ASHRAE Standard 62
Evaluation

Jonathan Burke
Mechanical Option
Central Shared Use Facility
Silver Spring, Maryland

Presented to: Jelena Srebric

Table of Contents

Executive Summary

ASHRAE Standard 62 is one of the primary guides used to properly design mechanical systems that will supply a correct amount of outdoor air. The Central Shared Use Facility is located in the middle of the FDA's campus in Silver Spring Maryland. It is a 4 story building approximately 11,695 square meters. As the name suggests, it is a multi-use building which contains a library, cafeteria, doctor's office, gym, auditorium, offices, and conference rooms. There are two rooftop units, OAHU-1 and OAHU-2, which supply 5 interior air handling units with outdoor air. The entire ground floor is serviced by AHU B-1, while the first and second floors are each serviced by two AHU's, AHU 1-1, 1-2, 2-1, and 2-2. OAHU-1 supplies AHU B-1, 1-1, and 2-1. OAHU-2 supplies AHU 1-2, 2-2.

It was found that OAHU-1 supplies an adequate amount of outdoor air to the three air handling units it supplies. 20,168 L/s is required by the AHU's and it supplies 26,515 L/s. This leaves enough outdoor air for the future unit which will supply a library.

OAHU-2 does not supply enough outdoor air to the two air handling units it supplies. 21,817 L/s is required but it only supplies 20,680 L/s of outdoor air. This unit is already undersized and there is not enough outdoor air for the future space planned on being supplied by it.

Aside from a couple spaces, the average space outdoor air fraction was found to be around 50%. A couple spaces were found to be under ventilated.

Purpose

As stated in the standard, the purpose of ANSI/ASHRAE Standard 62.1-2004 "is to specify minimum ventilation rates and indoor air quality that will be acceptable to human occupants." This is necessary to help reduce health hazards due to poor air quality. The standard specifies two procedures can be used to design ventilation systems, the first being Ventilation Rate Procedure, and the second being the IAQ Procedure. For this report, the Ventilation Rate Procedure was used for analysis. The theory behind this procedure is that by supplying enough outdoor air to a space, contaminated air will be cycled out of the building. This standard will specify the minimum amount of outdoor air that should be circulated through a room.

Assumptions

- Occupant Category – each room was labeled with a generic name, and using those, I used the conditions for the most similar occupant category listed on Table 6-1 from the standard.
- Occupant Density – As with the category, I did not know the Occupant Density, so as indicated on Table 6-1, the default values of the occupant density were used.
- Zone Air Distribution Effectiveness – For calculation purposes, the value of Ez is assumed to be 0.8. This is according to Table 6-2, stating that Ceiling supply of warm air 8°C above space temperature and ceiling return. The zones are supplied by ceiling diffusers, with outlet air heated to 35°C by the Terminal Box. 35°C is about 13°C above the space temperature.
- System Population (P_S) – Since the Occupant Density was not known to begin with, I assumed that the system population would be equal to the sum of the occupants for each space. This will yield a value of 1 for the occupant diversity (D).
- Exhaust Ventilation Systems were ignored. This includes spaces that were only exhausted, such as bathrooms, mechanical rooms, and electrical closets.
- Two shell spaces were ignored in this report. A shell space in the basement is a future IT Lab. The third floor shell space is a future library. Both of these spaces are not designed, and presently, there are no AHU's supplying these spaces.
- It is assumed there will be no smoking in the dining area, because this is a government building.

Procedure

Step One: Identify Zones, their occupancy category, occupant density, and area. As stated in the assumptions, the occupancy category and density were assumed based off the Space Name. The Area was measured off electronic drawings.

Step Two: Identify R_a and R_p using Table 6-1 from Standard 62.1-2004. These numbers correspond to the Occupancy Category which was assumed earlier.

Step Three: Calculate V_{BZ}. $V_{BZ}= (R_P P_Z) + (R_A A_Z)$

Step Three: Zone Air Distribution Effectiveness (E_Z) was identified as 0.8 due to the temperature of the supply air.

Step Four: Calculated V_{OZ}. $V_{OZ}=V_{BZ}/ E_Z$.

Step Five: Find the primary airflow from the air handler (V_{PZ}) to each space. This was found off of the mechanical drawings by the diffusers.

Step Six: Calculate the Primary Outdoor Air Fraction (Z_P) for each space. Zp=Voz/Vpz.

Step Seven: Calculate the occupancy diversity (D) for each system. $D=P_s/\text{Sum}(P_Z)$. Find the system population (P_S) for each AHU. Since the occupant level was unknown in the first place, I am being conservative by making P_S equal to P_Z for each space. D is equal to 1 for each AHU.

Step Eight: Calculate Uncorrected Outdoor Air Intake (V_{OU}) for each system. $V_{OU}=D(\text{sum}(R_P P_Z))+(\text{sum}(R_A A_Z))$.

Step Nine: To calculate the System Ventilation Efficiency (Ev) I had to use Appendix A, because the Max Zp for each system was greater than .55. This procedure requires that each Zone Ventilation Efficiency (Evz) be found, by the equation Evz=1+Xs-Zd, where Xs is the Average Outdoor Air Fraction and Zd is the Discharge Outdoor Air Fraction.

Step Ten: Calculate Ev for each air handling unit. Ev = minimum (Evz).

Step Eleven: Finally, the Outdoor Air Intake (Vot) was found for each system. Vot=Vou/Ev.

Analysis

The first calculation looked at is the Primary Outdoor Air Fraction for each space. This number indicates the needed percentage of outdoor air for a given space, with the given ventilation rate into that space. For instance, the space of the Service Tunnel on the Ground Floor is supplied by 1248 L/s from the air handling unit. The Primary Outdoor Air Fraction was found to be 17%. This means that 17% of that 1248 L/s should be outdoor air. Looking at each system, it is found that there is a wide variety of outdoor air fraction needed. This means that the highest percentage of outdoor air is needed in the air handling unit, which means the spaces that require a less amount of outdoor air will be receiving more than they need. There is no harm in this, except that more energy is required to heat a greater amount of outdoor air than is actually needed. This number also indicates if a space may be under designed. For example, the Dining Area on the First Floor has an Outdoor Air Fraction of 1.06. This means that the designed air flow rate is not adequate for this space, and that more air should be supplied to the space.

The next calculation looked at is the Outdoor Air Intake for an entire system of spaces. There are multiple spaces for each Air Handler, and the Outdoor Air Intake is the required amount of Outdoor air needed by the air handler to fulfill the space requirements. Each Air Handling Unit looked at in this project is supplied with outdoor air by two rooftop air handling units. AHU B-1, 1-1, and 2-1 are supplied by OAHU-1. AHU 1-2 and 2-2 are supplied by OAHU-2. By looking at the Outdoor Air Intake required by each AHU, the amount of outdoor air supplied by the rooftop units can be found.

Conclusion

AHU B-1 – Services the ground floor

The calculations and variables for this air handler can be found in Appendix B on Table B-1 and Table B-6. As on the table, the max Zp for this system is 0.97. This is for the Briefing room. The next highest is 0.94 for the Command Center. These two rooms each require a major portion of their supply air to be Outdoor Air. The rest of the spaces for this system only require 50% or less, most around 30%. This leads me to believe that the assumption's I made dealing with these two spaces may have been incorrect. However, assuming the assumptions were correct, these rooms should be supplied with more air, because 95% OA would be required by the AHU, which is a waste of energy if 50% or even 30% OA could be used instead. As for the system itself, Table B-6 lists how 2,839 L/s of outdoor air need to be supplied to this Air Handling Unit. AHU B-1 is supplied outdoor air from OAHU 1-1 located on the roof. OAHU 1-1 supplies 26,515 L/s of outdoor air to this unit, AHU 1-1, and AHU 2-1. There should not be a problem with the amount of OA supplied to AHU B-1.

AHU 1-1 – Services the north side of the first floor

For this system, Table B-2 and B-6 in Appendix B contain the required information. This is the first system in which every space may not be supplied correctly. The dining area has a primary outdoor air fraction of 106%. Since this is impossible, it means that, if the assumptions made were correct, this space is not ventilated properly. As with the first system, most of the spaces require about 50% outdoor air. The total amount of outdoor air supplied to this air handler is 8,329 L/s (Table B-6). This amount and the amount required by AHU B-1 is still less than the 26,515 L/s being supplied. This means that enough outdoor air is being supplied. Since the one space is not receiving enough, it means the rest of the spaces are being over supplied and wasting energy.

AHU 1-2 – Services the south side of the first floor

Table B-3 and B-6 in Appendix B have the required information for this system. Once again, the max Zp is found to be greater than 1. This space is the reception area for the doctor's office. It is surrounded by the Doctors Office and other Patient rooms with a substantially less outdoor air requirement, so if those rooms are over supplied, this may not be a problem. The average space requirement of outdoor air for this system is about 60%. Table B-6 lists that this air handling unit should be supplied with 6,541 L/s of outdoor air. This is the first AHU supplied by the second rooftop unit OAHU-2. OAHU-2 supplies 20,680 L/s of outdoor air, so AHU 1-2 will only require about 30% of this amount.

AHU 2-1 – Services the north side of the second floor

Table B-4 and Table B-6 in Appendix B have the required results for this system's calculations. The max Zp was found to be 1.13, again indicating a room is not supplied correctly. The room in question is named a "Training" room. There are three of them on this system, one of which is twice as big as another, but are each supplied by the same amount of air. Physically, this does not make sense; a room twice as big as a

similar room should have twice as much air being supplies. This leads me to believe that this bigger room is used for something different than the smaller room with the similar name, and thus the assumptions I made about occupant density are incorrect. As for the whole system, Table B-6 lists that this air handling unit requires 9,000 L/s of outdoor air. This is the final AHU that is being supplied by OAHU-1. OAHU-1 supplied 26,515 L/s of outdoor air. The total amount of OA required by the three AHU's is only 20,168 L/s. Therefore, there is more than enough Outdoor air being supplied to these systems, however, it may not be reaching the spaces it is required for.

AHU 2-2 – Services the south side of the second floor

For this system, look at Table B-5 and B-6. The max Zp for this system is 0.75. 75% of the air supplied by this AHU should be outdoor air. The system needs 15,276 L/s of outdoor air according to Table B-6. The AHU on this system is AHU 1-2, which required 6,541 L/s. If added together, the total requirement of outdoor air for these two systems is 21,817 L/s. These units are being supplied by OAHU-2 which is only supplying 20,680 L/s of outdoor air. This means there is not enough outdoor air being supplied to these systems.

Future

There are two major future spaces in this building which are not being supplied by the AHU's yet. The current AHU's are however supposed to supply these spaces, but I do not think that they are properly supplying the existing spaces. Another Outdoor Air Handling Unit would be required before these spaces can be properly supplied.

Ventilation Rate Procedure vs IAQ Procedure

Standard 62.1-2004 lists two methods used to evaluate the required amount of outdoor air supplied to a given space. Both methods will provide a way to reduce the containment concentration.

The Ventilation Rate Procedure determines the minimum amount of outside air that should be supplied to a space. By looking at the type of space, the occupants of the space, and the area of the space, this procedure has predetermined amounts of outside air required for these spaces. It also takes into account the delivery method of the outside air, for instance, air brought in through floor ducts and returned through the ceiling compared to air brought in through the ceiling and returned in the ceiling. By combining all of the spaces analyzed, this procedure will find the required amount of outdoor air required by an Air Handling Unit which supplies the spaces.

The Indoor Air Quality Procedure focuses on certain contaminates in an occupied space, and limits the amount of contaminates within that space. This method requires a much deeper understanding of each space, and the outside air at which the building is located. The IAQ procedure uses contaminate sources, targets, and perceived acceptability of each contaminate. This method does however credit air cleaning devices and other forms of contaminate removal systems. This procedure may be used to attain a target contaminate concentration level which may be useful in laboratories or hospitals.

The main difference between the two procedures is the fact that IAQ procedure requires an intimate knowledge of the space, and outside air. For most practical purposes, this procedure is too in depth because the information may be hard to come by.

Appendix A

Table A-1

AHU B-1 – Services the entire ground floor

Space Name	Occupancy Category (Table 6-1)	Area (m^2)	Occupant Density (#/100 m^2)
Service Tunnel	Corridor	549.27	0
Vestibule	Corridor	12.32	0
G/H Office	Office Space	10.55	5
Atypical G/H Office	Office Space	13.66	5
Corridor	Corridor	75.24	0
G/H Office	Office Space	10.55	5
G/H Office	Office Space	10.55	5
G/H Office	Office Space	10.55	5
G/H Office	Office Space	10.55	5
Atypical G/H Office	Office Space	11.32	5
Workspace A	Office Space	155.57	5
Workspace B	Office Space	38.01	5
G/H Office	Office Space	10.55	5
G/H Office	Office Space	10.55	5
G/H Office	Office Space	10.55	5
Badging	Office Space	11.36	5
Conference	Conference	19.27	50
E/F Office	Office Space	16.28	5
Atypical G/H Office	Office Space	8.18	5
Command Center	Office Space	56.83	5
Briefing	Office Space	32.71	5
Closet	Storage Room	6.61	0
Corridor	Corridor	23.15	0
Kitchen Surplus	Storage Room	47.25	0
Open Office	Office Space	70.83	5
Office	Office Space	11.1	5
Conference	Conference	18.2	50
Office	Office Space	11.11	5
Open Office	Office Space	38.35	5

Table A-2

AHU 1-1 – Services the north end of the first floor

Space Name	Occupancy Category (Table 6-1)	Area (m^2)	Occupant Density (#/100 m^2)
Lobby/Atrium	Lobbies	205.82	150
Dinning	Cafeteria	639.43	100
Kitchen Storage	Storage Room	14.04	0
Cook/Prep	Cafeteria (with less density)	110.29	20
Dry Surplus	Storage Room	12.23	0
Office	Office Space	8.42	5

Table A-3

AHU 1-2 – Services the south end of the first floor

Space Name	Occupancy Category (Table 6-1)	Area (m^2)	Occupant Density (#/100 m^2)
Lobby/Atrium	Lobbies	512.97	150
Resting	Patient Room - Appendix E	11.67	10
Reception	Reception Area	56.02	30
Treatment	Patient Room - Appendix E	10.88	10
Treatment	Patient Room - Appendix E	10.88	10
Doctors Office	Office Space	16.11	5
Nurse	Patient Room - Appendix E	13.51	10
Resting	Patient Room - Appendix E	11.74	10
EAP Reception	Reception Area	17.5	30
EAP Office	Office Space	11.48	5
EAP Office	Office Space	11.86	5
NTEU	Office Space	18.14	5
Credit Union	Reception Area	30.81	30
Credit Union Office	Office Space	11.41	5
Credit Union Office	Office Space	12.01	5
Retail	Sales	69.57	15
Gym	Health Club - Weight Room	244.57	10
Fitness Supplies	Storage Room	18.24	0
Aerobics Studio	Health Club - Aerobics Room	86.48	40
Women's Locker Room	Health Club - Weight Room	43.12	10
Men's Locker Room	Health Club - Weight Room	50.59	10

Table A-4

AHU 2-1 – Services the north end of the first floor

Space Name	Occupancy Category (Table 6-1)	Area (m^2)	Occupant Density (#/100 m^2)
Lobby/Atrium	Lobbies	594.95	150
Corridor	Corridor	151.11	0
Auditorium	Auditorium	161.32	150
Video Conference	Conference	54.35	50
Funiture Surplus	Storage Room	7.58	0
Office	Office Space	21.52	5
Training	Lecture Classroom	73.77	65
Training	Lecture Classroom	136.62	65
Training	Lecture Classroom	149	65

Table A-5

AHU 2-2 – Services the south end of the first floor

Spaces	Occupancy Category (Table 6-1)	Area (m^2)	Occupant Density (#/100 m^2)
Lobby/Atrium	Lobbies	418.33	150
Auditorium	Auditorium	345.1	150
Production Room	Computer (not printing)	22.38	4
Office	Office Space	10.69	5
Office	Office Space	10.67	5
Office	Office Space	10.44	5
Interim Library	Libraries	335.79	10

Appendix B

Table B-1
AHU B-1 – Services Ground Floor

Spaces	Rp (L/s*person)	Ra (L/s*m^2)	Vbz (L/s)	Ez	Voz (L/s)	Vpz (L/s)	Zp	RpZp	RaAz	Zd	Evz
Service Tunnel	0	0.3	164.781	0.8	205.9763	1248	0.17	0	164.781	0.165045	1.088701
Vestibule	0	0.3	3.696	0.8	4.62	17	0.27	0	3.696	0.271765	0.981982
G/H Office	8.5	0.3	7.64875	0.8	9.560938	28	0.34	4.48375	3.165	0.341462	0.912284
Atypical G/H Office	8.5	0.3	9.9035	0.8	12.37938	35	0.35	5.8055	4.098	0.353696	0.90005
Corridor	0	0.3	22.572	0.8	28.215	213	0.13	0	22.572	0.132465	1.121281
G/H Office	8.5	0.3	7.64875	0.8	9.560938	28	0.34	4.48375	3.165	0.341462	0.912284
G/H Office	8.5	0.3	7.64875	0.8	9.560938	28	0.34	4.48375	3.165	0.341462	0.912284
G/H Office	8.5	0.3	7.64875	0.8	9.560938	28	0.34	4.48375	3.165	0.341462	0.912284
G/H Office	8.5	0.3	7.64875	0.8	9.560938	28	0.34	4.48375	3.165	0.341462	0.912284
Atypical G/H Office	8.5	0.3	8.207	0.8	10.25875	31	0.33	4.811	3.396	0.330927	0.922819
Workspace A	8.5	0.3	112.7883	0.8	140.9853	400	0.35	66.11725	46.671	0.352463	0.901283
Workspace B	8.5	0.3	27.55725	0.8	34.44656	98	0.35	16.15425	11.403	0.351496	0.902251
G/H Office	8.5	0.3	7.64875	0.8	9.560938	28	0.34	4.48375	3.165	0.341462	0.912284
G/H Office	8.5	0.3	7.64875	0.8	9.560938	28	0.34	4.48375	3.165	0.341462	0.912284
G/H Office	8.5	0.3	7.64875	0.8	9.560938	28	0.34	4.48375	3.165	0.341462	0.912284
Badging	8.5	0.3	8.236	0.8	10.295	28	0.37	4.828	3.408	0.367679	0.886068
Conference	3.1	0.3	35.6495	0.8	44.56188	100	0.45	29.8685	5.781	0.445619	0.808127
E/F Office	8.5	0.3	11.803	0.8	14.75375	42	0.35	6.919	4.884	0.35128	0.902466
Atypical G/H Office	8.5	0.3	5.9305	0.8	7.413125	21	0.35	3.4765	2.454	0.353006	0.90074
Command Center	3.1	0.3	105.1355	0.8	131.4194	140	0.94	88.0865	17.049	0.93871	0.315036
Briefing	3.1	0.3	60.5135	0.8	75.64188	78	0.97	50.7005	9.813	0.969768	0.283979
Closet	0	0.6	3.966	0.8	4.9575	19	0.26	0	3.966	0.260921	0.992825
Corridor	0	0.3	6.945	0.8	8.68125	17	0.51	0	6.945	0.510662	0.743084
Kitchen Surplus	0	0.6	28.35	0.8	35.4375	80	0.44	0	28.35	0.442969	0.810777
Open Office	8.5	0.3	51.35175	0.8	64.18969	140	0.46	30.10275	21.249	0.458498	0.795248
Office	8.5	0.3	8.0475	0.8	10.05938	28	0.36	4.7175	3.33	0.359263	0.894483
Conference	3.1	0.3	33.67	0.8	42.0875	78	0.54	28.21	5.46	0.539583	0.714163
Office	8.5	0.3	8.05475	0.8	10.06844	28	0.36	4.72175	3.333	0.359587	0.894159
Open Office	8.5	0.3	27.80375	0.8	34.75469	112	0.31	16.29875	11.505	0.31031	0.943437

Table B-2
AHU 1-1 – Services North Side of First Floor

Spaces	Rp (L/s*person)	Ra (L/s*m^2)	Vbz (L/s)	Ez	Voz (L/s)	Vpz (L/s)	Zp	RpZp	RaAz	Zd	Evz
Lobby/Atrium	2.7	0.3	895.317	0.8	1119.146	2980	0.38	833.571	61.746	0.375552	1.248989
Dinning	4.7	0.9	3580.808	0.8	4476.01	4222	1.06	3005.321	575.487	1.060163	0.564378
Kitchen Storage	0	0.6	8.424	0.8	10.53	142	0.07	0	8.424	0.074155	1.550387
Cook/Prep	4.7	0.9	202.9336	2.8	72.47629	142	0.51	103.6726	99.261	0.510396	1.114145
Dry Surplus	0	0.6	7.338	0.8	9.1725	17	0.54	0	7.338	0.539559	1.084983
Office	8.5	0.3	6.1045	0.8	7.630625	24	0.32	3.5785	2.526	0.317943	1.306599

Table B-3
AHU 1-2 – Services South Side of First Floor

Spaces	Rp (L/s*person)	Ra (L/s*m^2)	Vbz (L/s)	Ez	Voz (L/s)	Vpz (L/s)	Zp	RpZp	RaAz	Zd	Evz
Lobby/Atrium	2.7	0.3	2231.42	0.8	2789.27438	2980	0.94	2077.529	153.891	0.935998	0.617315
Resting	13	0	15.171	0.8	18.96375	31	0.61	15.171	0	0.611734	0.941579
Reception	3.5	0.3	75.627	0.8	94.53375	94	1.01	58.821	16.806	1.005678	0.547635
Treatment	13	0	14.144	0.8	17.68	28	0.63	14.144	0	0.631429	0.921885
Treatment	13	0	14.144	0.8	17.68	28	0.63	14.144	0	0.631429	0.921885
Doctors Office	8.5	0.3	11.67975	0.8	14.5996875	42	0.35	6.84675	4.833	0.347612	1.205702
Nurse	13	0	17.563	0.8	21.95375	35	0.63	17.563	0	0.62725	0.926063
Resting	13	0	15.262	0.8	19.0775	33	0.58	15.262	0	0.578106	0.975207
EAP Reception	3.5	0.3	23.625	0.8	29.53125	50	0.59	18.375	5.25	0.590625	0.962688
EAP Office	8.5	0.3	8.323	0.8	10.40375	99	0.11	4.879	3.444	0.105088	1.448225
EAP Office	8.5	0.3	8.5985	0.8	10.748125	33	0.33	5.0405	3.558	0.325701	1.227612
NTEU	8.5	0.3	13.1515	0.8	16.439375	144	0.11	7.7095	5.442	0.114162	1.439151
Credit Union	3.5	0.3	41.5935	0.8	51.991875	80	0.65	32.3505	9.243	0.649898	0.903415
Credit Union Office	8.5	0.3	8.27225	0.8	10.3403125	118	0.09	4.84925	3.423	0.08763	1.465683
Credit Union Office	8.5	0.3	8.70725	0.8	10.8840625	120	0.09	5.10425	3.603	0.090701	1.462613
Retail	7.8	0.6	123.1389	0.8	153.923625	208	0.74	81.3969	41.742	0.740017	0.813296
Gym	13	0.3	391.312	0.8	489.14	1270	0.39	317.941	73.371	0.38515	1.168164
Fitness Supplies	0	0.6	10.944	0.8	13.68	24	0.57	0	10.944	0.57	0.983313
Aerobics Studio	10.8	0.3	399.5376	0.8	499.422	738	0.68	373.5936	25.944	0.676724	0.87659
Women's Locker Room	13	0.3	68.992	0.8	86.24	177	0.49	56.056	12.936	0.487232	1.066082
Men's Locker Room	13	0.3	80.944	0.8	101.18	142	0.71	65.767	15.177	0.712535	0.840778

Table B-4
AHU 2-1 – Services North Side of Second Floor

Spaces	Rp (L/s*person)	Ra (L/s*m^2)	Vbz (L/s)	Ez	Voz (L/s)	Vpz (L/s)	Zp	RpZp	RaAz	Zd	Evz
Lobby/Atrium	2.7	0.3	2588.033	0.8	3235.041	3295	0.98	2409.548	178.485	0.981803	0.655135
Corridor	0	0.3	45.333	0.8	56.66625	164	0.35	0	45.333	0.345526	1.291412
Auditorium	2.7	0.3	701.742	0.8	877.1775	1532	0.57	653.346	48.396	0.57257	1.064368
Video Conference	3.1	0.3	100.5475	0.8	125.6844	255	0.49	84.2425	16.305	0.49288	1.144058
Furniture Surplus	0	0.6	4.548	0.8	5.685	25	0.23	0	4.548	0.2274	1.409538
Office	8.5	0.3	15.602	0.8	19.5025	57	0.34	9.146	6.456	0.342149	1.294789
Training	4.3	0.3	228.3182	0.8	285.3977	464	0.62	206.1872	22.131	0.615081	1.021856
Training	4.3	0.3	422.8389	0.8	528.5486	468	1.13	381.8529	40.986	1.129377	0.50756
Training	4.3	0.3	461.155	0.8	576.4438	912	0.63	416.455	44.7	0.632066	1.004872

Table B-5
AHU 2-2 – Services South Side of Second Floor

Spaces	Rp (L/s*person)	Ra (L/s*m^2)	Vbz (L/s)	Ez	Voz (L/s)	Vpz (L/s)	Zp	RpZp	RaAz	Zd	Evz
Lobby/Atrium	2.7	0.3	1819.736	0.8	2274.669	3732	0.61	1694.237	125.499	0.609504	0.875618
Auditorium	2.7	0.3	1501.185	0.8	1876.481	2508	0.75	1397.655	103.53	0.748198	0.251802
Production Room	10	0.3	15.666	0.8	19.5825	61	0.32	8.952	6.714	0.321025	0.678975
Office	8.5	0.3	7.75025	0.8	9.687813	28	0.35	4.54325	3.207	0.345993	0.654007
Office	8.5	0.3	7.73575	0.8	9.669688	28	0.35	4.53475	3.201	0.345346	0.654654
Office	8.5	0.3	7.569	0.8	9.46125	28	0.34	4.437	3.132	0.337902	0.662098
Interim Library	8.5	0.6	486.8955	0.8	608.6194	1544	0.39	285.4215	201.474	0.394184	0.605816

Table B-6
Outdoor Air Intake for each System

Air Handler	Max Zp	D	SUM RpZp	SUM RaAz	Vou	Xs	Ev	Vot	% OH Supplied	Meet Criteria?
AHU B-1	0.97	1	396.68775	409.464	806	0.253746	0.283979	2839	15%	No
AHU 1-1	**1.06**	1	3946.143	754.782	4701	0.624542	0.564378	8329	60%	No
AHU 1-2	**1.01**	1	3192.54	389.607	3582	0.553313	0.547635	6541	40%	No
AHU 2-1	**1.13**	1	4160.777	407.34	4568	0.636938	0.50756	9000	44%	No
AHU 2-2	0.75	1	3399.78	446.757	3847	0.485123	0.251802	15276	69%	No