2021 WSEC-C & 2021 IMC Fresh Air Ventilation

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WSEC Commercial Technical Support

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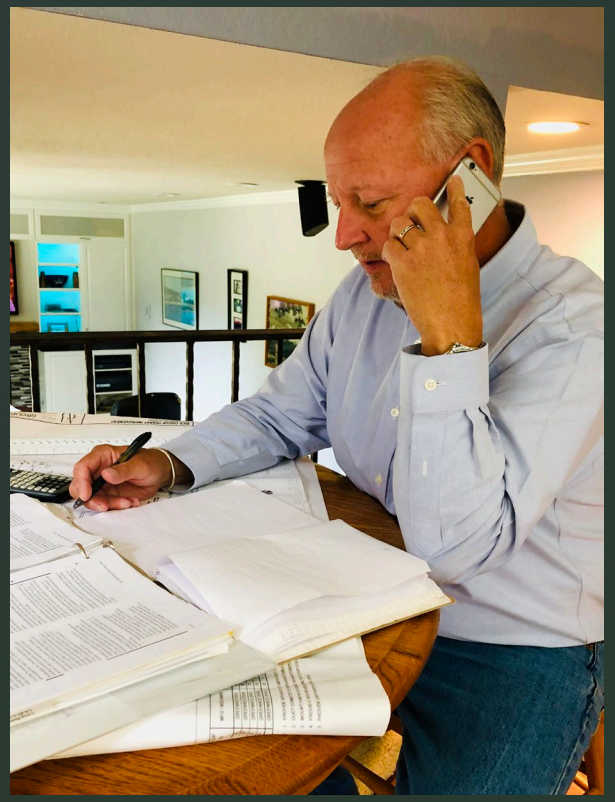

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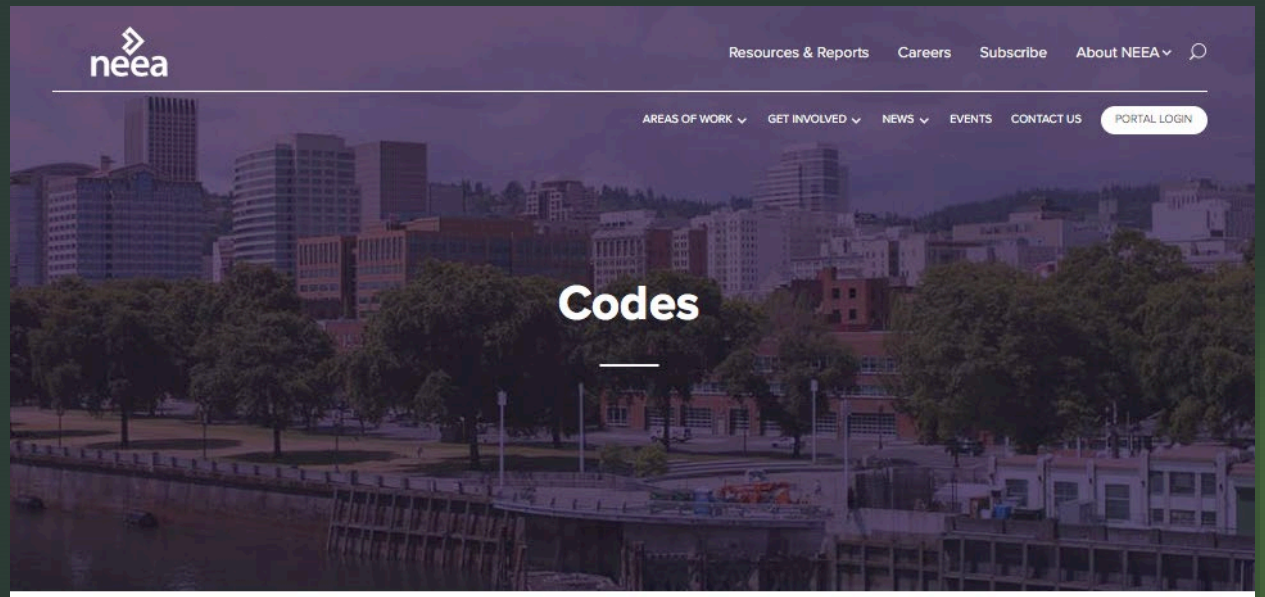

Increasing progressive effectiveness of energy codes

The NEEA Codes and Standards program supports regional stakeholders in the development and adoption, training and implementation of energy codes. States engage in the code development process along different cycles and code versions, but all states now use the International Energy Conservation Code (IECC) as a baseline for their commercial energy codes. All states except Oregon now use the IECC as the basis of their residential code. The adoption of codes is the responsibility of state code boards or agencies. Official state-by-state energy code information can be found on state building code websites:

Idaho - http://dbs.idaho.gov/boards/index.html

Oregon - http://www.cbs.state.or.us/external/bcd/

Washington - https://sbcc.wa.gov/

Montana - http://svc.mt.gov/gov/boards/

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WSEC technical support services are made possible thanks to the generous support of the Northwest Energy Efficiency Alliance

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Today's Presentation

- This presentation represents ETC's ***unofficial*** interpretation of WA State Energy Code intent.
- Our technical support team is not an affiliate, nor do we speak for the Washington State Building Code Council (SBCC).
- The WSEC commercial technical support we provide is advisory only and non-binding.

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Topics we'll discuss today ~

1. WSEC-C & IMC applicable ventilation code sections
2. Natural ventilation
3. Mechanical ventilation for other than Group R occupancies
4. Dedicated outdoor air systems (DOAS)
5. Group R-2 (multi-family) ventilation
6. Group R-1 (hotel/motel) ventilation
7. Group R-1 & R-2 common area ventilation
8. Question & answer session

Residential Buildings

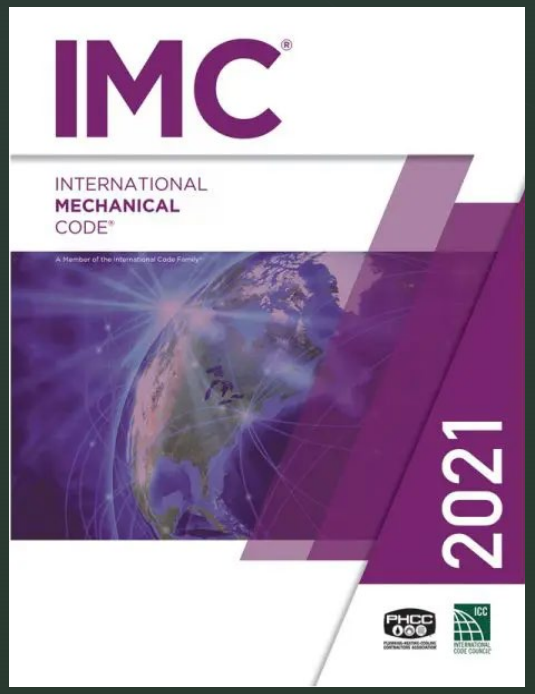
Group R commercial buildings, or portions thereof, include the following occupancies as established in the *International Building Code*.

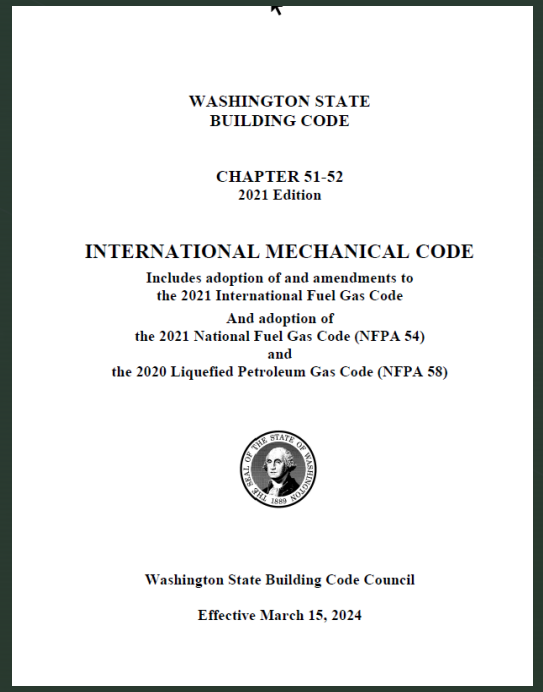
- All Group R-1 occupancy buildings (hotels, motels, boarding houses).
- Group R-2 occupancy buildings that are greater than three stories in height above grade plane.
- Group R-2 buildings (any number of stories) in which *dwelling units are* accessed from interior corridors or other interior spaces.
- Group R-4 occupancy buildings that are greater than three stories in height above grade plane.
- Group R also includes Group I-1 Condition 2 occupancies (assisted living) per WSEC C101.2.

Applicable Codes & Standards

Applicable Codes & Standards

- 2021 IMC with WA State Amendments (WAC 51-52)
- 2021 Washington State Energy Code – Commercial (WAC 51-11C)
- 2022 ASHRAE Standard 62.1 – Ventilation & Acceptable Indoor Air Quality
- Additional sections of the Washington Administrative Code (WAC)




WASHINGTON STATE
BUILDING CODE

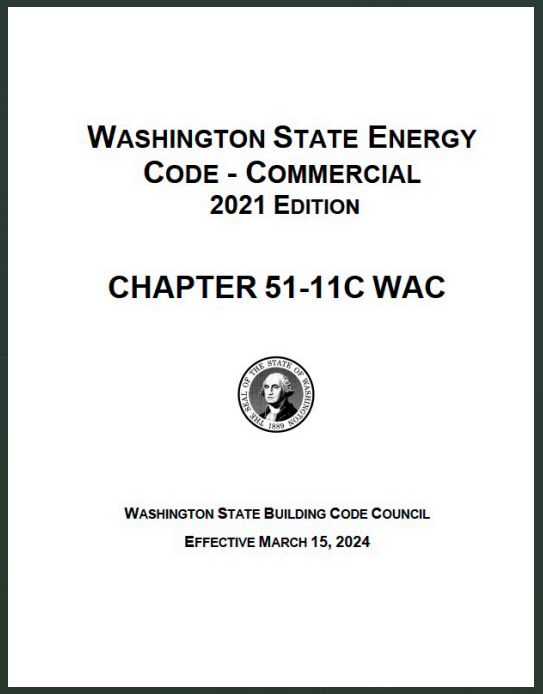
CHAPTER 51-52
2021 Edition

INTERNATIONAL MECHANICAL CODE

Includes adoption of and amendments to
the 2021 International Fuel Gas Code
And adoption of
the 2021 National Fuel Gas Code (NFPA 54)
and
the 2020 Liquefied Petroleum Gas Code (NFPA 58)

Washington State Building Code Council

Effective March 15, 2024


WASHINGTON STATE ENERGY
CODE - COMMERCIAL
2021 EDITION

CHAPTER 51-11C WAC

WASHINGTON STATE BUILDING CODE COUNCIL

EFFECTIVE MARCH 15, 2024

Applicable Code Sections – IMC

Chapter 4 Ventilation

- Section 401 General Requirements
- Section 402 Natural Ventilation
- Section 403 Mechanical Ventilation
- Section 404 Enclosed Parking Garages
- Section 405 (Ventilation) Systems Control
- Section 406 Ventilation of Uninhabited Spaces
- Section 407 Ambulatory Care Facilities and Group I-2 Occupancies

IMC Ventilation General Requirements

IMC 401 – When & where fresh air ventilation is required

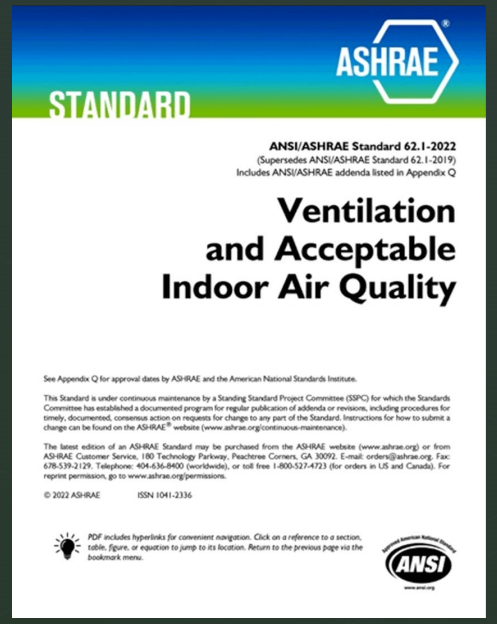
- Every occupied space is required to be ventilated during all occupied periods, including during periods of inclement weather, peak outdoor temperatures and unhealthy outdoor air quality.
- For most occupancies, ventilation may be provided by natural means per IMC 402 or mechanically per IMC 403.
- Occupancies where ***mechanical ventilation is required*** include:
  - Group R occupancies per IMC 403.4
  - Buildings that encounter vehicle exhaust (enclosed parking, vehicle repair) per IMC 401.2
  - Ambulatory care facilities and Group I-2 occupancies per IMC 401.2.2
- Additional ventilation-related requirements for other occupancies may apply per the Washington Administrative Code (WAC).

Applicable Code Sections – WSEC-C

C403.2.2.1 Ventilation

- Points to the ventilation requirements in Chapter 4 of the 2021 IMC
- For mechanical ventilation, the system shall be configured to provide no greater than 150% of the minimum outdoor air CFM required by Chapter 4 of the IMC or other applicable code or standard, ***whichever is greater.***

NOTE: IMC Section 403.2 allows ASHRAE Standard 62.1 Section 6.2 Ventilation Rate Procedure, as an alternate standard for determining minimum outdoor air CFM.



Applicable Code Sections – WSEC-C

Exceptions to 150% limit in C403.2.2.1:

- OK to exceed 150% of design ventilation rate for VOC dilution, economizer, night flushing, dehumidification, pressurization, exhaust makeup air. ***Outdoor air shall be reduced to minimum when not required for these uses.***
- Air systems serving dwelling and sleeping units within Group R-1 and R-2, and Group I-2 occupancies.
- Alterations that replace < 50% of total heating & cooling system capacity.
- Systems with energy recovery that utilize active chilled beams for space cooling, where higher outdoor airflow is necessary to achieve the cooling capacity required to maintain space latent cooling loads.
- Systems with energy recovery ventilation that achieve ≥ 80% sensible recovery effectiveness are permitted provide up to 200% of the minimum required outdoor air CFM.

Applicable Code Sections – WSEC-C

C505.5 Change of (space) use alteration

- Where the use in a space changes from one use type in Table C405.4.2 (1) or (2) to another use type, the installed lighting wattage in the space shall comply with Section C405.4, ***and*** ***the ventilation airflow provided to the space shall comply Chapter 4 of the IMC***

2021 WSEC-C - TABLE C405.4.2(2) INTERIOR LIGHTING POWER ALLOWANCE		
Space Type		**LPA Watts/SF**
Sales area	**New Use**	1.05
Warehouse	**Existing Use**	0.33

2021 IMC - TABLE 403.3.1 MINIMUM VENTILATION RATES		
Occupancy Classification		**Breathing Zone CFM/SF**
Sales area	**New Use**	0.12
Warehouse	**Existing Use**	0.06

Applicable Code Sections – IMC

IMC 407.1 Ambulatory care facilities and Group I-2 occupancies

- Mechanical ventilation in health care facilities licensed by Washington State shall comply with the IMC and the following provisions of the Washington Administrative Code (WAC):
  1. Ambulatory care facilities – WAC Chapter 246-330
  2. Acute care hospitals – WAC Chapter 246-320
  3. Nursing homes – WAC Chapter 388-97
- Mechanical ventilation in ***unlicensed*** ambulatory care facilities shall comply with the IMC and ASHRAE 170 Ventilation of Health Care Facilities.

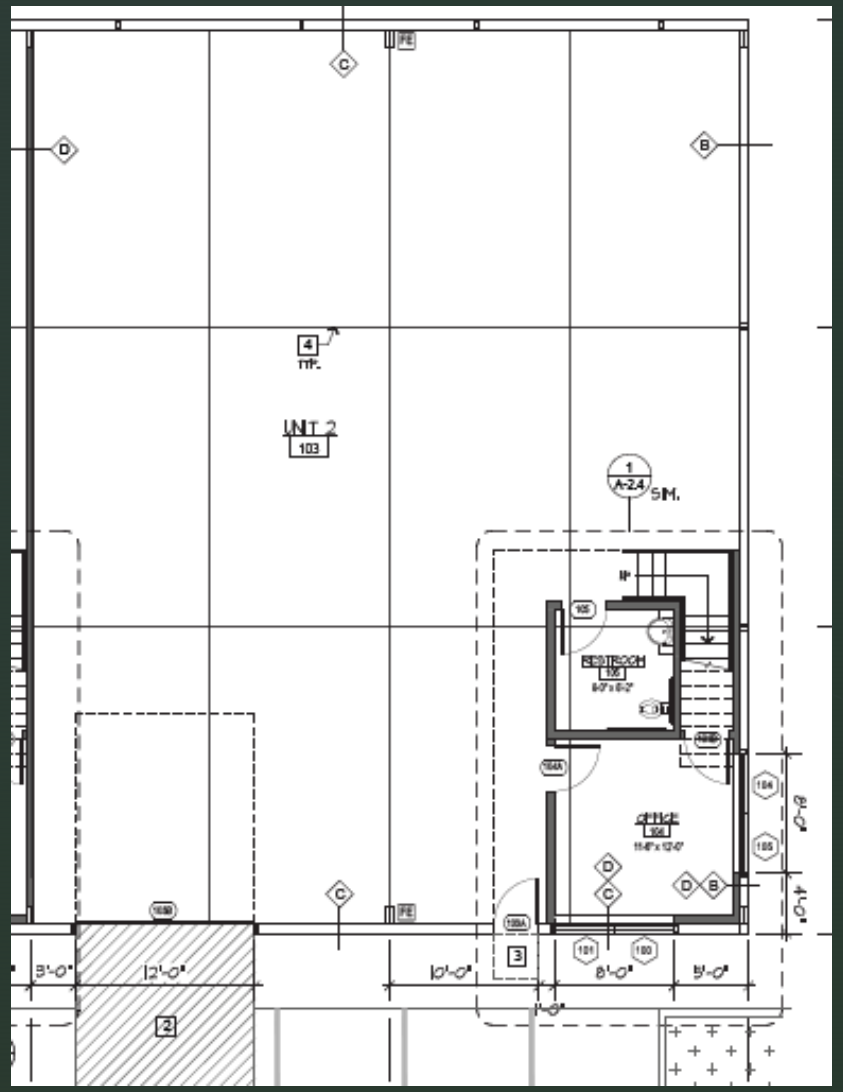
Natural Ventilation

IMC Natural Ventilation

IMC 402 – Natural Ventilation

- Natural ventilation shall be through operable windows, doors, louvers or other openings to the outdoors.
- Operating mechanism for openings utilized for natural ventilation shall be readily accessible and controllable by the building occupants.
- Openable area to the outdoors shall be ≥ 4% of the floor area being ventilated.
- Spaces without openings to the outdoors can be ventilated through an adjoining space provided the opening between the two spaces is unobstructed, and the area of the opening is ≥ 8% of the floor area being ventilated (minimum of 25 SF).

Natural Ventilation Example



- Storage/workshop spaces
- 2,400 SF with mezzanine open to below
- 1@ 12 ft. X 12 ft. garage door
- 1@ 3 ft. X 7 ft. swinging door
- Total operable opening area 165 SF
- 165 SF / 2,400 SF = 6.8% > 4% required - **COMPLIES**

Show natural ventilation calculations on the plans

Mechanical Ventilation Systems

Mechanical Ventilation System Sizing

Outdoor Airflow Rate

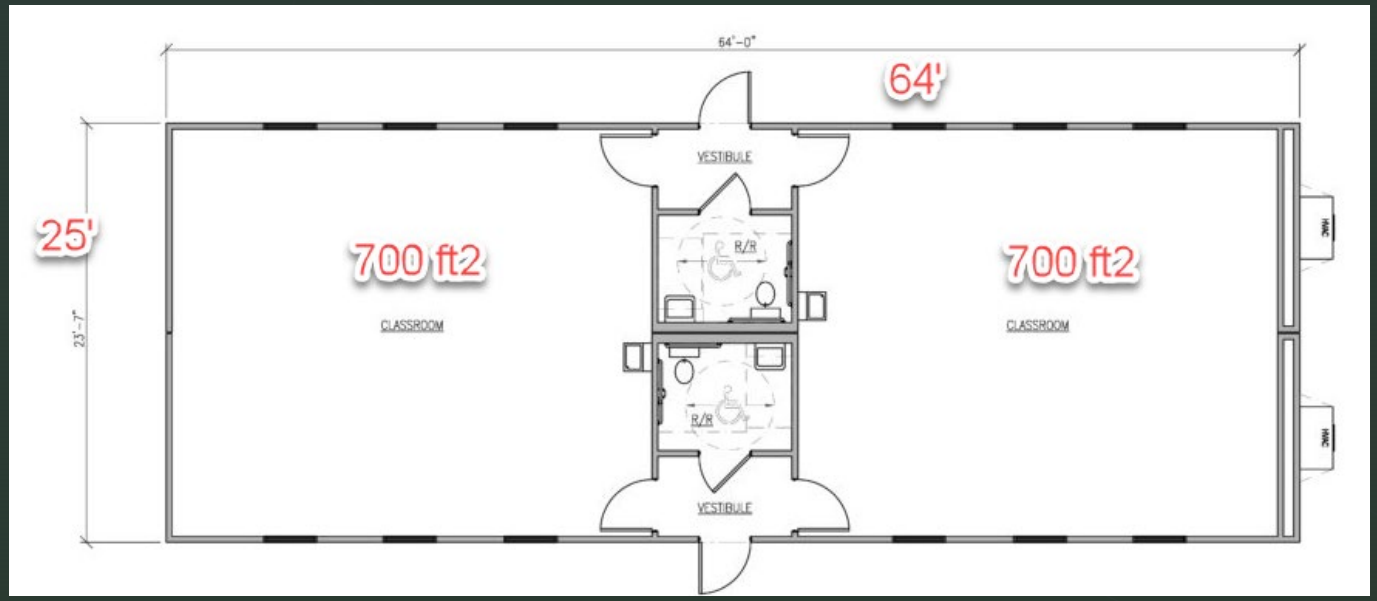
- **IMC 403.3.1.1** – Mechanical ventilation system shall be designed to provide the minimum outdoor airflow rate to each space per Table 403.3.1.1 or other applicable code or standard, whichever is greater.
- **WSEC C403.2.2.1** – Limits the allowed outdoor airflow rate to 150% of the design airflow rate per the IMC with exceptions.

TABLE 403.3.1.1—continued MINIMUM VENTILATION RATES

OCCUPANCY CLASSIFICATION	OCCUPANT DENSITY #/1000 FT^{2a}	PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING ZONE R_p CFM/PERSON	AREA OUTDOOR AIRFLOW RATE IN BREATHING ZONE R_a CFM/FT^{2a}	EXHAUST AIRFLOW RATE CFM/FT^2
Hotels, motels, resorts and dormitories				
Bathrooms/toilets—private[g]	—	—	—	25/50[f]
Bedroom/living room	10	5	0.06	—
Conference/meeting	50	5	0.06	—
Dormitory sleeping area	20	5	0.06	—
Gambling casinos	120	7.5	0.18	—
Lobbies/prefunction	30	7.5	0.06	—
Multipurpose assembly	120	50	0.06	—

NOTE: If occupant density is known, for example the number of dining room chairs, can use that number of people in the calculations.

Mechanical Ventilation Systems Example



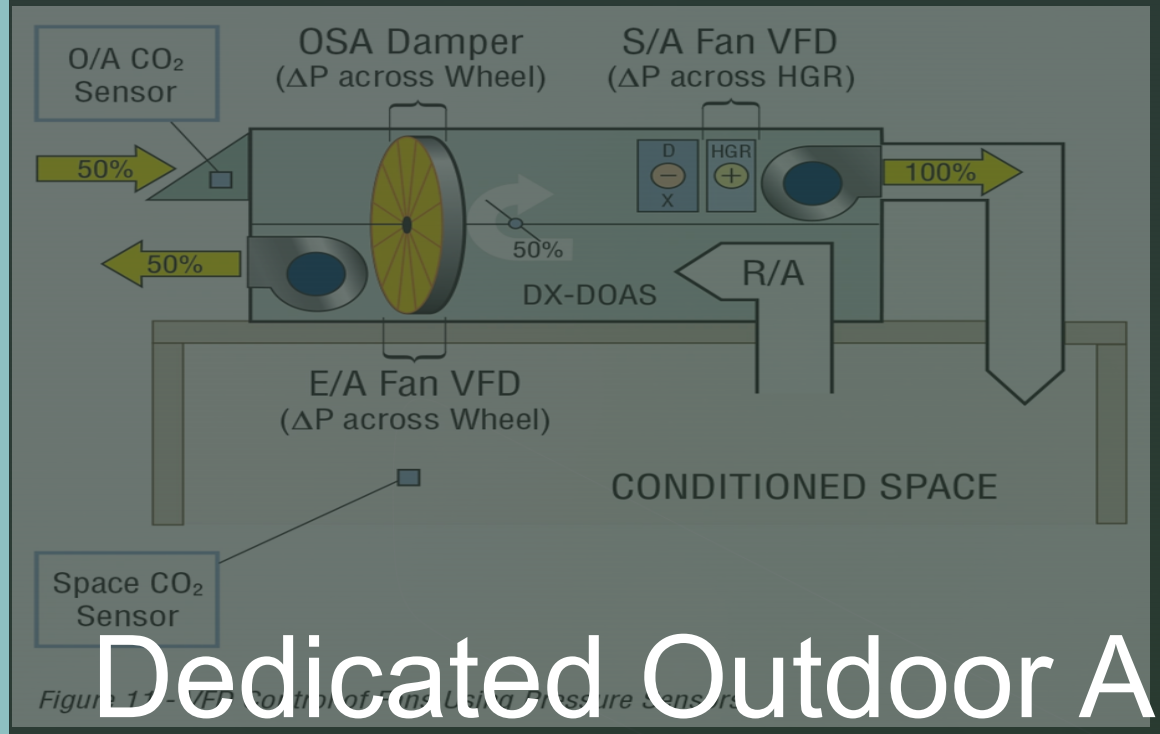
- New 1,600 SF portable classroom for High School
- Heating and cooling provided by packaged vertical heat pumps
- Each classroom is 700 SF in area
- Windows are not operable

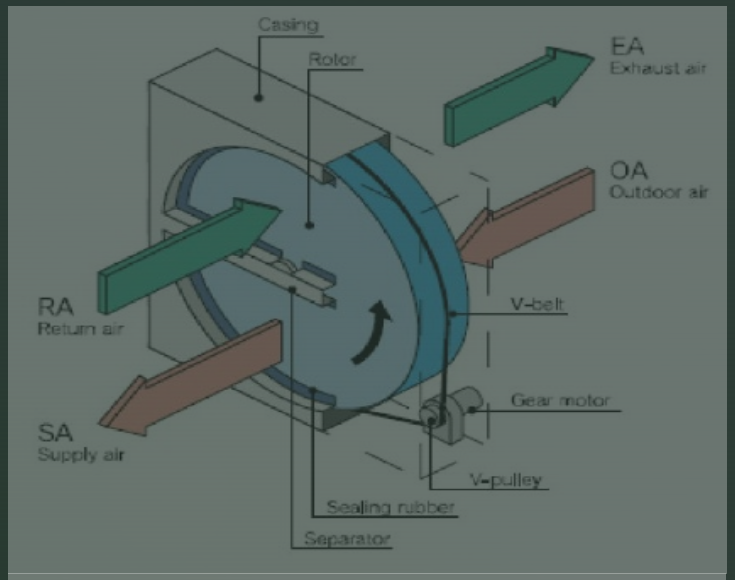
Sizing Ventilation Systems – Example

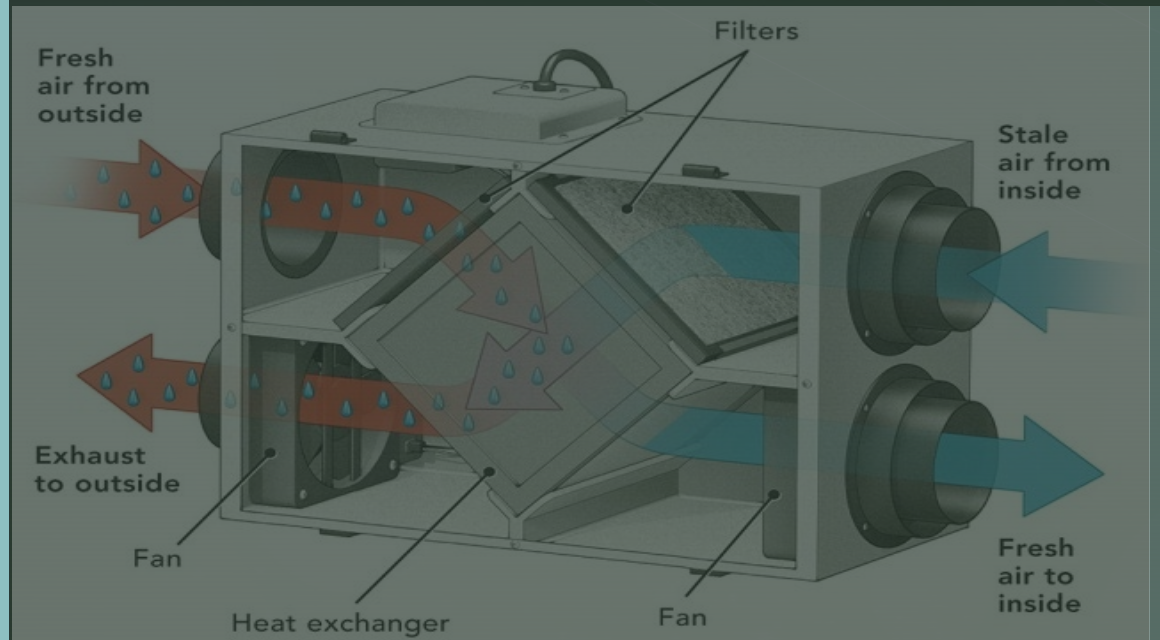
OCCUPANCY CLASSIFICATION	OCCUPANT DENSITY #/1000 FT^{2a}	PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING ZONE R_p CFM/PERSON	AREA OUTDOOR AIRFLOW RATE IN BREATHING ZONE R_a CFM/FT^{2a}	EXHAUST AIRFLOW RATE CFM/FT^2
Education				
Art classroom[g]	20	10	0.18	0.7
Auditoriums	150	5	0.06	—
Classrooms (ages 5 through 8)	25	10	0.12	—
Classrooms (age 9 plus)	35	10	0.12	—
Computer lab	25	10	0.12	—
Corridors (see "Public spaces")	—	—	—	—
Day care (through age 4)	25	10	0.18	—
Lecture classroom	65	7.5	0.06	—

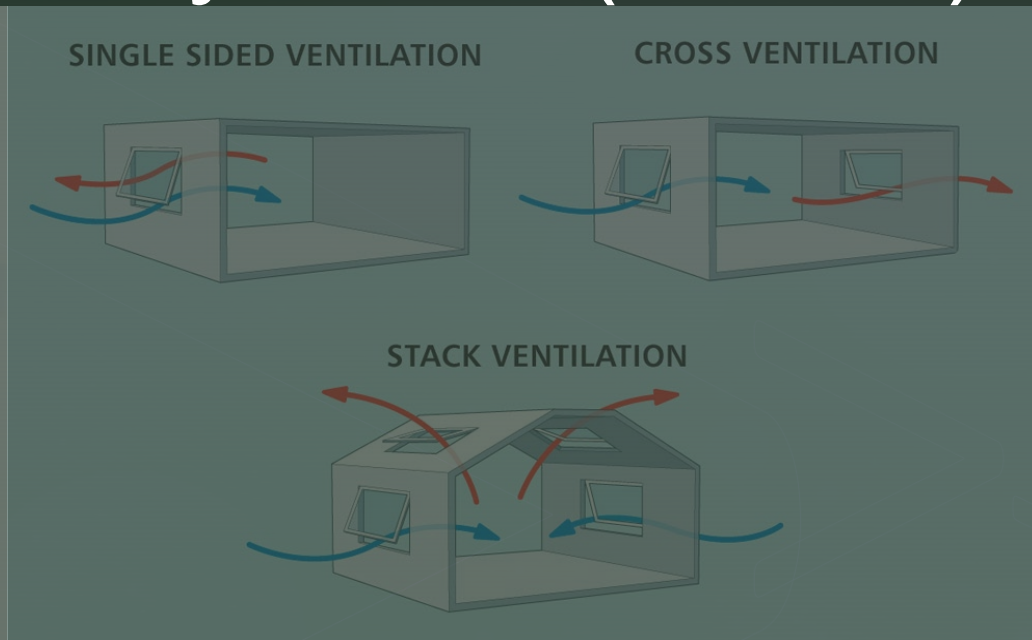
- Occupant density = (700 SF/1,000 SF) x 35 = 25 for each classroom
- People outdoor airflow rate = 25 people x 10 cfm/SF = 250 cfm
- Area outdoor airflow rate = 700 SF x 0.12 cfm/SF = 84 cfm
- Total minimum outdoor airflow rate for each classroom is 334 cfm
- The maximum outdoor airflow rate is 334 cfm x 150% = **501 cfm**

Dedicated Outdoor Air Systems (DOAS)









WSEC-C – DOAS

DOAS with energy recovery is required in the following occupancy classifications

TABLE C403.3.5
OCCUPANCY CLASSIFICATIONS REQUIRING DOAS

Occupancy Classification[a]	Inclusions	Exempted
A-1	All occupancies not specifically exempted	Television and radio studios
A-2	Casinos (gaming area)	All other A-2 occupancies
A-3	Lecture halls, community halls, exhibition halls, gymnasiums, courtrooms, libraries, places of religious worship	All other A-3 occupancies
A-4, A-5		All occupancies excluded
B	All occupancies not specifically exempted	Food processing establishments including commercial kitchens, restaurants, cafeterias; laboratories for testing and research; data processing facilities and telephone exchanges; air traffic control towers; animal hospitals, kennels, pounds; ambulatory care facilities.
F, H, I, R, S, U		All occupancies excluded
E, M	All occupancies included	

a. Occupancy classification from the *International Building Code* Chapter 3.

WSEC-C – DOAS

C403.3.5 Dedicated Outdoor Air Systems

- The DOAS system shall be equipped with heat recovery and sized to meet the ventilation requirements of Chapter 4 of the IMC.
- Requires minimum heat recovery effectiveness of 68% sensible recovery or 60% enthalpy recovery ratio.
- Exceptions:
  - Spaces meeting the natural ventilation requirements of IMC 402.
  - High efficiency multiple zone variable air volume (VAV) systems that comply with C403.6.10.
  - High efficiency single zone VAV systems serving Group A-1, A-2, A3 that comply with C403.12.

DOAS Supply Air Delivery

C403.3.5.4 Decoupled Supply Air

- The DOAS supply air shall be delivered directly to the occupied space, or downstream of the terminal heating and/or cooling coils.

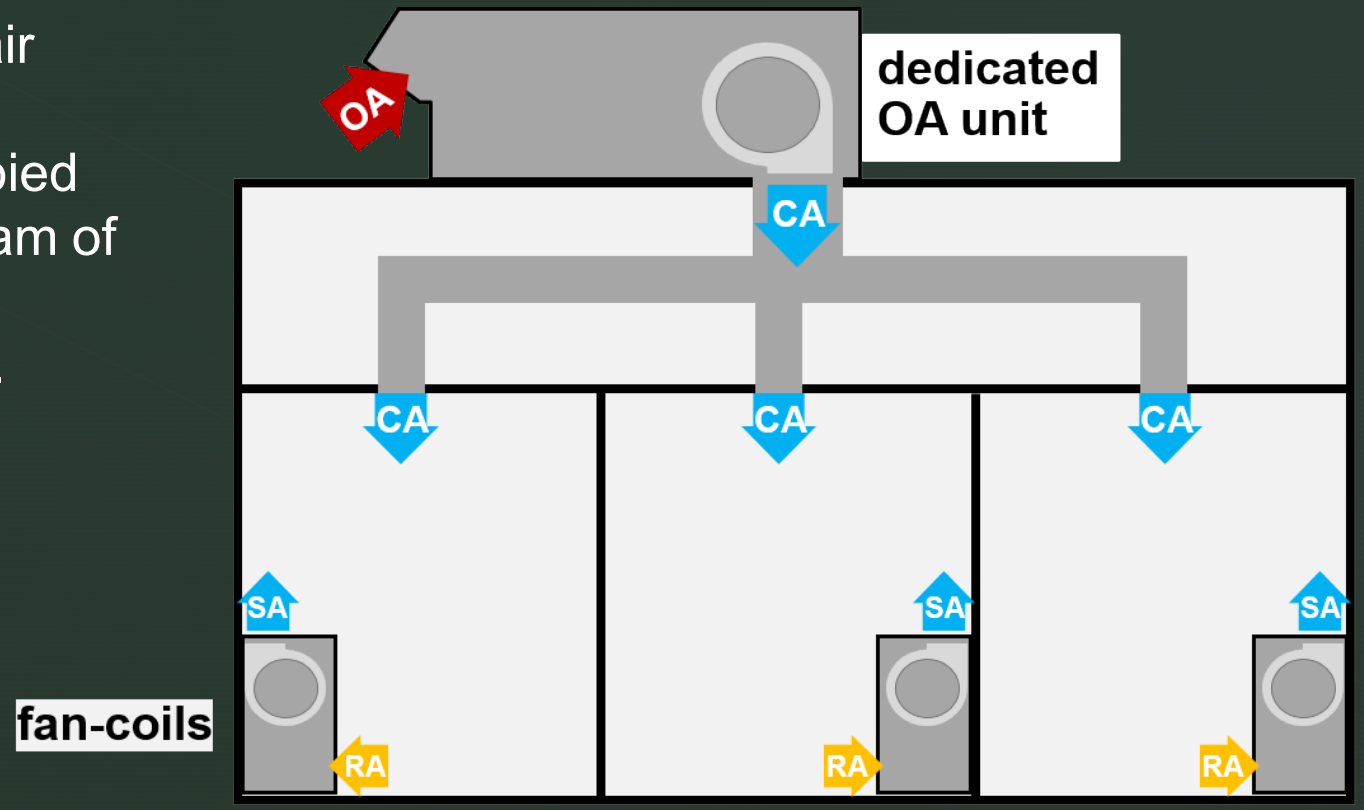


Diagram courtesy of Trane

Tempering of DOAS Supply Air

Supplemental Heating

- C403.7.3 Ventilation air heating control – **Ventilation supply air supplemental heating,** that operates in conjunction with the zone heating & cooling systems, may **temper supply air to up to 55°F (13°C).**
- Refer to Section C403.1.4 for additional information regarding DOAS auxiliary/supplemental heating equipment type allowances.

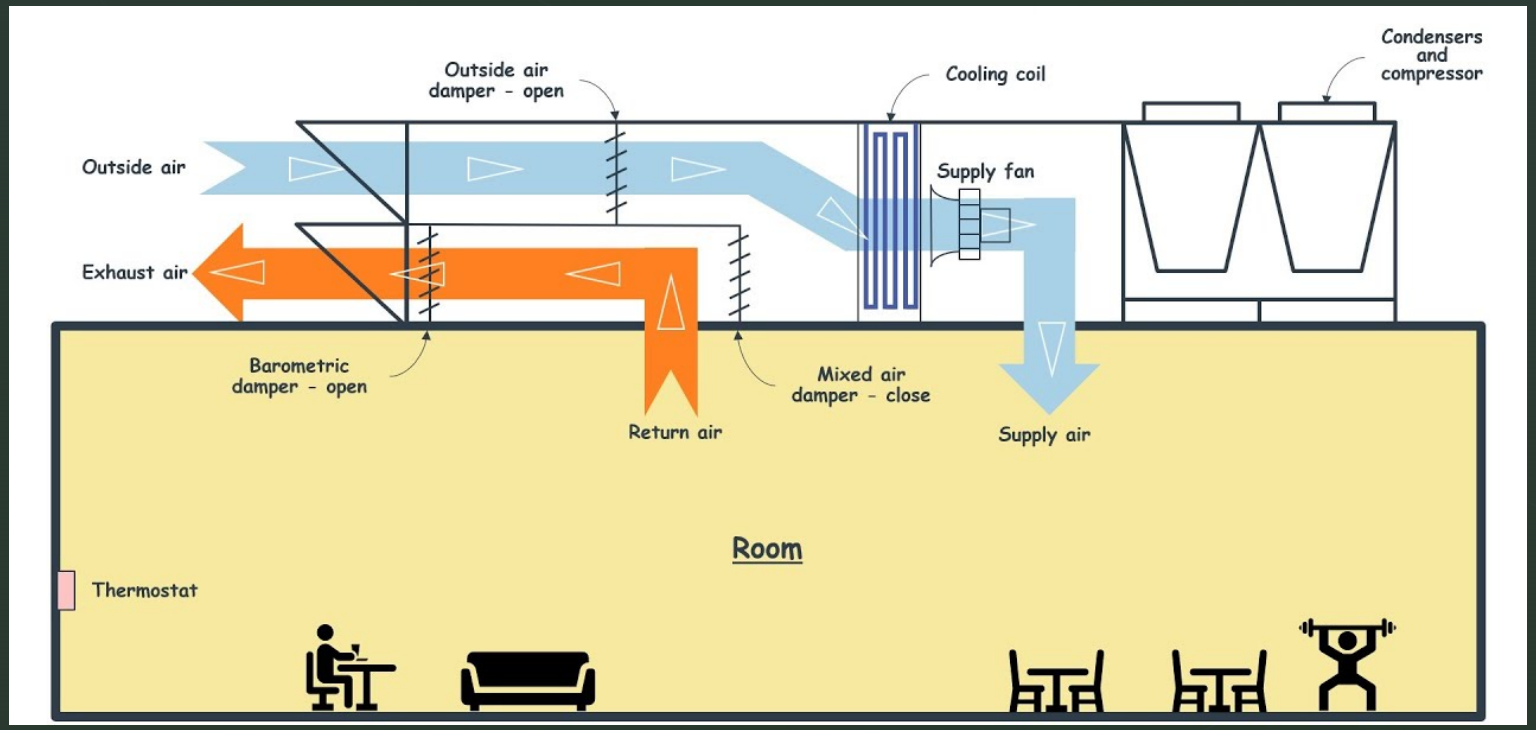
Supplemental Cooling

- Ventilation supply air cooling is permitted only for the purpose of maintaining supply air relative humidity or zone relative humidity.
- Cooling coil shall be sized for peak dehumidification at design outdoor temperatures, and no larger.

Economizer Review

C403.5 Economizer Cooling

- Economizer cooling **IS NOT** a ventilation strategy - it's a cooling strategy.
- HVAC systems required to have economizer cooling shall use outside air as the first stage of cooling when available.



Group R-2 Multi-Family Dwelling Unit Ventilation

IMC – Group R-2 Ventilation

IMC 403.4.4.1 – Whole house ventilation in Group R-2

- Dwelling and sleeping units in Group R-2 occupancies shall be served by a whole house mechanical ventilation system.
- Natural ventilation in lieu of a whole house system ***is not permitted***.
- System shall comply with IMC 403.4.6.3 balanced flow requirements.
- The ventilation system shall operate continuously at the minimum ventilation rate.
- Outdoor air shall be provided directly into each habitable space.
- OK to use transfer air to ventilate adjoining or adjacent interior spaces.

WSEC-C – Group R-2 Ventilation

C403.7.6.1 – Ventilation in Group R-2 occupancies

In addition to the IMC requirements:

- Whole house ventilation system shall include heat or energy recovery with ≥ 60% sensible recovery effectiveness
- Design airflow rates shall be tested and verified in each habitable space as part of the commissioning process per C408.2.2.

Group R-2 Ventilation Sizing

IMC 403.4.2 – Whole house mechanical ventilation rates

- The ventilation system shall ***operate continuously*** at the minimum ventilation rate per IMC Table 403.4.2.

Table 403.4.2
WHOLE HOUSE MECHANICAL VENTILATION AIRFLOW RATE
(CONTINUOUSLY OPERATING SYSTEMS)

Floor Area (ft^2)	Bedrooms[a]				
	1	2	3	4	>5
<500	30	30	35	45	50
500 - 1000	30	35	40	50	55
1001 - 1500	30	40	45	55	60
1501 - 2000	35	45	50	60	65
2001 - 2500	40	50	55	65	70
2501 - 3000	45	55	60	70	75
3001 - 3500	50	60	65	75	80
3501 - 4000	55	65	70	80	85
4001 - 4500	60	70	75	85	90
4501 - 5000	65	75	80	90	95

[a] Minimum airflow (Q_r) is set at not less than 30 cfm for each dwelling units.

Group R-2 Ventilation Fan Efficacy

WSEC C403.8.4 – Low-capacity ventilation fan efficacy

- Fans shall be tested and listed per HVI 916
- Refer to fan efficacy static pressure criteria in Footnote A of Table C403.8.4

Table C403.8.4
Low-Capacity Ventilation Fan Efficacy[a]

Fan Location	Airflow Rate Minimum (cfm)	Minimum Efficacy (cfm/watt)	Airflow Rate Maximum (cfm)
HRV or ERV	Any	1.2 cfm/watt	Any
Range hood	Any	2.8 cfm/watt	Any
In-line fan	Any	3.8 cfm/watt	Any
Bathroom, utility room	10	2.8 cfm/watt	< 90
Bathroom, utility room	90	3.5 cfm/watt	Any

Group R-2 Ventilation Balanced Flow

IMC 403.4.4.1 – Whole house ventilation in Group R-2 dwelling units

- Supply and exhaust fans shall have airflow that is within ***10% of each other***.
- The flow rate test results shall be submitted and posted per IMC 403.4.6.6 and the WSEC-C.
- Balanced flow ventilation system shall be provided with **≥ *60% sensible*** heat recovery effectiveness per the IMC and WSEC-C C403.7.6.1.
- The exhaust air shall be ducted to the exterior per IMC 403.4.6.1.
- Supply fan systems < 500 cfm shall include minimum MERV 8 filters per IMC 403.4.6.2.

Group R-2 Distribution of Ventilation Air

IMC 403.4.4.1 – Whole house ventilation in Group R-2 dwelling units

- The whole house supply fan shall provide ducted outdoor ventilation air to each habitable space.

Exception conditions to this specific requirement:

- Interior ***adjoining spaces*** that are ventilated from another habitable space.
- Interior ***adjacent rooms*** that are ventilated from another habitable space.
- Whole house ventilation systems serving adjoining and adjacent spaces from another habitable space are considered a “not distributed” system.

Group R-2 Distribution of Ventilation Air

IMC 403.4.3 – Ventilation quality adjustment

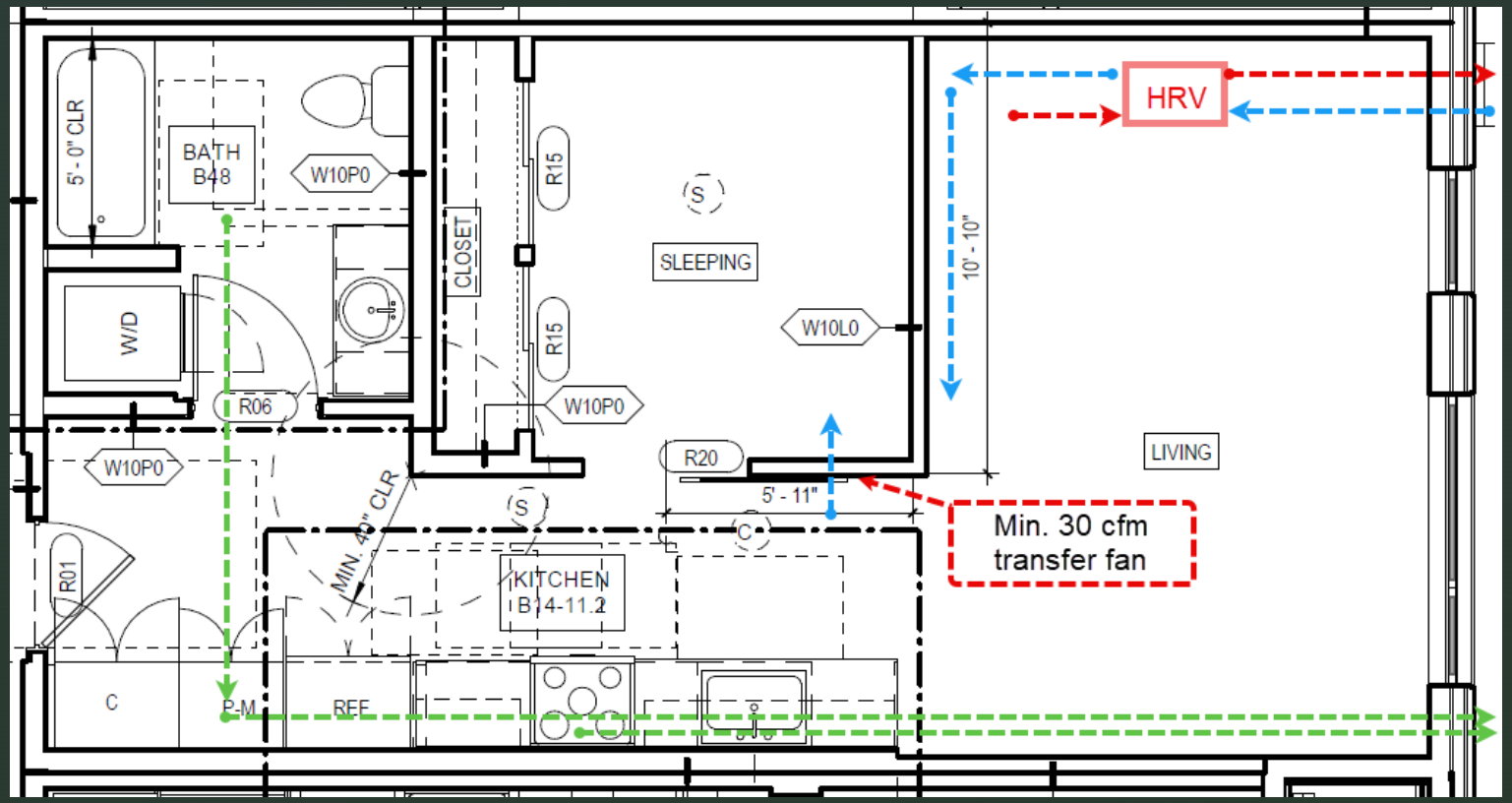
- For ***interior adjoining spaces & adjacent rooms*** served by not distributed systems, the minimum required ventilation rate for the whole house ventilation system is adjusted per IMC Equation 4-11 using the “Balanced - Not Distributed” coefficient in Table C403.4.3.
- ***Interior adjacent rooms*** shall also be provided with a transfer fan with airflow rate ≥ 30 cfm, or with a relief air inlet with airflow ≥ 20 cfm, that is connected to the exhaust/relief air inlet of an ERV/HRV whole house ventilation system.

Table 403.4.3
SYSTEM COEFFICIENT (C_{system})

System Type	Distributed	Not Distributed
Balanced	1.0	1.25
Not Balanced	1.25	1.5

Distribution of Ventilation Air – Example #1

Not distributed system example – Minimum ventilation = 38 CFM



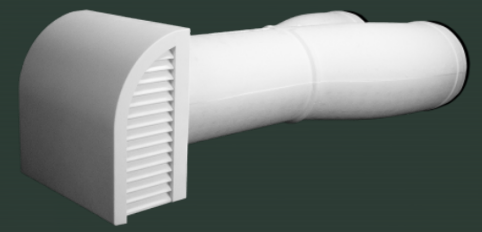
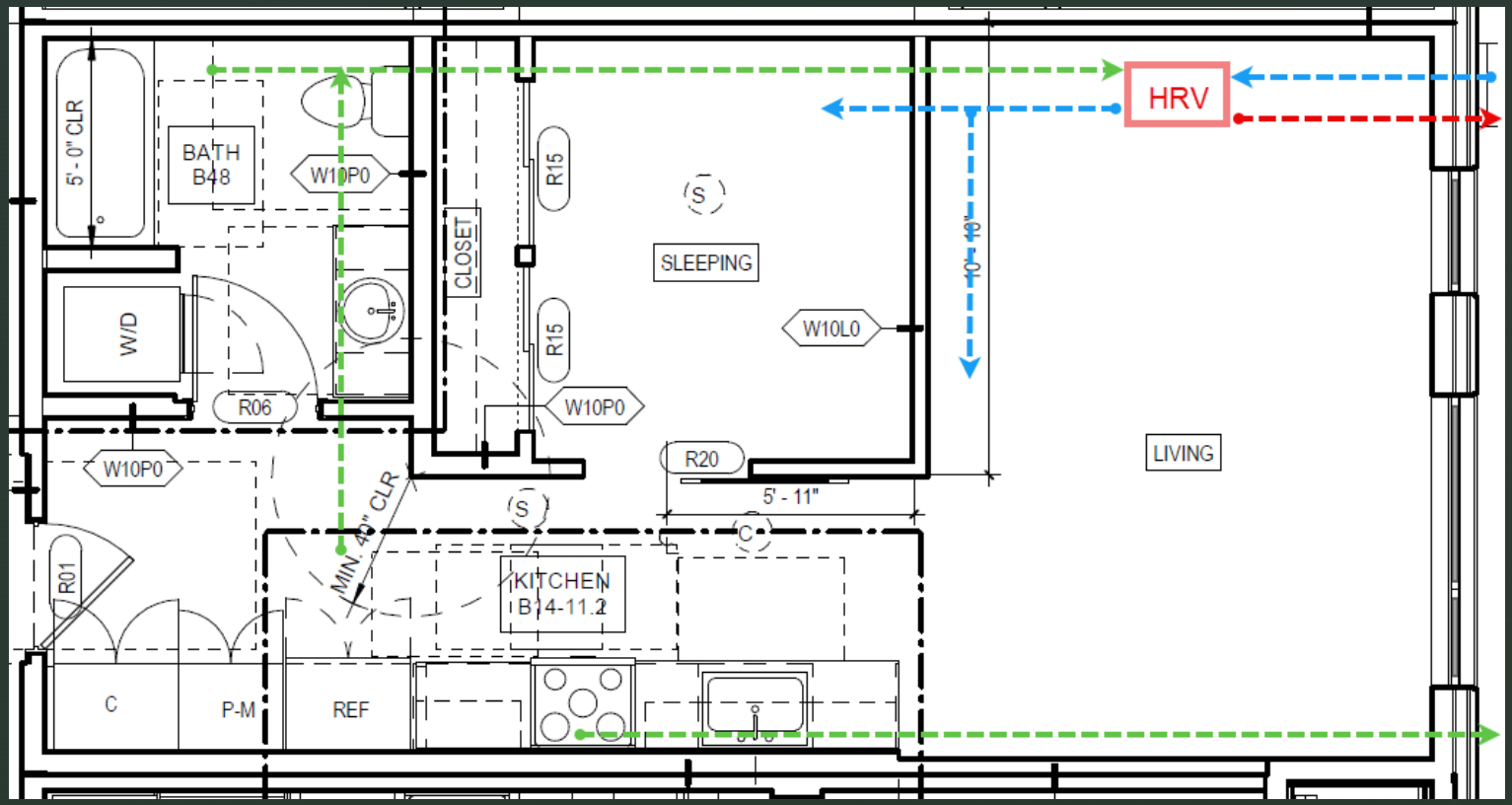


Image courtesy of Panasonic

Concentric intake/exhaust kit for HRV

Distribution of Ventilation Air – Example #2

Distributed system example – Minimum ventilation = 30 CFM



HRV is used to exhaust kitchen and bathroom

Group R-2 Occupant Controls

IMC 403.4.5 – Whole house ventilation controls

- Ventilation system shall be controlled with a manual switch, timer or other means that provides automatic operation of the ventilation system.
- Controls shall be readily accessible to the occupant.
- Controls shall include a **manual override** so the occupant can turn the ventilation system off during periods of poor outdoor air quality.
- Controls shall include **permanent text or a symbol** indicating their function. Recommended control permanent labeling to include text similar to the following: “Leave on unless outdoor air quality is very poor.”
- Exception: Central whole house mechanical systems with supply air and/or exhaust that serve more than one dwelling are not required to have manual override off controls accessible to the occupant.

Group R-1 Sleeping Units Fresh Air Ventilation

IMC – Group R-1 Ventilation

IMC 403.4.4.2 – Whole house ventilation for "Other than Group R-2"

- Sleeping units shall be served by a whole house mechanical ventilation system.
- Natural ventilation in lieu of a whole house system ***is not permitted***.
- System shall comply with IMC 403.4.6.3 balanced flow requirements.
- The ventilation system shall operate continuously at the minimum ventilation rate unless configured with intermittent off controls.
- The whole house supply fan shall provide ducted outdoor ventilation air to each habitable space within the sleeping unit.
- OK to use transfer air to ventilate adjoining or adjacent interior spaces.

NOTE: The 2021 WSEC/IMC ***do not require*** heat or energy recovery for whole house ventilation systems serving Group R-1 sleeping units.

Sizing Ventilation Systems – Example

TABLE 403.3.1.1—continued MINIMUM VENTILATION RATES

OCCUPANCY CLASSIFICATION	OCCUPANT DENSITY #/1000 FT^{2a}	PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING ZONE R_p CFM/PERSON	AREA OUTDOOR AIRFLOW RATE IN BREATHING ZONE R_a CFM/FT^{2a}	EXHAUST AIRFLOW RATE CFM/FT^2
Hotels, motels, resorts and dormitories				
Bathrooms/toilets—private[g]	—	—	—	25/50[f]
Bedroom/living room	10	5	0.06	—
Conference/meeting	50	5	0.06	—
Dormitory sleeping area	20	5	0.06	—
Gambling casinos	120	7.5	0.18	—
Lobbies/prefunction	30	7.5	0.06	—
Multipurpose assembly	120	50	0.06	—

Typical Group R-1 sleeping unit – 300 SF average room size with 2 occupants

Minimum fresh air ventilation:

2 people x 5 cfm/person = 10 CFM 300 SF x 0.06 cfm/SF = 18 CFM

10 CFM + 18 CFM = 28 CFM

- Bathroom requires ≥ 25 CFM exhaust if continuous or 50 CFM if intermittent
- Balanced flow required (+/-5 cfm or 10%), so 28 CFM ventilation air and 25 CFM exhaust complies
- If intermittent exhaust flow, fresh air ventilation shall be increased to ≥ 45 cfm

WSEC-C – Automatic Controls

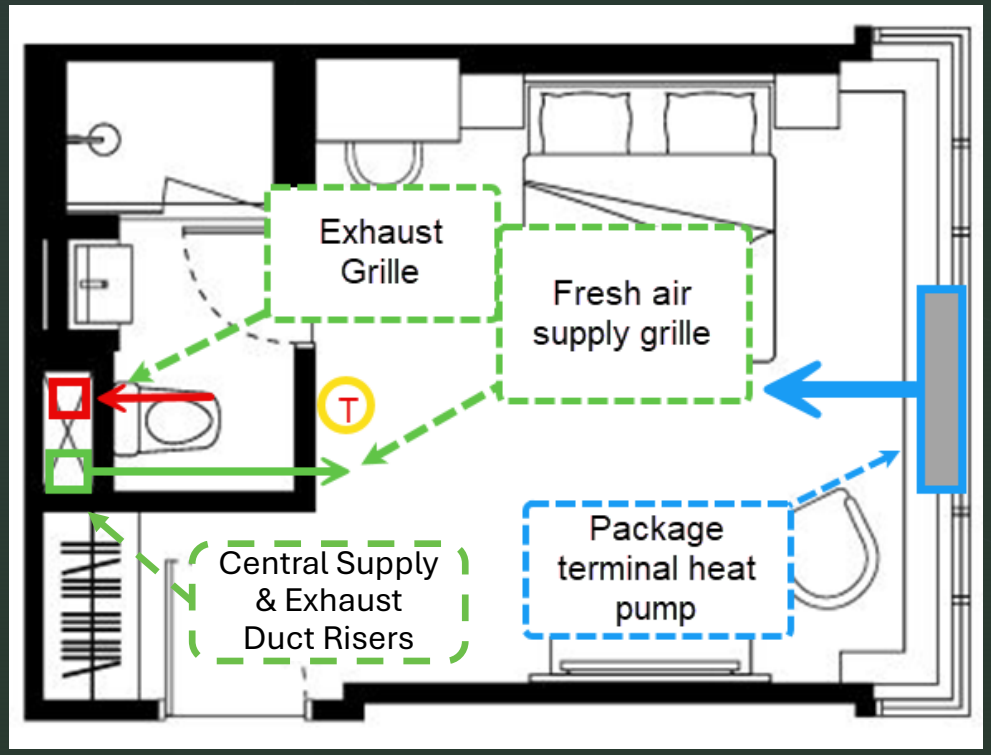
C403.7.4 Automatic control of HVAC systems serving guestrooms

- Applies to Group R-1 buildings with > 50 guest rooms
- Automatically turn off the ventilation and exhaust fans within 20 minutes of the occupants leaving the guestroom. OR
- Provide isolation devices to each guestroom that are capable of automatically shutting off the supply of outdoor air to and exhaust air from the guestroom.

Use occupancy sensor or card key to control ventilation system operation

Sleeping Unit Ventilation – Example #1

Central exhaust & supply fan systems serve multiple guestrooms



2021 IMC Review

- Exhaust cfm per room
- Supply cfm per room
- Continuous or intermittent operation
- Supply air filtering
- Supply/exhaust discharge air location

2021 WSEC-C Review

- Exhaust air isolation if > 50 guestrooms
- Supply air isolation if > 50 guestrooms
- Fan system total supply air cfm
- Central ventilation air system heat recovery efficiency
- Central fan system motor efficiency

WSEC-C – Energy Recovery

C403.7.6.2 Spaces other than Group R-2 dwelling units

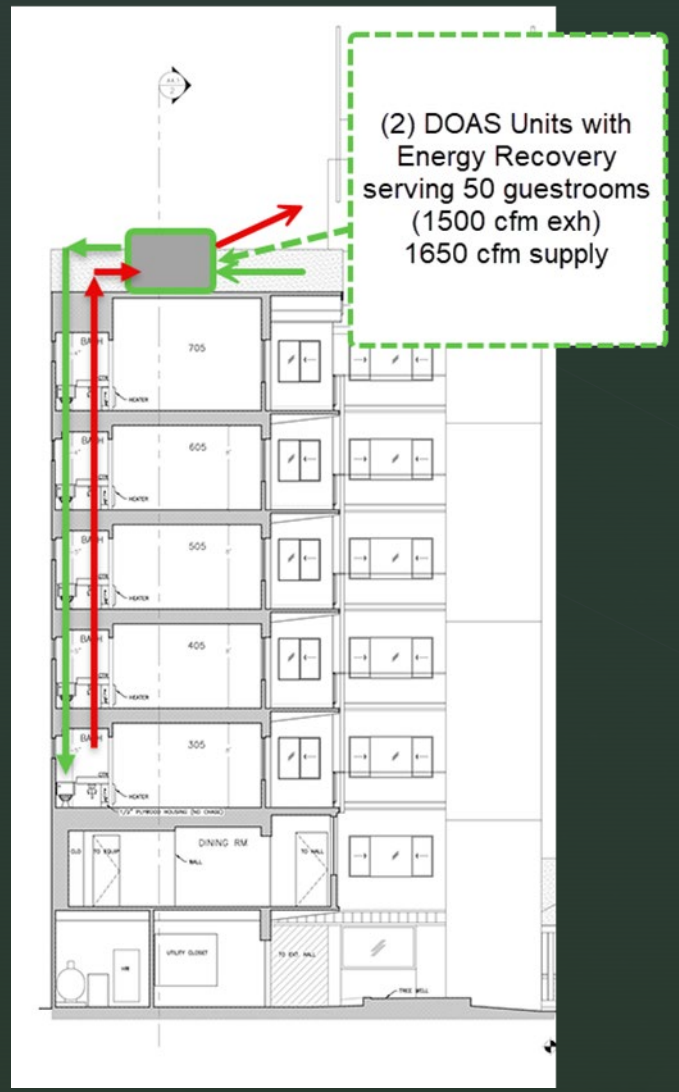
- Energy recovery is required where the total system supply airflow rate exceeds the values listed in Tables C403.7.6(1) and C403.7.6(2), based on climate zone and % of outdoor airflow rate at design conditions.

TABLE C403.7.6.1(2)
ENERGY RECOVERY REQUIREMENT
(VENTILATION SYSTEMS OPERATING NOT LESS 8,000 HOURS PER YEAR)

CLIMATE ZONE	PERCENT (%) OUTDOOR AIR AT FULL DESIGN AIRFLOW RATE							
	≥ 10% and < 20%	≥ 20% and < 30%	≥ 30% and < 40%	≥ 40% and < 50%	≥ 50% and < 60%	≥ 60% and < 70%	≥70% and < 80%	≥ 80%
	DESIGN SUPPLY FAN AIRFLOW RATE (cfm)							
4C	NR	≥ 19500	≥ 9000	≥ 5000	≥ 4000	≥ 3000	≥ 1500	≥120
5B	≥ 2500	≥ 2000	≥ 1000	≥ 500	≥ 140	≥ 120	≥ 100	≥ 80

NR = not required

Sleeping Unit Ventilation – Example #2



2021 IMC Review

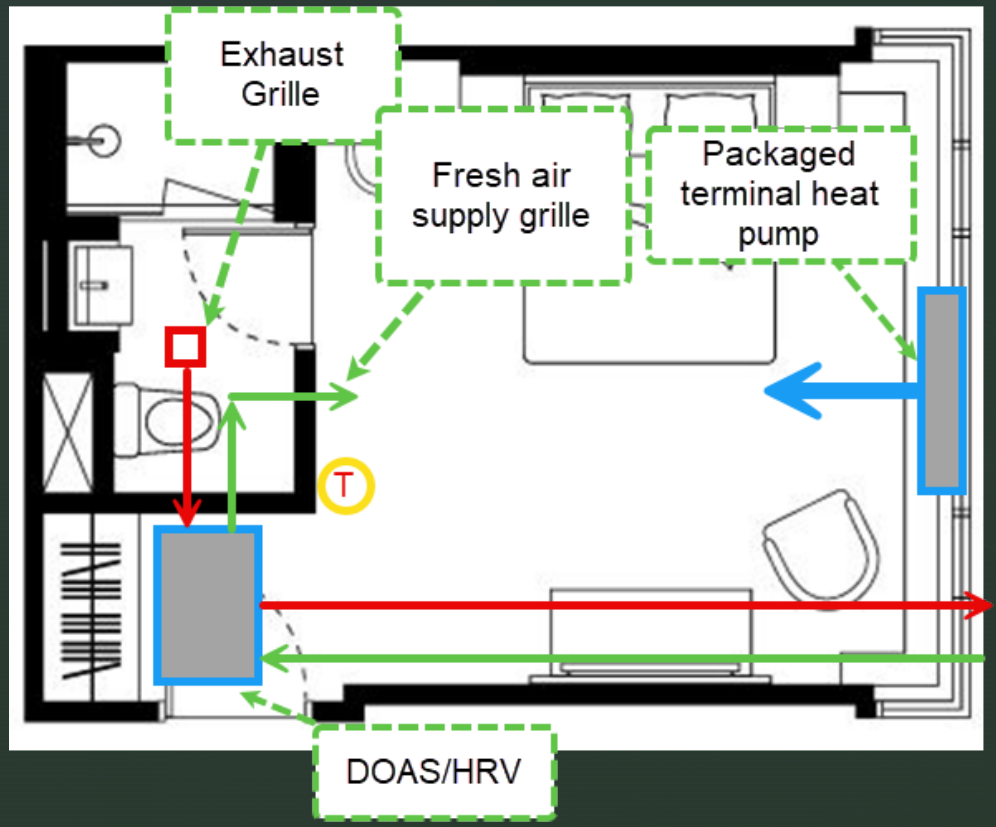
- Exhaust = 30 CFM per guestroom
- Supply cfm = 35 CFM per guestroom
- Continuous operation
- Rooftop ERV with MERV 13 filters
- Exhaust discharge > Ducted 10ft away from supply inlet

2021 WSEC-C Review

- Exhaust air isolation
- Supply air isolation
- Exhaust/Supply fan motor efficiency
- Energy recovery efficiency
- Supply air tempering

Sleeping Unit Ventilation – Example #3

Each guestroom is served by independent DOAS/HRV equipment



2021 IMC Review

- Exhaust cfm per room
- Supply cfm per room
- Continuous or intermittent operation
- Supply air filtering
- Supply/exhaust discharge air location

2021 WSEC-C Review

- Exhaust air isolation if > 50 guestrooms
- Supply air isolation if > 50 guestrooms
- Fan system total supply air cfm
- Heat recovery efficiency
- Small ventilation fan efficacy

Group R-1 & Group R-2 Common Area Ventilation

Group R-1 & R-2 Common Areas

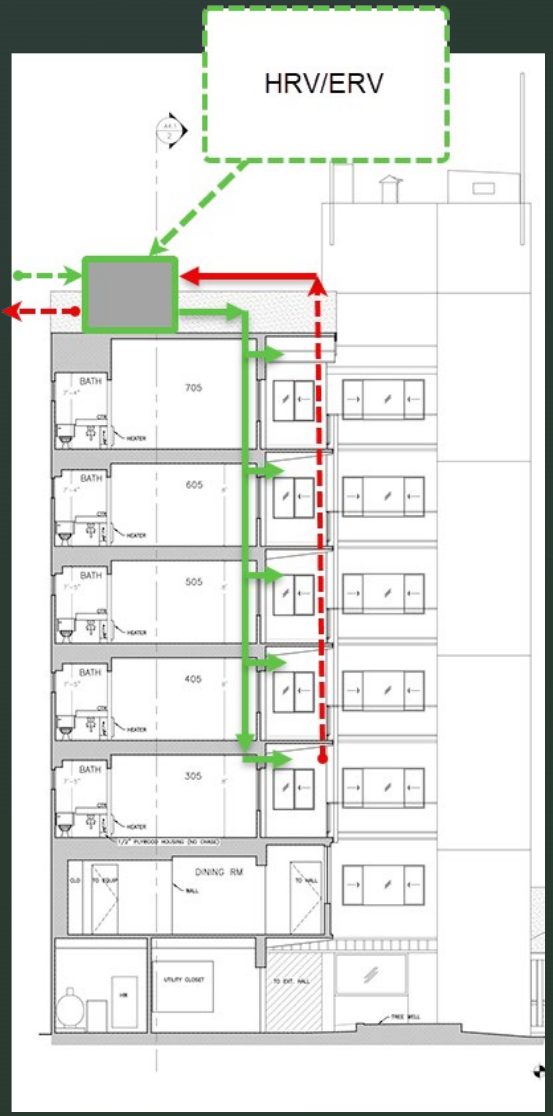
- All occupied spaces, other than Group R dwelling units and sleeping units, that support the Group R occupancy.
- Space types include corridors, lobbies, exercise rooms, business centers, offices, laundry, storage, lounge, dining rooms, cafeterias, etc.
- Shall meet the natural ventilation requirements of IMC 402 or the mechanical ventilation requirements of the IMC and WSEC.

Common Area Ventilation System Sizing

TABLE 403.3.1.1—continued MINIMUM VENTILATION RATES

OCCUPANCY CLASSIFICATION	OCCUPANT DENSITY #/1000 FT^{2a}	PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING ZONE R_p CFM/PERSON	AREA OUTDOOR AIRFLOW RATE IN BREATHING ZONE R_a CFM/FT^{2a}	EXHAUST AIRFLOW RATE CFM/FT^2
Hotels, motels, resorts and dormitories				
Bathrooms/toilets—private[g]	—	—	—	25/50[f]
Bedroom/living room	10	5	0.06	—
Conference/meeting	50	5	0.06	—
Dormitory sleeping area	20	5	0.06	—
Gambling casinos	120	7.5	0.18	—
Lobbies/prefunction	30	7.5	0.06	—
Multipurpose assembly	120	50	0.06	—
Public spaces				
Corridors serving other than Group R occupancies	--	--	0.06	--
Corridors serving Group R dwelling or sleeping units with whole house exhaust system	--	--	0.12	--
Corridors serving Group R dwelling or sleeping units with other than whole house exhaust system	--	--	0.06	--

Corridor Ventilation – Example #1



2021 WSEC-C requirements for corridors served by HRVs or ERVs

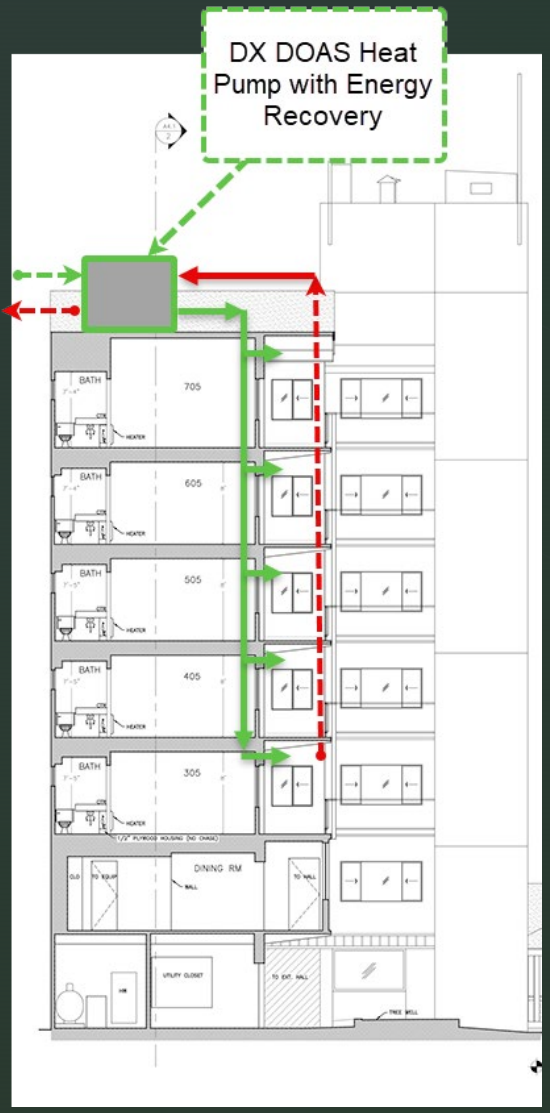
- C403.7.6 Energy recovery required, 68% sensible
- C403.4.1 Thermostatic controls shall limit heating supply air temperature to 65 °F
- C403.8.1 HRV/ERV fans shall comply with the fan power allowance

TABLE C403.7.6.1(2)
ENERGY RECOVERY REQUIREMENT
(VENTILATION SYSTEMS OPERATING NOT LESS 8,000 HOURS PER YEAR)

CLIMATE ZONE	PERCENT (%) OUTDOOR AIR AT FULL DESIGN AIRFLOW RATE							
	≥ 10% and < 20%	≥ 20% and < 30%	≥ 30% and < 40%	≥ 40% and < 50%	≥ 50% and < 60%	≥ 60% and < 70%	≥70% and < 80%	≥ 80%
	DESIGN SUPPLY FAN AIRFLOW RATE (cfm)							
4C	NR	≥ 19500	≥ 9000	≥ 5000	≥ 4000	≥ 3000	≥ 1500	≥120
5B	≥ 2500	≥ 2000	≥ 1000	≥ 500	≥ 140	≥ 120	≥ 100	≥ 80

NR = not required

Corridor Ventilation – Example #2



2021 WSEC-C requirements for corridors served by DX-DOAS heat pumps

- C403.7.6 Energy recovery required, 68% sensible
- C403.4.1 Thermostatic controls limits heating supply air temperature to 65 °F for heating and 72F for cooling
- Table C403.3.2(13) Minimum equipment efficiency
- C403.8.1 DX-DOAS fans shall comply with the fan power allowance

2021 WSEC-C & 2021 IMC Fresh Air Ventilation

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