"	66.0			
System Ventilation Efficiency (App A Method)	Į.		= min (Evz)	" 0	55			
Ventilation System Efficiency (Table 6.3 Method)	5		= Value from Table 6.3	- 0	8			
Dubleer Air Intake airfiew	Set.	₽		۳ ب	25			
OA intake regid as a fraction of primary SA	<b>~</b> ;		= Vot / Vps	"	12			
Outdoor Air Intake Flow required to System (Table 6.3 Method)	Vot	đ	= Vou/Ev	"	7			
OA intake regid as a fraction of primary SA (Table 6.3 Method) DA Temp at which Min DA provides all cooling	~		= Vot / Vps	"	12			
OAT below which OA Intake flow is @ minimum		Deg F	= {(Tp-dTsf)-(1-Y)*(Tr+dTr	"	69			

# **Appendix B – Minimum Ventilation Compliance Check**

		AH	U-1			
Room Number	Room Name	Level	Area	Design Ventilation	Minimum Ventilation	Standard 62.1 Compliant (Y/N)
1-17	Lobby	Level 1	375 SF	100	73	Y
1-19	Corr. #2	Level 1	451 SF	200	27	Y
1-20	Group Study Area	Level 1	1018 SF	1600	478	Y
1-21	36-Person General Classroom	Level 1	1181 SF	1950	341	Y
1-22	24-Person General Classroom	Level 1	755 SF	1200	225	Y
1-23	24-Person General Classroom	Level 1	761 SF	1100	226	Y
1-24	Chemistry Computer Cluster	Level 1	989 SF	1800	369	Y
1-26	Corr. #3	Level 1	622 SF	350	37	Y
1-27	Fac. Office	Level 1	109 SF	350	12	Y
1-28	Fac. Office	Level 1	105 SF	325	11	Y
1-29	Fac. Office	Level 1	105 SF	325	11	Y
1-30	Fac. Office	Level 1	105 SF	325	11	Y
1-31	Fac. Office	Level 1	105 SF	325	11	Y
1-32	Fac. Office	Level 1	105 SF	325	11	Y
1-33	Fac. Office	Level 1	106 SF	325	11	Y
1-34	Elec.	Level 1	56 SF	100	3	Y
1-35	Fac. Office	Level 1	102 SF	150	11	Y
1-36	Fac. Office	Level 1	105 SF	150	11	Y
1-37	Fac. Office	Level 1	106 SF	150	11	Y
1-39	Seating Niche	Level 1	432 SF	300	12	Y
2-15	Faculty Lounge	Level 2	301 SF	500	96	Y
2-18	Corr.#2	Level 2	598 SF	250	36	Y
2-20	Chemistry Admin. Suite	Level 2	299 SF	350	38	Y
2-20A	Director's Office	Level 2	174 SF	175	15	Y
2-20C	Conf. Room	Level 2	247 SF	500	75	Y
2-26	Fac. Office	Level 2	109 SF	350	12	Y
2-27	Fac. Office	Level 2	105 SF	325	11	Y
2-28	Fac. Office	Level 2	105 SF	325	11	Y
2-29	Fac. Office	Level 2	105 SF	325	11	Y
2-30	Fac. Office	Level 2	105 SF	325	11	Y
2-31	Fac. Office	Level 2	105 SF	325	11	Y
2-32	Fac. Office	Level 2	106 SF	325	11	Y
2-33	Elec.	Level 2	56 SF	100	3	Y
2-34	Fac. Office	Level 2	102 SF	150	11	Y
2-35	Fac. Office	Level 2	105 SF	150	11	Y
2-36	Fac. Office	Level 2	106 SF	150	11	Y

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2-37	Fac. Office	Level 2	105 SF	150	11	Y
2-38	Fac. Office	Level 2	105 SF	150	11	Y
2-39	Fac. Office	Level 2	102 SF	150	11	Y
3-15	Faculty Lounge	Level 3	301 SF	525	141	Y
3-17	Practical Skills Training Room	Level 3	1423 SF	2100	363	Y
3-18	Corr. #2	Level 3	1111 SF	500	67	Y
3-19	Nursing Admin. Suite	Level 3	517 SF	350	51	Y
3-20	Storage	Level 3	155 SF	150	19	Y
3-21	Director's Office/Conf. Room	Level 3	470 SF	500	33	Y
	Nursing Learning Center/Media					
3-23	Stor.	Level 3	666 SF	700	160	Y
3-24	Nursing Computer Exam Room	Level 3	1643 SF	2100	677	Y
3-26	Corr. #3	Level 3	613 SF	350	37	Y
3-27	Fac. Office	Level 3	109 SF	375	12	Y
3-28	Fac. Office	Level 3	105 SF	350	11	Y
3-29	Fac. Office	Level 3	105 SF	350	11	Y
3-30	Fac. Office	Level 3	105 SF	350	11	Y
3-31	Fac. Office	Level 3	105 SF	350	11	Y
3-32	Fac. Office	Level 3	105 SF	350	11	Y
3-33	Fac. Office	Level 3	106 SF	350	11	Y
3-34	Elec.	Level 3	56 SF	100	3	Y
3-35	Fac. Office	Level 3	102 SF	175	11	Y
3-36	Fac. Office	Level 3	105 SF	175	11	Y
3-37	Fac. Office	Level 3	106 SF	175	11	Y
3-38	Fac. Office	Level 3	105 SF	175	11	Y
3-39	Fac. Office	Level 3	105 SF	175	11	Y
3-40	Fac. Office	Level 3	102 SF	175	11	Y

		AHU-	2			
Room Number	Room Name	Level	Area	Design Ventilation	Minimum Ventilation	Standard 62.1 Compliant (Y/N)
1-01	Corr. #1	Level 1	1492 SF	750	90	Y
1-03	36-Person General Classroom	Level 1	1074 SF	1600	334	Y
1-04	24-Person General Classroom	Level 1	755 SF	1100	225	Y
1-05	36-Person General Classroom	Level 1	1067 SF	1600	334	Y
1-06	36-Person General Classroom	Level 1	1056 SF	1300	333	Y
1-08	Men	Level 1	243 SF	225	29	Y
1-09	Women	Level 1	314 SF	325	38	Y
1-10	Elec.	Level 1	110 SF	100	7	Y
1-15	Tele.	Level 1	69 SF	50	4	Y
1-40	Vending	Level 1	203 SF	225	32	Y
1-41	Fac. Office	Level 1	106 SF	325	11	Y

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1-42	Fac. Office	Level 1	105 SF	325	11	Y
1-43	Fac. Office	Level 1	105 SF	325	11	Y
1-44	Fac. Office	Level 1	105 SF	325	11	Y
1-45	Fac. Office	Level 1	105 SF	325	11	Y
1-46	Fac. Office	Level 1	105 SF	325	11	Y
1-47	Fac. Office	Level 1	105 SF	325	11	Y
1-48	Fac. Office	Level 1	105 SF	325	11	Y
1-49	Fac. Office	Level 1	105 SF	325	11	Y
1-50	Fac. Office	Level 1	105 SF	325	11	Y
1-51	Fac. Office	Level 1	105 SF	325	11	Y
1-52	Fac. Office	Level 1	105 SF	325	11	Y
1-53	Fac. Office	Level 1	109 SF	350	12	Y
2-07	Men	Level 2	243 SF	225	29	Y
2-08	Women	Level 2	310 SF	325	37	Y
2-09	Elec.	Level 2	110 SF	100	7	Y
2-14	Tele.	Level 2	69 SF	50	4	Y
2-40	Vending	Level 2	201 SF	225	32	Y
2-41	Fac. Office	Level 2	106 SF	325	11	Y
2-42	Fac. Office	Level 2	105 SF	325	11	Y
2-43	Fac. Office	Level 2	105 SF	325	11	Y
2-44	Fac. Office	Level 2	105 SF	325	11	Y
2-45	Fac. Office	Level 2	105 SF	325	11	Y
2-46	Fac. Office	Level 2	105 SF	325	11	Y
2-47	Fac. Office	Level 2	105 SF	325	11	Y
2-48	Fac. Office	Level 2	105 SF	325	11	Y
2-49	Fac. Office	Level 2	105 SF	325	11	Y
2-50	Fac. Office	Level 2	105 SF	325	11	Y
2-51	Fac. Office	Level 2	105 SF	325	11	Y
2-52	Fac. Office	Level 2	105 SF	325	11	Y
2-53	Fac. Office	Level 2	109 SF	350	12	Y
3-01	Corr. #1	Level 3	1501 SF	700	90	Y
3-03	Practical Skills Training Room	Level 3	1426 SF	1500	531	Y
3-04	Practical Skills Training Room	Level 3	1419 SF	1500	530	Y
3-05	Practical Skills Training Room	Level 3	1396 SF	1500	528	Y
3-06	Prep Room	Level 3	299 SF	300	28	Y
3-07	Men	Level 3	243 SF	225	29	Y
3-08	Women	Level 3	310 SF	325	37	Y
3-09	Elec.	Level 3	110 SF	100	7	Y
3-14	Tele.	Level 3	69 SF	50	4	Y
3-41	Vending	Level 3	202 SF	175	32	Y
3-42	Fac. Office	Level 3	106 SF	350	11	Y
3-43	Fac. Office	Level 3	105 SF	350	11	Y

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3-44	Fac. Office	Level 3	105 SF	350	11	Y
3-45	Fac. Office	Level 3	105 SF	350	11	Y
3-46	Fac. Office	Level 3	105 SF	350	11	Y
3-47	Fac. Office	Level 3	105 SF	350	11	Y
3-48	Fac. Office	Level 3	105 SF	350	11	Y
3-49	Fac. Office	Level 3	105 SF	350	11	Y
3-50	Fac. Office	Level 3	105 SF	350	11	Y
3-51	Fac. Office	Level 3	105 SF	350	11	Y
3-52	Fac. Office	Level 3	105 SF	350	11	Y
3-53	Fac. Office	Level 3	105 SF	350	11	Y
3-54	Fac. Office	Level 3	109 SF	375	12	Y

AHU-3										
Room Number	Room Name	Level	Area	Design Ventilation	Minimum Ventilation	Standard 62.1 Compliant (Y/N)				
2-01	Corr. #1	Level 2	1533 SF	1000	92	Y				
2-03	Inorganic Chemistry Lab	Level 2	1283 SF	2500	414	Y				
2-04	Inorganic Chemistry Lab	Level 2	1271 SF	2500	413	Y				
2-05	Inorganic Chemistry Lab	Level 2	1275 SF	2500	413	Y				
2-06	Chemical Stockroom	Level 2	533 SF	750	64	Y				
2-06A	Chem. Stockroom Office	Level 2	87 SF	100	10	Y				
2-17	Cart/Equipment Storage Room	Level 2	294 SF	350	35	Y				
2-18	Corr. #2	Level 2	598 SF	300	36	Y				
2-19	Inorganic Chemistry Lab	Level 2	1289 SF	2500	355	Y				
2-21	Organic Chemistry Lab	Level 2	947 SF	3840	314	Y				
2-22	Organic Instrumentation	Level 2	292 SF	350	55	Y				
2-23	Organic Chemistry Lab	Level 2	947 SF	3840	314	Y				
2-25	Corr. #3	Level 2	680 SF	350	41	Y				
B-01	Corr. #2	Basement	711 SF	1925	43	Y				
B-06	Main Telecom Room	Basement	221 SF	100	13	Y				
B-15	Custodial/Maintenance	Basement	101 SF	100	12	Y				