

Washington State Board of Health

Indoor Air Quality Panel

January 10, 2023



DELTA E CONSULTING

SUSTAINABILITY CONSULTING

CARBON CONSULTING

ENERGY CONSULTING

MECHANICAL DESIGN

ELECTRICAL DESIGN

PLUMBING DESIGN

LIGHTING DESIGN



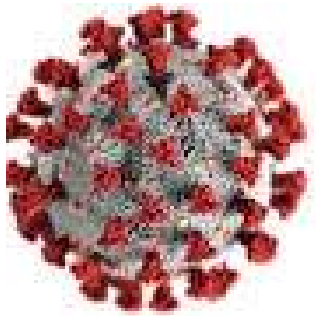
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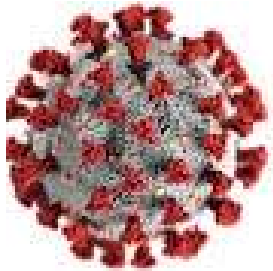
Agenda

Indoor Air Quality & Mechanical HVAC System Design impacts due to:

- COVID-19 Virus Pandemic
- Recent Washington State Energy Code Changes
- Washington State Clean Buildings Act and Seattle Building Emissions Performance Standard
- Sustainability Standards



IAQ: COVID-19 Virus & HVAC System Design

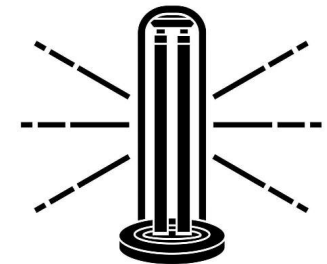


- Project by Project Client Education Process
 - ASHRAE Recommendations
 - Space by Space Review



- Above Code Minimum HVAC System Design Strategies Considered
 - Air Distribution Options
 - Increased Outdoor Airflow Rates
 - Filtration: HVAC System: Outdoor Air & Recirculating Air
 - Filtration: Room HEPA Filtration
 - UV Light Sterilization
 - Ionization
 - Pressure Relationships between Spaces

MERV 13



UV LIGHT STERILIZATION



IAQ: COVID-19 Virus & HVAC System Design

Air-to-Air Energy Recovery Media Types



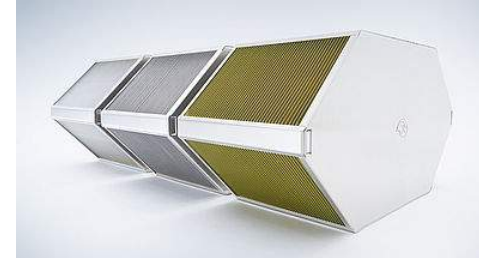
**Crossflow
Aluminum Fixed
Plate Heat
Exchanger**



**Enthalpy Core
Heat Exchanger
(engineered resin)**



**Total Enthalpy
Wheel**



**Counterflow
Aluminum Fixed
Plate Heat
Exchanger**



**Reverse Flow
Aluminum Heat
Exchanger Cores**



IAQ: Energy Code & HVAC System Design

- **Reduce Fan Energy**

- Reduce airflow required for ventilation (outdoor air & exhaust air)
- Reduce airflow for heating and cooling (less recirculating air changes)
- Reduce pressure drop of components in HVAC system (filters, ductwork, etc)

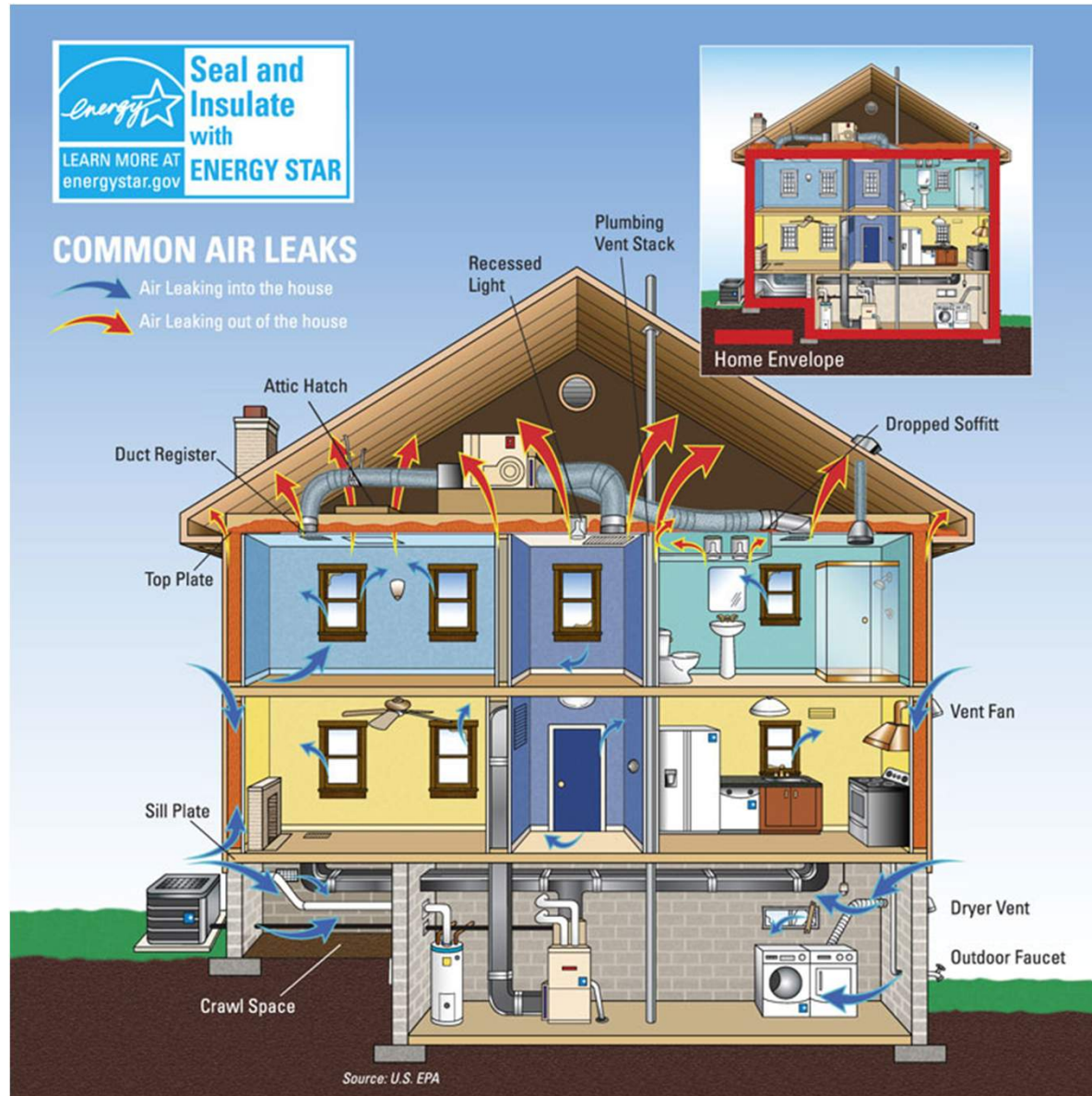


- **Control of HVAC Systems**

- Demand Controlled Ventilation (DCV) Simple: based on CO₂, CO, NO_x
- Demand Controlled Ventilation (DCV) Advanced: Air purity or others CO₂, VOC's, etc
- Occupied Standby Controls: Unoccupied disable Ventilation and Heating/Cooling



IAQ: Energy Code & HVAC System Design

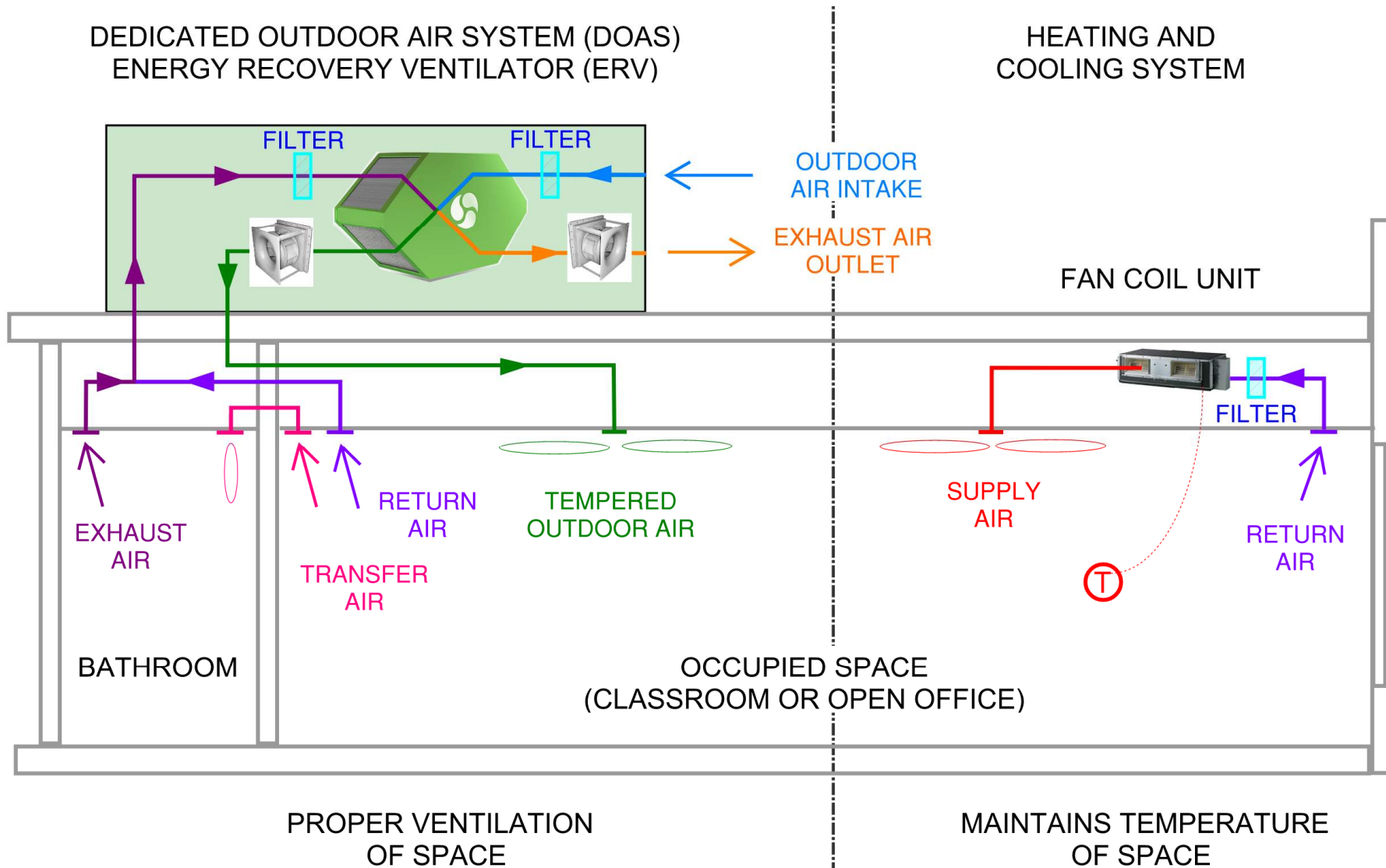


**BUILD TIGHT
VENTILATE RIGHT**



IAQ: Energy Code & HVAC System Design

2015 WSEC Non-Residential & 2018 WSMC/WSEC Multi-Family Residential



IAQ: Group R Multi-Family Residential Exhaust

2018 Washington State Mechanical Code

**TABLE 403.4.7
MINIMUM EXHAUST RATES**

Area to be exhausted	Exhaust Rate	
	Intermittent	Continuous
Kitchens	100 cfm	30 cfm
Bathrooms - Toilet rooms	50 cfm	20 cfm

2021 Washington State Mechanical Code

**TABLE 403.4.7
MINIMUM EXHAUST RATES**

Area to be exhausted	Exhaust Rate	
	Intermittent	Continuous
Open Kitchens	In accordance with Section 403.4.7.3	Not permitted
Enclosed Kitchens	In accordance with Section 403.4.7.3	5 ACH based on kitchen volume
Bathrooms - Toilet rooms	50 cfm	20 cfm

**TABLE 403.4.7.3
KITCHEN RANGE HOOD AIRFLOW RATES (CFM)
AND ASTM E3087 CAPTURE EFFICIENCY (CE) RATINGS
ACCORDING TO KITCHEN RANGE FUEL TYPE**

Hood Over Electric Range	Hood Over Combustion Range
65 percent CE or 160 cfm	80 percent CE or 250 cfm

2024 International Mechanical Code

TABLE 403.3.2.3 MINIMUM REQUIRED LOCAL EXHAUST RATES FOR GROUP R-2, R-3 AND R-4 OCCUPANCIES

AREA TO BE EXHAUSTED	EXHAUST RATE CAPACITY
Kitchens	100 cfm intermittent or 50 cfm continuous
Bathrooms and toilet rooms	50 cfm intermittent or 25 cfm continuous

For SI: 1 cubic foot per minute = 0.0004719 m³/s.



IAQ: Energy Code & HVAC System Design



2018/2021 WSMC/WSEC:

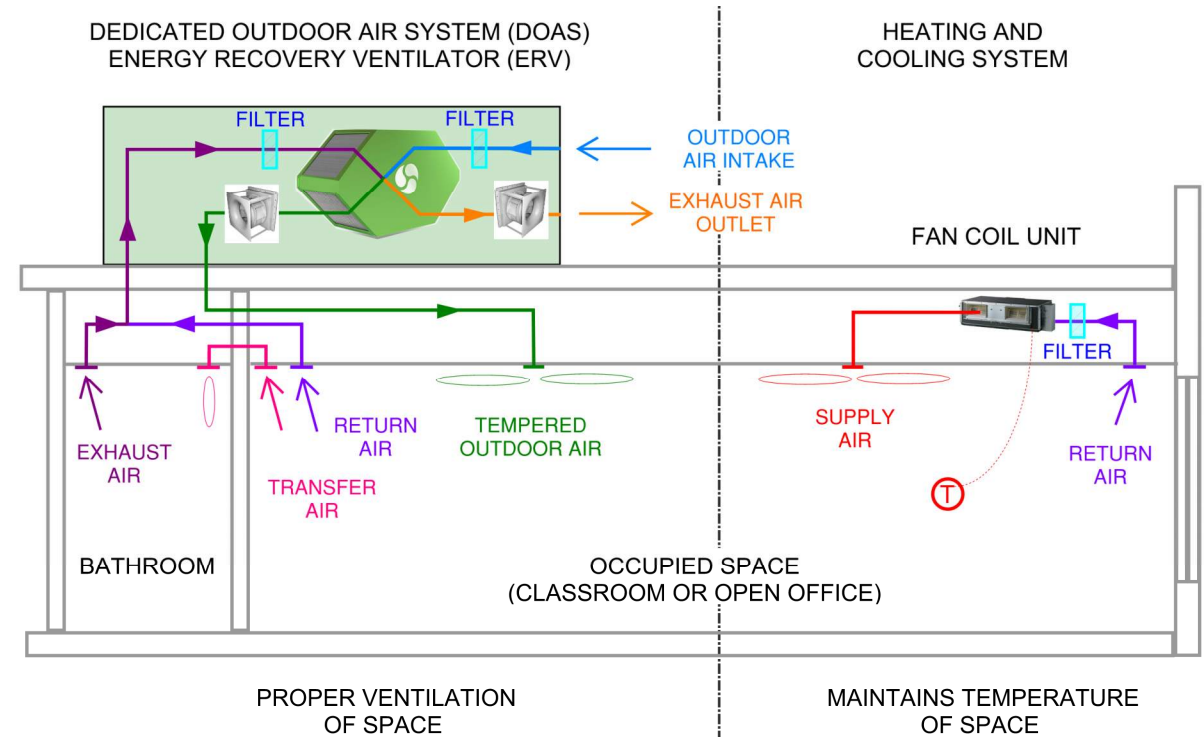
- **Reduced Corridor Outdoor Airflows**
- **Corridors with recirculating systems for heat pumps**
- **Makeup air source for local exhaust for clothes dryer & kitchen range exhaust**

BUILD TIGHT

VENTILATE RIGHT



IAQ: Wildfire Smoke & HVAC System Design



- **Balanced Mechanical Ventilation Systems with Filtered Supply**
- **Outdoor Air Filtration**
- **Minimize Outdoor Airflow Rates**
- **Occupant Control of HVAC System**



IAQ: Operational Energy & Carbon Emissions



CLEAN BUILDINGS PROGRAM

Seattle's New Building Emissions
Performance Standard
A High-Impact Solution to the Climate Crisis



Standard 100-2015 -- Energy Efficiency in Existing Buildings (ANSI Approved/IES Co-sponsored)



Sustainability Protocols & Indoor Air Quality



- LEED BD+C: New Construction, Schools, Hospitality, LEED: Multi-Family
 - HVAC Filtration
 - Outdoor Air Ventilation Rates +30%
 - Indoor Air Quality Assessment Testing, Credits Possible
 - LEED Multi-Family: Residential Unit Compartmentalization

- Living Building Challenge
 - Materials: Redlist



- fitwel
 - HVAC Filtration, more stringent than LEED
 - Indoor Air Quality Assessment Testing, Credits Possible



- WELL
 - HVAC Filtration, more stringent than LEED
 - Indoor Air Quality Assessment Testing, Performance Based (minimum requirements must be met)



THANK YOU

