ASHRAE Standard 60.1 Ventilation Report

Tech 1 – AE 481 Senior Project

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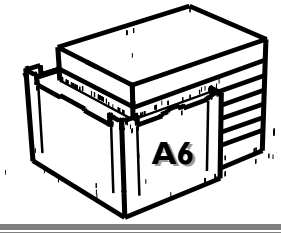


Summary:

Hoboken Residential is designed to comply with ASHRAE 90.1, section 6.

The seven story building has 6 floors of condominiums and one floor of retail space. Two roof top air handling units provide the breathing zone fresh air. A 15000 CFM unit supplies outdoor air to individual fan coil units in the apartments. A 1755 CFM unit supplies 100% OA to egress corridors. For the retail space, only a capped duct between the first floor and roof is provided for 3000 CFM. The duct for the apartment supply is capped at the basement to allow for basement ventilation fit-out as well. Two fans on the roof supply unconditioned ventilation to the boiler room and to pressurize the stairwell.

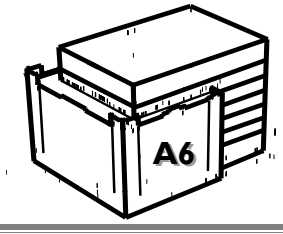
Report, By Section of ASHRAE 90.1:

6.1
Ventilation Rate or IAQ Procedure; reasons for using ventilation rate procedure:

- Air intake is not close to any likely contaminants.
- Contaminate monitoring system is not specified.
- There are no unusual interior contaminants.
- Outdoor air quality is typical and indicates that dilution will successfully keep indoor air concentrations at acceptable levels.
- Contaminate removal is not specified, besides air intake filters.

6.2.1
Outdoor Air Treatment:

- Air is assumed to be in accordance with section 4.1, as Hoboken, New Jersey, is in "attainment" with the National Ambient Air Quality Standards.
- Air intake air handlers are equipped with MERV-13 filters.



6.2.2-6.2.6

Outdoor Air Intake, Egress Corridors:

- Shared corridor occupancy is assumed zero.
- Supply air is 100% OA, conditioned by roof top air handling unit.

Others Spaces 100% OA Supply	Floor Area	Default Occupants	Required CFM/SF	Breathing Zone Outdoor Airflow	Air Distribution Effectiveness[2]	Zone Outdoor Airflow	Total OA Required	Provided OA Quantity
	Az	Pz	Ra	Vbz	Ez	Voz	Vot	
Egress Corridors (each)	320	-	0.06	19	1	19	19	160

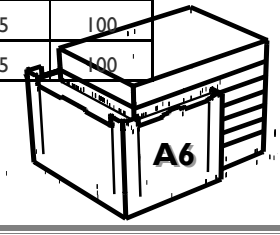
Outdoor Air Intake, Lobby

- The private lobby space does not have a ventilation requirement per 90.1 and is not evaluated against the standard in this report.

Outdoor Air Intake, Condominiums

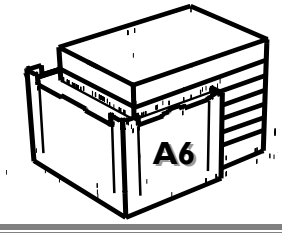
- Residential Space is evaluated against Appendix E, table E-2. It is assumed that air change rate is met by infiltration as suggested in the table.
- Air quantities are calculated as continuous.

Residential Apartments Exhaust & Supply (Continuous)	Bathrooms			Laundry Rooms			Kitchens		
	Quantity	90.1 Exhaust	Actual Exhaust	Quantity	90.1 Exhaust	Actual Exhaust	Quantity	90.1 Exhaust	Actual Exhaust
Floors 2-5									
Unit A	3	60	225	1	-	120	1	25	100
Unit B	3	60	225	1	-	120	1	25	100
Unit C	2	40	150	1	-	120	1	25	100
Unit D	2	40	150	1	-	120	1	25	100
Unit E	3	60	225	1	-	120	1	25	100
Unit F	3	60	225	1	-	120	1	25	100
Floor 6									
Duplex A	1	20	75	0	-	0	1	25	100
Duplex B	2	40	150	0	-	0	1	25	100
Unit C	3	60	225	1	-	120	1	25	100
Unit D	3	60	225	1	-	120	1	25	100
Floor 7									
Duplex A	2	40	150	1	-	120	0	0	0
Duplex B	1	20	75	1	-	120	0	0	0
Unit C	3	60	225	1	-	120	1	25	100
Unit D	3	60	225	1	-	120	1	25	100



6.2.2-6.2.6
Outdoor Air Intake, Condominiums (Continued)

Residential Apartments (Continued) Exhaust & Supply (Continuous)	People	90.1 CFM/ Person	90.1 OA Required	Actual Total Exhaust	Actual OA Supply
Floors 2-5					
Unit A	5	15	75	445	445
Unit B	5	15	75	445	445
Unit C	3	15	45	370	370
Unit D	3	15	45	370	370
Unit E	5	15	75	445	445
Unit F	5	15	75	445	445
Floor 6					
Duplex A	5	15	75	175	245
Duplex B	5	15	75	250	245
Unit C	4	15	60	445	445
Unit D	4	15	60	445	445
Floor 7					
Duplex A	5	15	75	270	200
Duplex B	5	15	75	195	200
Unit C	4	15	60	445	445
Unit D	4	15	60	445	445



6.2.2-6.2.6

Outdoor Air Intake, Retail

- Retail space is designated for future mechanical fit out.
- 3000 CFM of capped duct is designed for this space. Temporary resistive heaters are specified as well.
- To complete a more thorough study of the retail space, two likely situations are evaluated.

  -TRIAL 1: The future mechanical system will be in-ceiling fan coil units, each ducted seperatly to the OA dupply. 20% of the space will be office space. The space will be a furniture store and will not have more than 80 people.

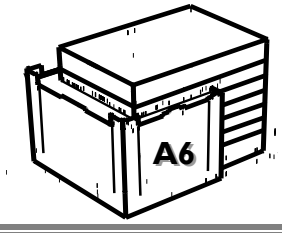
  -TRIAL 2: The future mechanical system will be a single air handling unit in the basement space, supplying the retail space. 20% of the space will be office space. Retail supply air is 5400 cfm and office supply air is 600 cfm. The space will be a furniture store and will not have more than 80 people.

First Floor Retail Spaces[1]	Floor Area	Default Density #/1000 SF	Default Occupants	Required CFM/SF	Required CFM/Person	Breathing Zone Outdoor Airflow	Air Distribution Effectiveness[2]
TRIAL 1 - Multiple Fan Coil Units	Az		Pz	Ra	Rp	Vbz	Ez
Retail	8685	15	130	0.12	7.5	2019	1
Retail Office	2171	5	11	0.06	5	185	1
TRIAL 2 - Single AHU							
Retail (Zone 1)	8685	15	130	0.12	7.5	2019	1
Retail Office (Zone 2)	2171	5	11	0.06	5	185	1
						Vbz=Rp*Pz+Ra*Az	

First Floor Retail Spaces (continued)	Zone Outdoor Airflow	Supply Airflow	Primary Outdoor Air Fraction	System Ventilation Efficiency	Uncorrected OA Intake[3]	Corrected OA Intake[4]	Total OA Required	Provided OA Quantity
TRIAL 1 - Mult Fan Coil Units	Voz	Vsa	Zp	Ev	Vou	Vot		
Retail	2019	5120	-	-	-	2019	2204	3000
Retail Office	185	600	-	-	-	185		
						Vot=Voz		
TRIAL 2 - Single AHU								
Retail (Zone 1)	2019	5120	0.39	0.7	1719	2456	2456	3000
Retail Office (Zone 2)	185	600	0.31					
			Zp=Voz/Vsa		Vou=D[sum (Rp*Pz)] +sum(Ra+Az)			

Notes:
(1) Mechanical to be done by others, capped duct is supplied for 3000 cfm OA
(2) Ez=1, Assume future fit-out will be ceiling fan coil units or ceiling ducts

(3) Ps=80; D=Ps/Pz=80 / (147 +5) = 0.53



(4) Each fan coil unit serves only one zone, so Vot=Voz for trial 1

6.2.7
Dynamic Reset - The outdoor air quantities will remain constant.

6.2.8
Exhaust Ventilation, Miscellaneous - In addition to the residential exhaust quantities, the garbage rooms also have an exhaust quantity

Exhaust Quantities	Floor Area	90.1 CFM/SF	Exhaust Requirement	Actual Exhaust
Garbage Room (each)	15	1	15	50

6.2.9
Ventilation in smoking areas - There are no designated smoking areas or perceived risks to overall air quality from smoke

6.3
Indoor Air Quality Procedure- Not used for this report

6.4
Design Documentation Procedures- Not applicable at this time

Conclusion:

Because each apartment is serviced by individual fan coil units, and the retail space is comprised of only one zone, determining the quantity of required outdoor air is concise. The building appears to meet all requirements of ASHRAE 90.1 section 6.

Had Indoor Air Quality method been used, a more thorough understanding of actual air quality could have been obtained. However, this would not have helped show compliance with ASHRAE 90.1. For example, it is possible that by the IAQ method, less OA would be needed to dilute bioeffluents in the apartments. However, the actual OA quantity is determined by the amount of air needed to balance the pressure from the exhaust for each apartment. Therefore it would be irrelevant to establish that less than 15 cfm /person is needed to maintain air quality when the exhaust quantity is much more. For the retail space, it is possible that the required outdoor air for IAQ method would be more or less than the required quantity for ventilation rate procedure. For example, if it were indeed a furniture retailer, the actual number of people would be smaller, and less ventilation would be needed. At the same time, VOC's from the furniture might require more ventilation. Until the occupant is determined, Ventilation rate procedure is a more effective way to show the existing design complies. In short, although Indoor Air Quality Method would be a more descriptive method for ventilation requirements, it is more appropriate to use Ventilation Rate Procedure to show the building's compliance with ASHRAE 90.1.