AIR

HOW MUCH OF THE OUTSIDE IS NEEDED INSIDE TO STAY FRESH?

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MODERATOR – WILKES EVANS

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WHAT IS VENTILATION AIR?

Per ASHRAE "*The introduction of outside air to reduce concentrations of indoor generated pollutants and desired pressurization of the building envelope. Increased ventilation reduces sick building syndrome, odors, respiratory illness, and occupant absences.*"

Who requires us to use ventilation air? (Hint, everyone!)

- ASHRAE 62
- ASHRAE 170
- ASHRAE 241
- International Building Code
- International Mechanical Code
- International Energy Code
- ACGIH (Industrial Ventilation)
- CDC
- OSHA
- Etc…

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COMMON VENITALATION ISSUES

- Design
  - OA flow measuring devices properly located & calibrated.
  - Proper calculation of required ventilation (actual occupancy)
  - Proper design conditions for location (cooling vs dehumidification)
  - Proper treatment of ventilation air
  - Proper location of ventilation air intakes
  - Proper OA/EA offset to achieve desired positive building pressure
  - Proper controls to maintain desired ventilation/exhaust/relief airflows
  - Proper moisture barrier design
- Construction
  - Proper sealing of building
  - Proper application of continuous moisture barrier
  - Quality Test and Balance to verify space/building pressurization
  - Verification of controls sequences
- Maintenance
  - Clean OA flow measuring devices routinely
  - Do not close OA intakes
  - Be sure replacement equipment properly selected for ventilation needs

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HOW DO WE PROVIDE OUTSIDE AIR?

- Design:
  - Fixed Volume
  - Demand Control (DCV)
  - Fixed Offset
  - Building Pressure
  - Occupancy Schedule
- Equipment:
  - Economizer
  - Energy Recovery
  - DOAS
  - Mixing Box
  - Natural Ventilation

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HOW ARE OUTSIDE AIR REQUIREMENTS DETERMINED?

- ASHRAE 62/170 and your DP's best practices
- OA: SQFT/# Occupants
- EA: SQFT/ACH/# Fixtures
- Building pressurization
  - Overall slightly positive!
  - Labs/Restrooms/Housekeeping/Kitchens/Natatoriums negative to rest of building
    - Beware of exterior exposures
- OA reduction allowed in ASHRAE 62 when utilizing electronic air cleaning (ie BiPolar Ionization)

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DESIGN CONSIDERATIONS

OA conditions vary drastically across Georgia and greatly impact building/HVAC design, some things to consider for your building.

- North vs South: Very humid south of Atlanta and along border with South Carolina. North of Atlanta has excellent economizer opportunities for free cooling and increased ventilation due to cooler/drier conditions.
- Design Outdoor Conditions:
  - Peak Heating
  - Peak Cooling
  - Peak Dehumidification
- Supply Temperature/Dewpoint:
  - Must mechanically cool below 60F to keep %RH below 60%.
  - Recommend keeping dewpoint temperature of cooling coil LAT below 55F to prevent condensation on surfaces.
- Location (away from contaminants)
  - Garbage cans/chutes
  - Vehicle idle areas
  - Exhaust outlets
  - Standing water
  - Dusty areas

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ATLANTA HARTSFIELD-JACKSON, GA, USA WMO: 722190

Lat: 33.630N Lon: 84.442W Elev: 1010 StdP: 14.17 Time Zone: -5.00 (NAE) Period: 94-19 WBAN: 13874

Annual Heating, Humidification, and Ventilation Design Conditions

	Coldest Month	Heating DB		Humidification DP/MCDB and HR						Coldest Month WB/MCDB				MCWB/PCWD to 99.6% DB		WBF
				99.6%			99%			0.4%		1%				
		99.6%	99%	DP	HR	MCDB	DP	HR	MCDB	WB	MCDB	WB	MCDB	MCWB	PCWD	
(1)	1	21.7	26.4	4.7	7.3	28.5	8.9	9.0	31.7	25.3	37.7	23.6	37.8	12.0	320	0.427

Annual Cooling, Dehumidification, and Enthalpy Design Conditions

	Hottest Month	Hottest Month DB Range	Cooling DB/MCWB						Evaporation WB/MCDB						MCWB/PCWD to 0.4% DB	
			0.4%		1%		2%		0.4%		1%		2%			
			DB	MCWB	DB	MCWB	DB	MCWB	WB	MCDB	WB	MCDB	WB	MCDB	MCWB	PCWD
(2)	7	16.5	93.7	73.8	91.6	73.6	89.7	73.3	77.2	88.1	76.3	86.4	75.3	84.8	8.6	330

	Dehumidification DP/MCDB and HR									Enthalpy/MCDB						Extreme Max WB
	0.4%			1%			2%			0.4%		1%		2%		
	DP	HR	MCDB	DP	HR	MCDB	DP	HR	MCDB	Enth	MCDB	Enth	MCDB	Enth	MCDB	
(3)	74.2	132.6	81.0	73.3	128.5	80.4	72.5	125.0	79.8	41.1	88.1	40.2	86.6	39.4	85.3	81.5

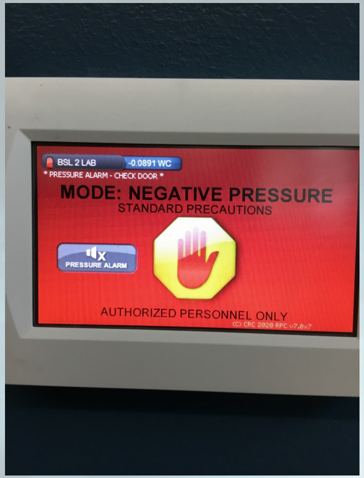
Extreme Annual Design Conditions

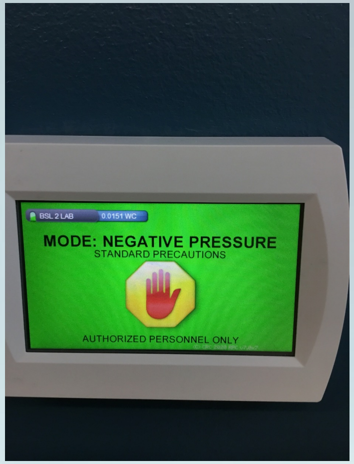
	Extreme Annual WB				Extreme Annual Temperature				n-Year Return Period Values of Extreme Temperature							
					Mean		Standard Deviation		n=5 years		n=10 years		n=20 years		n=50 years	
	1%	2.5%	5%		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
(4)	21.1	18.8	16.9	DB	14.8	96.4	4.7	3.6	11.4	98.9	8.7	101.0	6.0	103.0	2.6	105.6
(5)				WB	12.6	78.6	4.4	1.1	9.4	79.4	6.8	80.1	4.3	80.7	1.1	81.4

The typical design approach would be to provide dehumidification controls on all DX units that have an outside air percentage over 10-12%, where the supply fan runs continuously in a facility such as this. The dehumidification cycle is an option on Lennox/Carrier/Trane light commercial packaged rooftop units, but only certain models.

When outside air percentages exceed 17%, the type of rooftop unit recommended changes to equipment that has modulating components such as modulating gas heat, modulating hot gas reheat, modulating condenser fans, modulating/digital

EFFECTS OF IMPROPER AMOUNT OF OUTSIDE AIR





- Over Ventilating:
  - Increased energy bills
  - Over pressurization (doors won't close)
  - Possible moisture/humidity issues w undersized HVAC systems
  - High initial equipment costs
- Under Ventilating:
  - Increased CO2 levels
  - Odor migration
  - Negative building pressurization (doors won't open)
  - Possible moisture/humidity issues w untreated OA entering the building

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SUMMARY & QUESTIONS

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