TRI-COUNTY
REGIONAL ENERGY NETWORK
SAN LUIS OBISPO • SANTA BARBARA • VENTURA

Ventilation and HRV – Part 4: All-Electric Design & Construction Series

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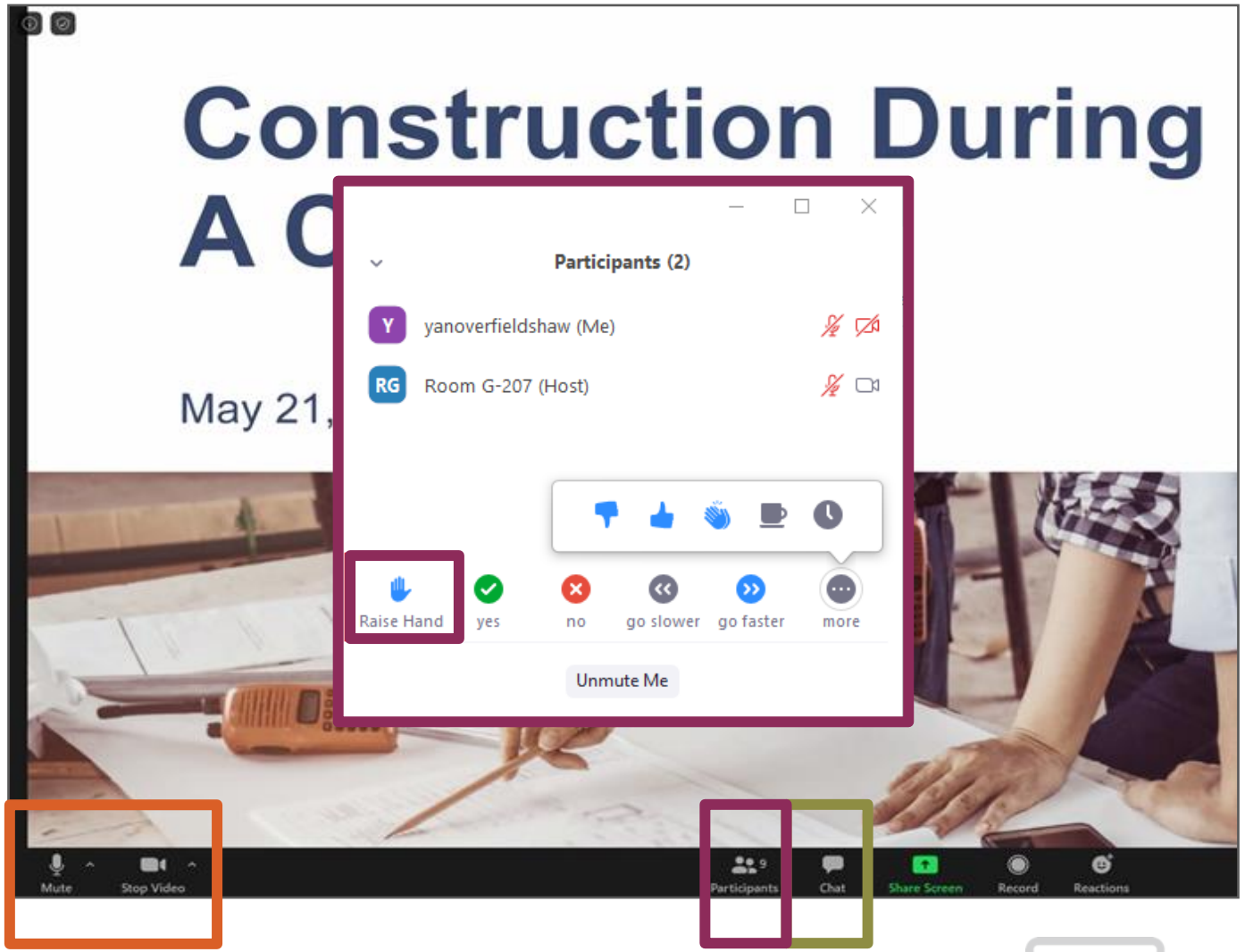
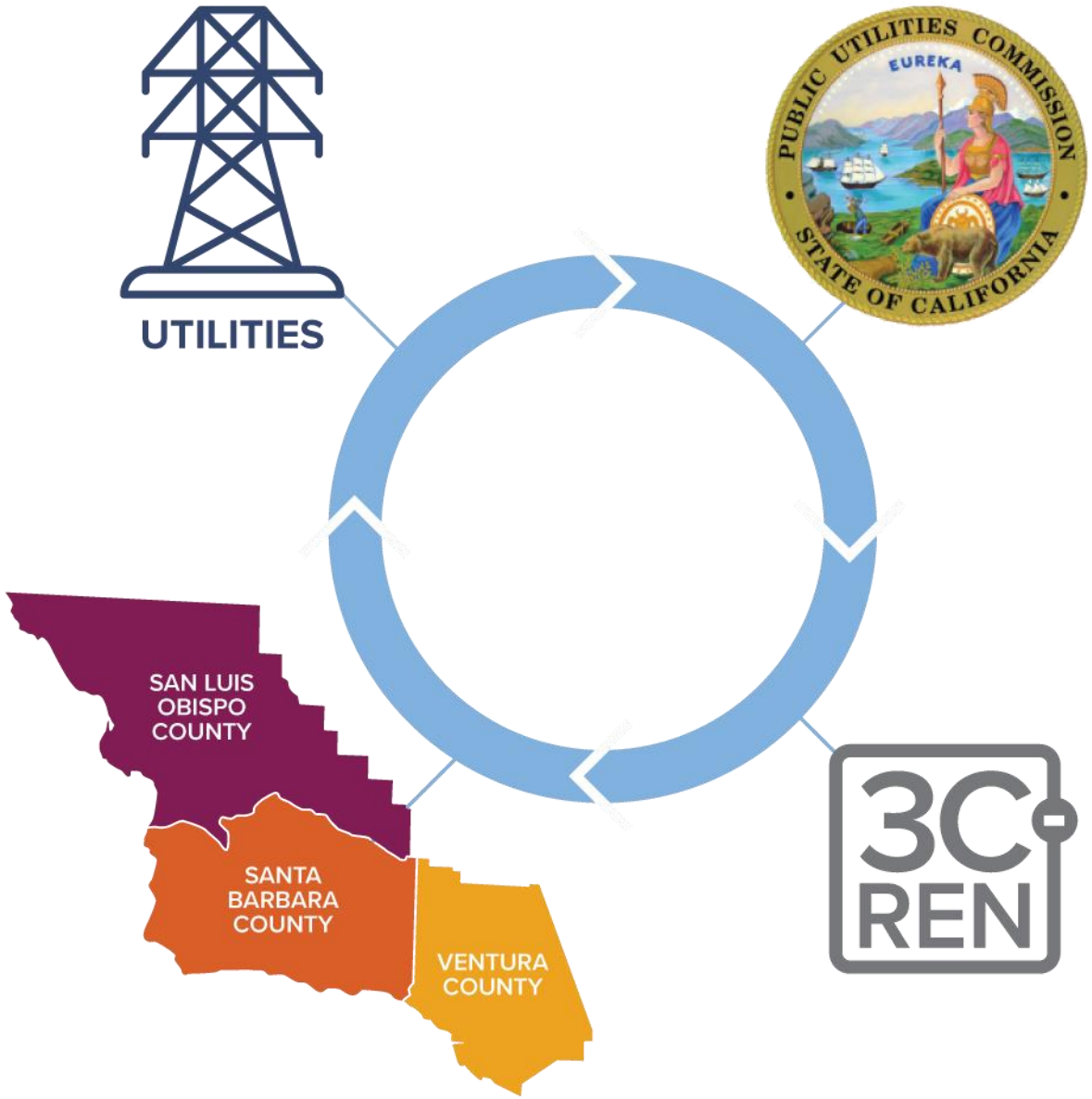
January 23, 2025

Zoom Orientation

- Add an **introduction** in the chat.
  Be sure **full name** is displayed.
- Did you call in? Please **share** first and last name with us.
- Please **mute** upon joining
- Use the "**Chat**“ to share questions or comments
- Under "**Participant**" select "**Raise Hand**" to share a question or comment verbally
- Session may be **recorded** and posted to 3C-REN's on-demand page
- Slides/recording are **shared** after most events





Tri-County Regional Energy Network

3C-REN is a collaboration between the tri-counties

Our programs reduce energy use for a more sustainable, equitable and economically vibrant Central Coast

Our free services are funded via the CPUC, bringing ratepayer dollars back to the region

Our Services

Incentives

HOME ENERGY SAVINGS

3c-ren.org/for-residents
3c-ren.org/multifamily

COMMERCIAL ENERGY SERVICES

3c-ren.org/commercial

Contractors can enroll at
3c-ren.org/contractors

Training

BUILDING PERFORMANCE TRAINING

3c-ren.org/events
3c-ren.org/building

ENERGY CODE CONNECT

3c-ren.org/code

View past trainings at
3c-ren.org/on-demand

Technical Assistance

AGRICULTURE ENERGY SOLUTIONS

3c-ren.org/agriculture

ENERGY ASSURANCE SERVICES

3c-ren.org/assurance

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3C-REN Achievements

4,000+

Individuals Attended Training

1,374

Energy-Saving Projects Completed

334

Title 24/CalGreen Questions Answered

$155M

Secured for investment in the tri-county region through 2028

Data from 2019-2022 for three programs

California Licensure & AIA Learning Units

- Beginning in 2023 Licensed Architects are required by the State of California to take five (5) hours of Continuing Education (CE) coursework in Zero Net Carbon Design (ZNCD).
- This course is designed to count towards CA's ZNCD requirement **as well as** AIA's Health, Safety, Welfare (HSW) Learning Units.
- The whole series provides **5 AIA HSW / CA ZNCD** Learning Units
- For more information see https://www.cab.ca.gov/docs/misc/ab1010_zncdce_faq.pdf

CALIFORNIA ARCHITECTS BOARD

AIA

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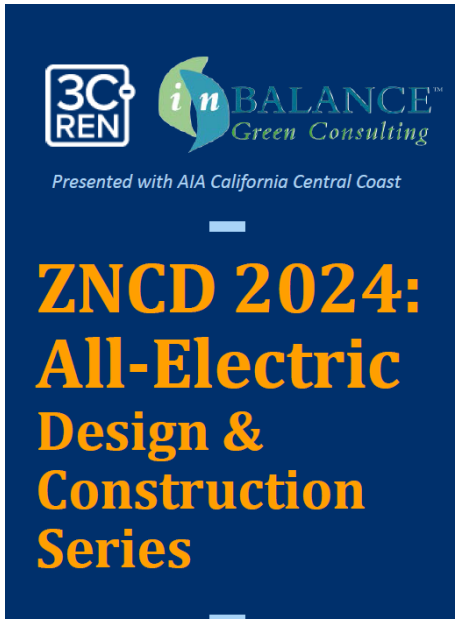
Series Outline



1. Overview: Carbon Reduction through Building Electrification
2. ZNCD for Heat Pumps for Heating and Cooling
3. ZNCD for Domestic Hot Water
4. ZNCD for Ventilation and HRV
5. ZNCD for Appliances & Energy Storage

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Today's Learning Objectives

- Learn the 'why' behind California's shift to building electrification and the link to Zero Net Carbon Design
- Learn the pros and cons of various products to help in selecting appropriate systems that meet electrification and carbon-reduction goals
- Learn critical installation details such as dimensions and venting to call out in plans and/or identify early in construction
- Understand the local market for specific all-electric/ZNCD equipment, including cost, availability and lead times.

Learning Units:

- 1.0 AIA HSW LU approved for this course

We'll send you the slides later!

Agenda

1. Context: CA Clean Energy Goals
2. Ventilation for Indoor Air Quality
3. A Closer Look at Ventilation Strategies
4. Tips for Managing Client Expectations and Meeting Title 24

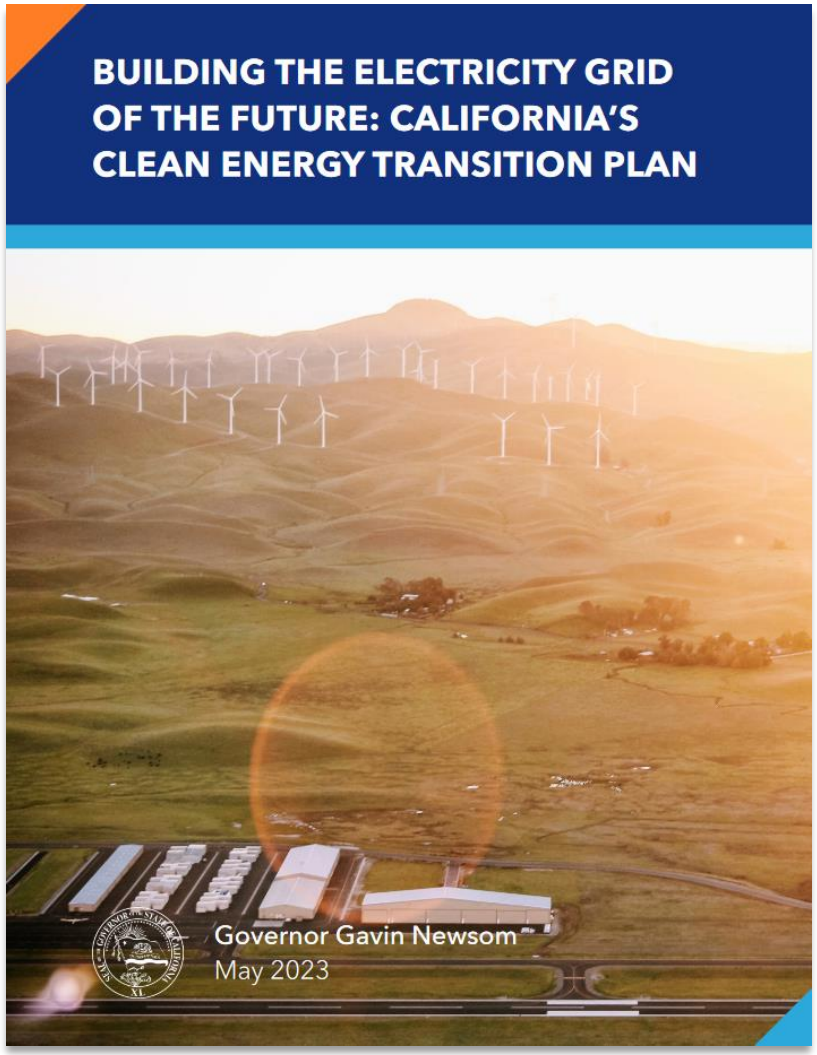
ZNCD and California's Clean Energy Goals

California Air Resources Board (CARB) - Mary D. Nichols Campus

California's Plan for Grid Stability and Expansion

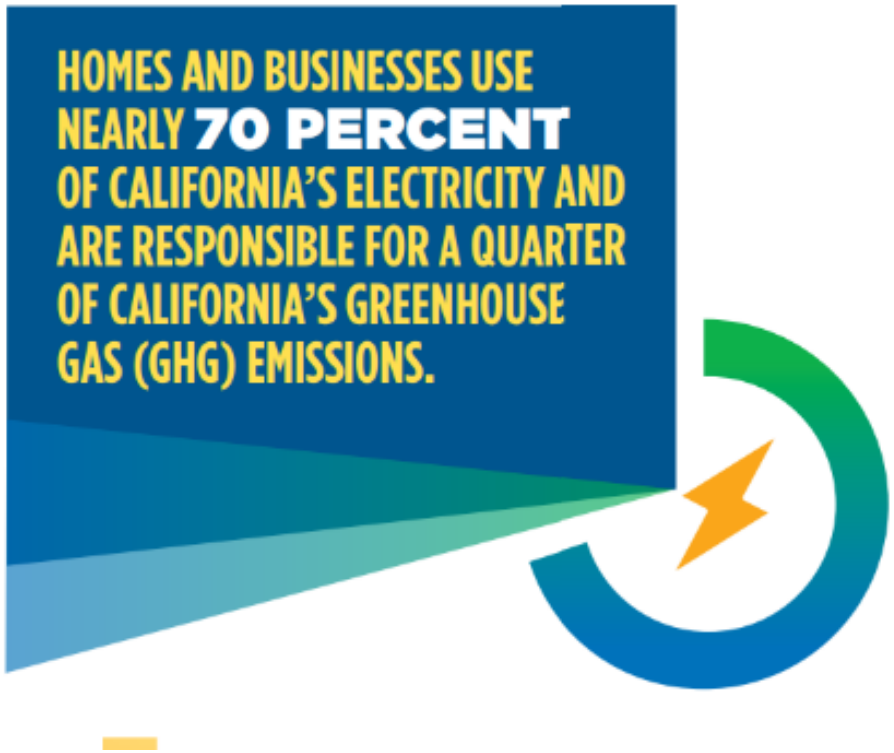
A carbon-free electric grid where:

- **Buildings** are increasingly decarbonized.
- **The Industrial Sector** is powered by clean electricity, and by clean fuels, such as green hydrogen.
- **Transportation** choices are zero-emission and able to plug into the electric grid at places of convenience for all customers



https://www.gov.ca.gov/wp-content/uploads/2023/05/CAEnergyTransitionPlan.pdf

Big Picture Goals for the 2022 Code and 2025 Updates



- Encourage heat pump technology for space and water heating
- Establish electric-ready requirements for single family homes
- Expand PV systems and battery storage standards
- Strengthen IAQ ventilation standards

Ventilation for Indoor Air Quality (IAQ)

We need fresh air!

Reasons for fresh air:

- Materials that off gas
  - Building materials
  - Cleaners
  - Finishes
  - Packaging
  - Furniture
  - Carpets
  - Clothing
- Combustion gases
- Airborne infections

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A great way to provide fresh air…

An open window!

Unless…

- You have the heater on
- Or air conditioning
- Or passive heating or cooling
- Or the outside air quality is bad

Then, you'll ~~want~~ NEED mechanical ventilation

(per the energy code)

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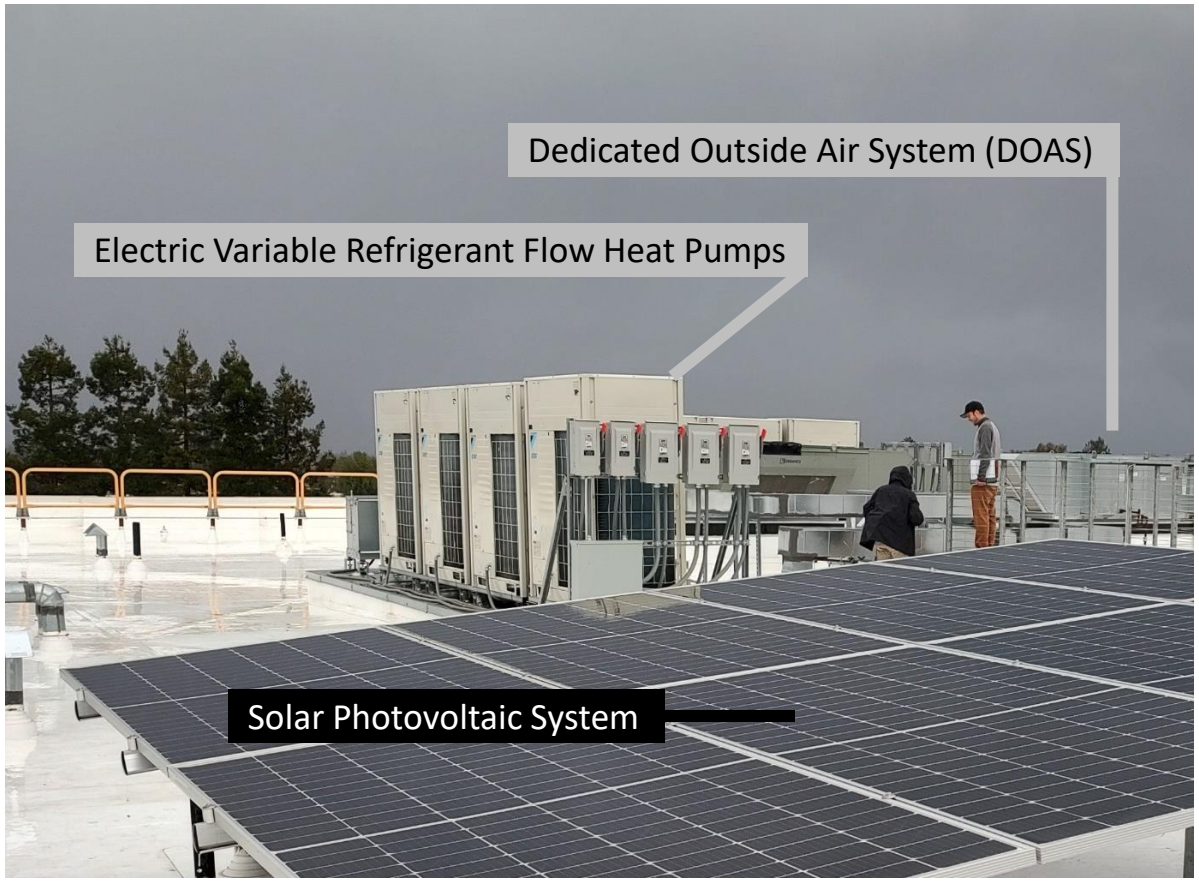
Mechanical Fan Strategies

Indoor Air Quality (IAQ) Ventilation:

- Bathroom Exhaust
- Kitchen Exhaust / Range Hood
- Dryer Exhaust (Power Vents)
- Garage / Workshop Exhaust
- Radon Mitigation (Monitoring and Power Vents)
- Whole House Fans (WHF) for Cooling
- Outside Air (OA) Ventilation
  - Pull in the outside air,
  - Push in the outside air, or
  - Do both

All-Electric (and *Nearly* All-Electric) Buildings



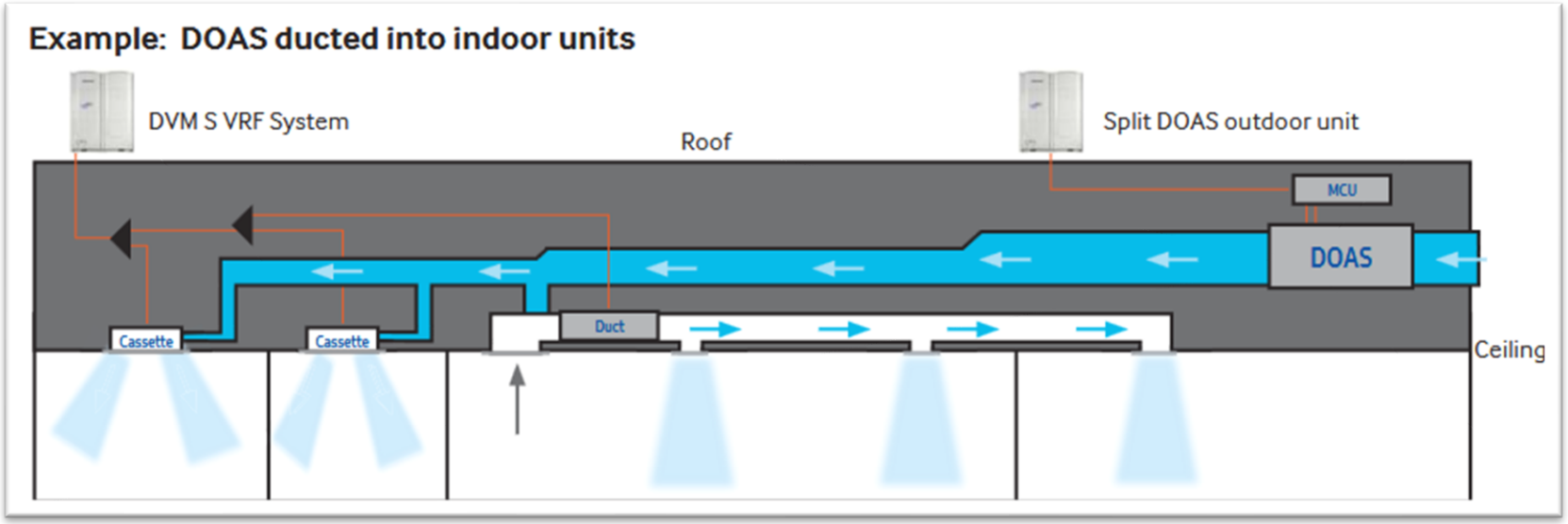
Morning Star Senior Living, San Jose, CA

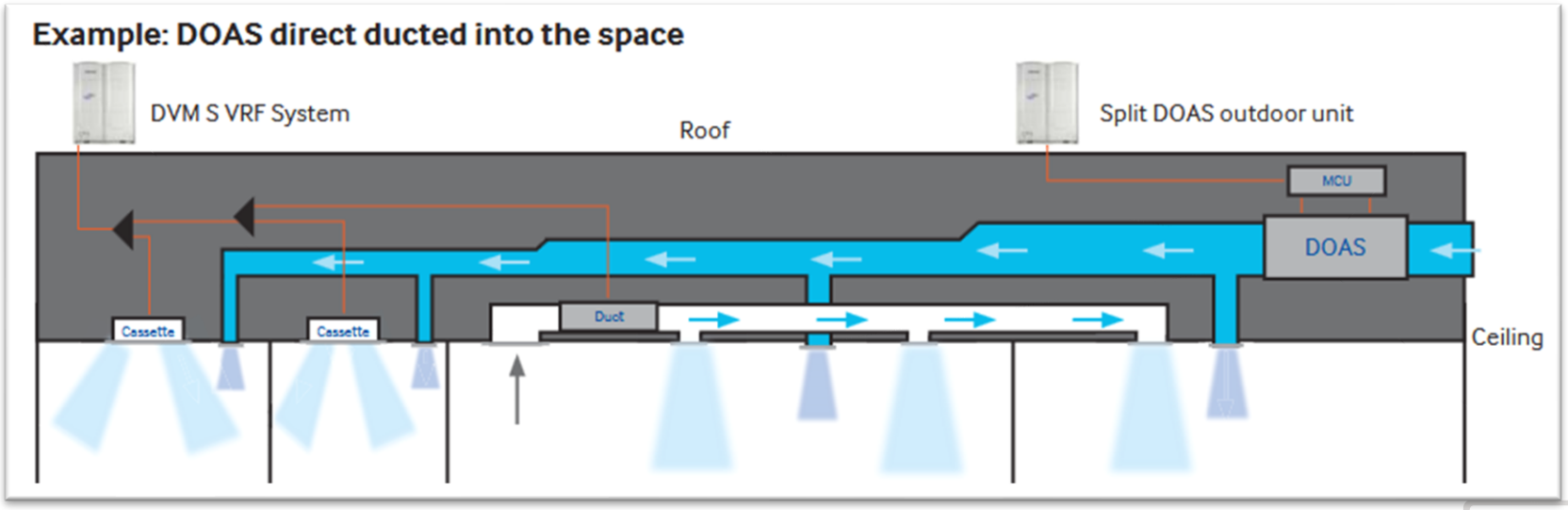
All-Electric Heating and Cooling *only* Systems, require a different approach for outside air (OA) ventilation.

Introducing Outside Air System

"Back" of the outdoor unit

Winery Laboratory and Office – multi-zone VRF with ducted fan coil units





https://www.samsunghvac.com/Fresh-Access-Ventilation-Products/FA-ERV

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Four Different "Fan" Types Common in California:

Exhaust Fan

- Local spot ventilation for kitchen and bathrooms
- Can also be used for OA

Supply Fan

- Direct OA
- MERV 13
- Combine with Exhaust fan for Balanced system

Whole House Ventilation

- Balanced
- MERV 13
- With or without H/ERV
- Spot or Fully Ducted

Whole House Fan – *for cooling*

- e.g., attic fan
- Exhausts heat

IAQ ASHRAE 62.2

Cooling

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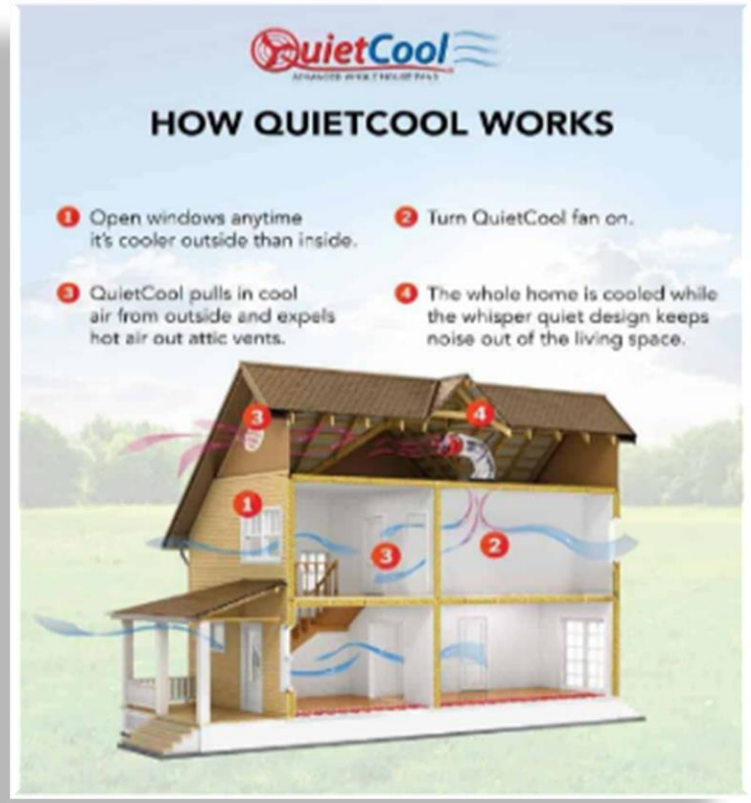
Cooling Ventilation –Whole House Fan

Ventilation Cooling with a Whole House Fan (WHF)
CZ's 8-14 Prescriptive Requirement Section 150.1(c)12

- A Performance Baseline in Ventura County (CZ9)
- System is used to Cool-Off a home when outside temperatures have dropped
- OA is introduced, but this is not considered a practical solution to meeting ASHRAE 62.2



Quiet Cool


Quiet Air

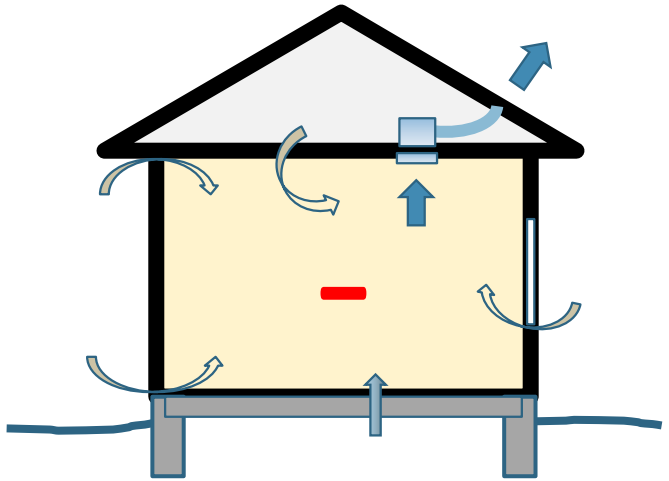

Tamarack Ventilation

Exception to 150.1(c)12: New dwelling units with a CFA of 500 sf or less, WHF *not* required

Options: Ducted Fans and Ductless Units with Insulated Dampers

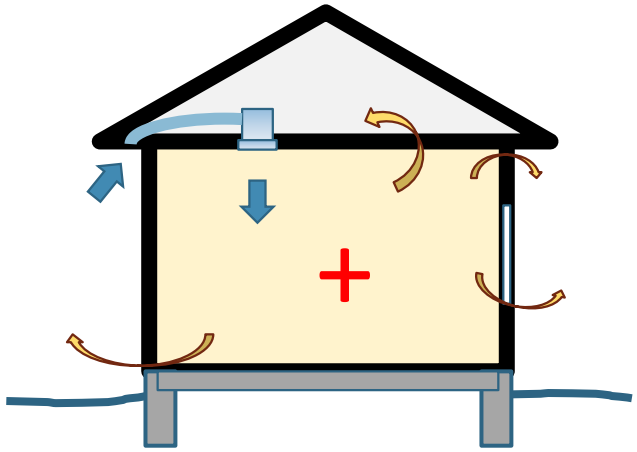
IAQ Ventilation Strategies: Exhaust or Supply Only

Code Minimum: Exhaust Only



- Meets 2022 Title 24 –Code min for single-fam and detached units
- CALGreen bath fans
- Humidistat and variable speed options

Better: Supply Only



- Supply fan meets OA ventilation
- Exhaust Kitchen and Bath fan with humidistat also required

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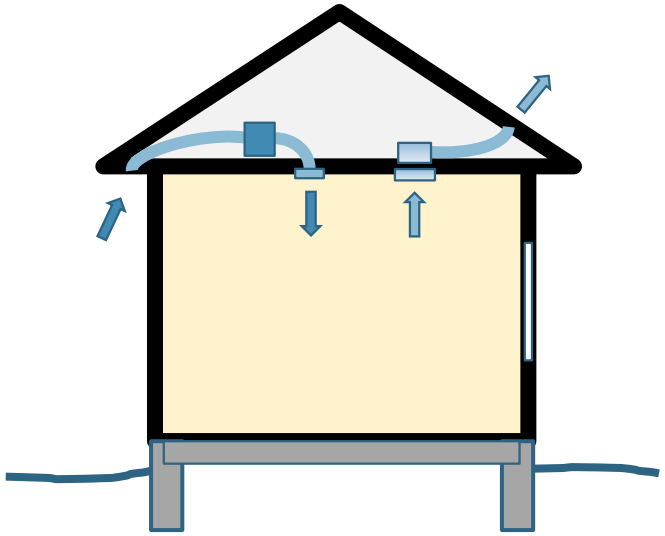
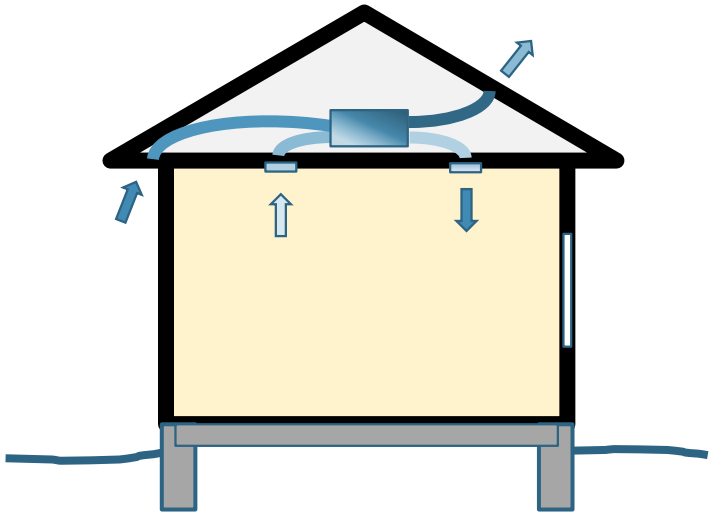
IAQ Ventilation Strategies: Balanced Ventilation

Good: Balanced Ventilation



- Better supply air control
- Works with tight envelope
- Still brings in cold air in winter and hot air in summer

Best: Balanced Ventilation with Heat/Energy Recovery



- System meets OA ventilation
- Exhaust Kitchen and Bath fan with humidistat also required –depending on system type

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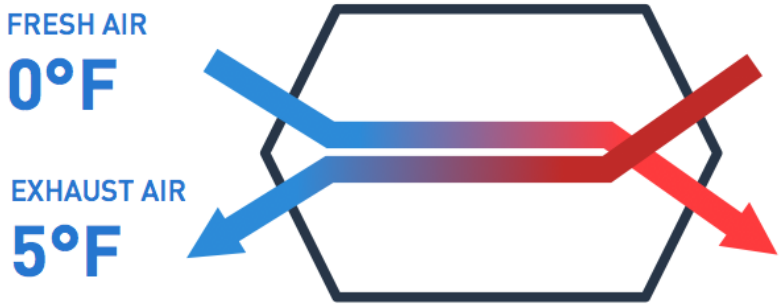
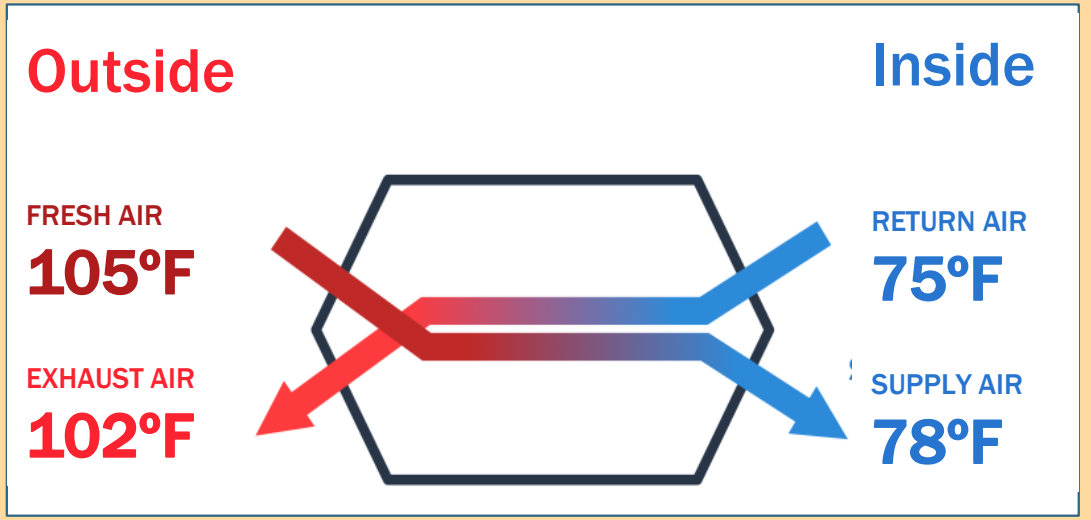
Continuous, Balanced Ventilation, with Heat and Cooling Recovery





Skylar Swinford, Hammer & Hand

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A Closer Look at Ventilation Strategies

The Current Market

Many Options… Many Brands…

Whole Dwellings or a Room; Central Ducted or Distributed; Exhaust, Supply, or Balanced?

Fantech

BROAN Fresh In

Panasonic

VENTS-US

Zehnder

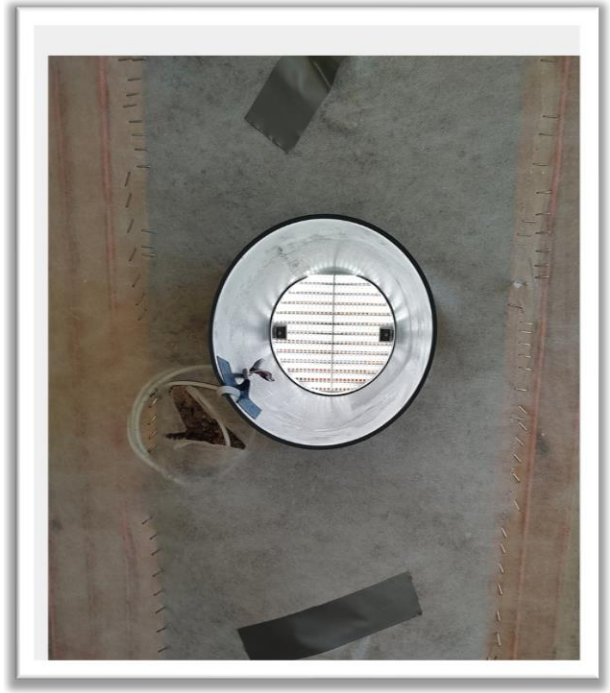
ComfoAir Q 350

TwinFresh

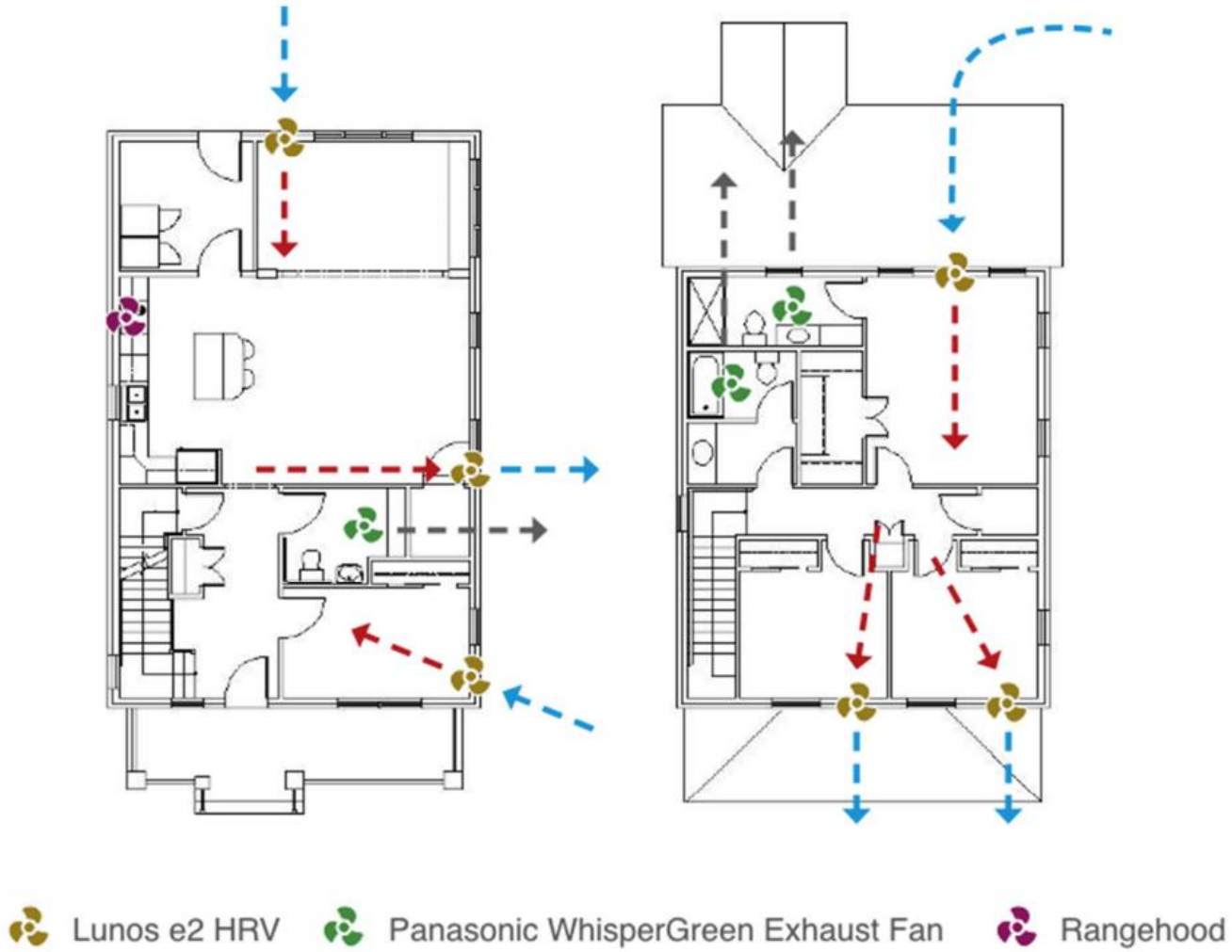
Lunos

PIONEER

Lunos – Distributed Room/Spot ERV



Spot Ventilation in practice



Credit: 475 Building Supply

Zehnder – Whole House Ducted ERV

Duct System Includes ‘Home Runs’ to the Heat Exchanger and Fan Unit

Heat Exchanger and Fan Unit

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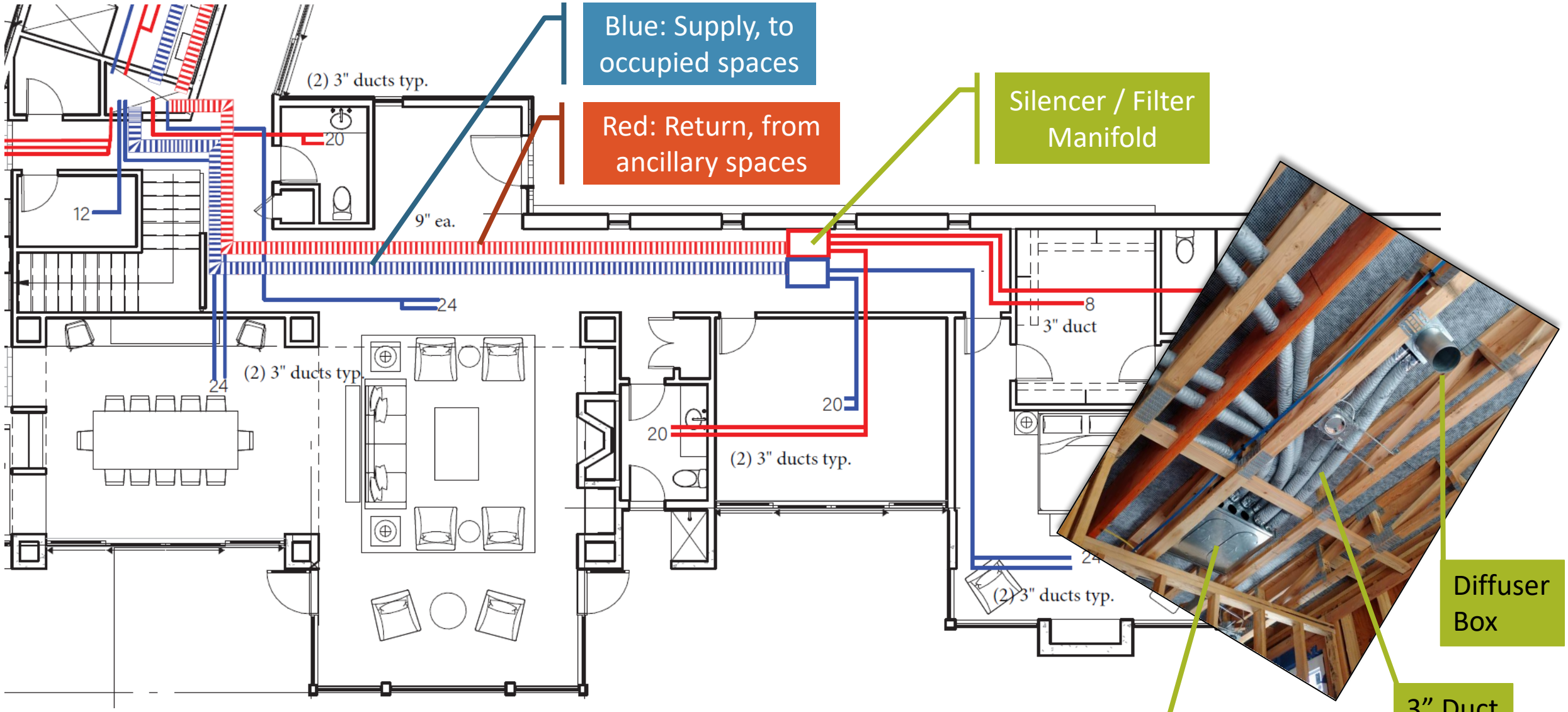

Sample lay-out for ducted ventilation

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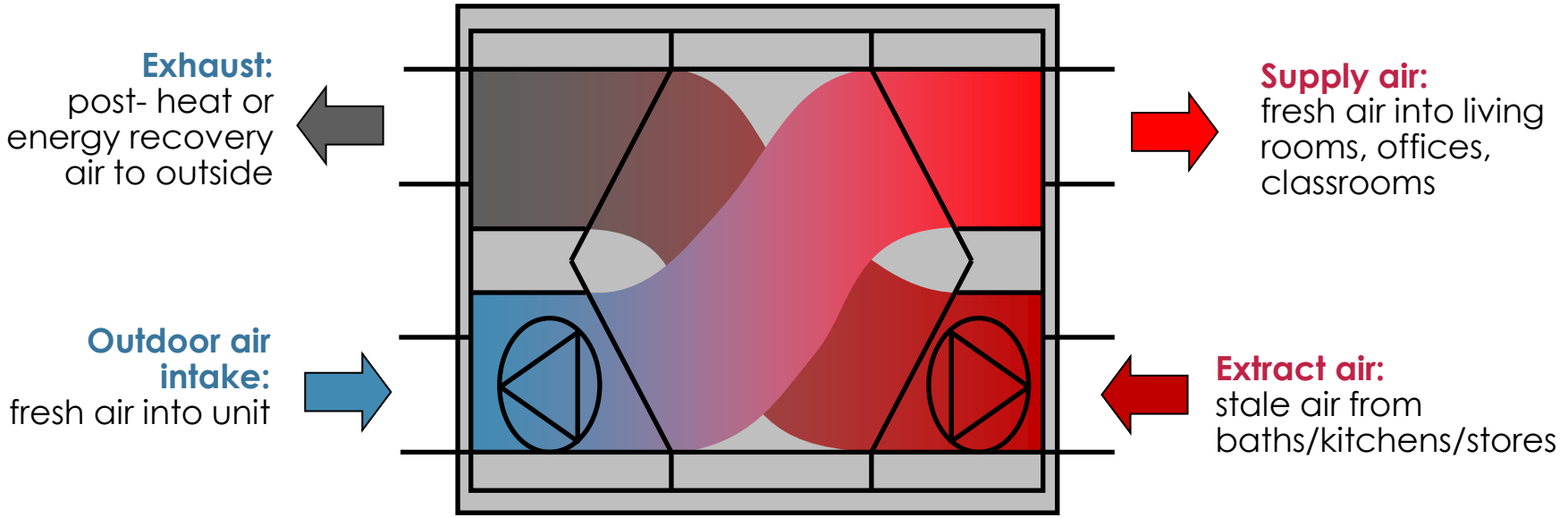
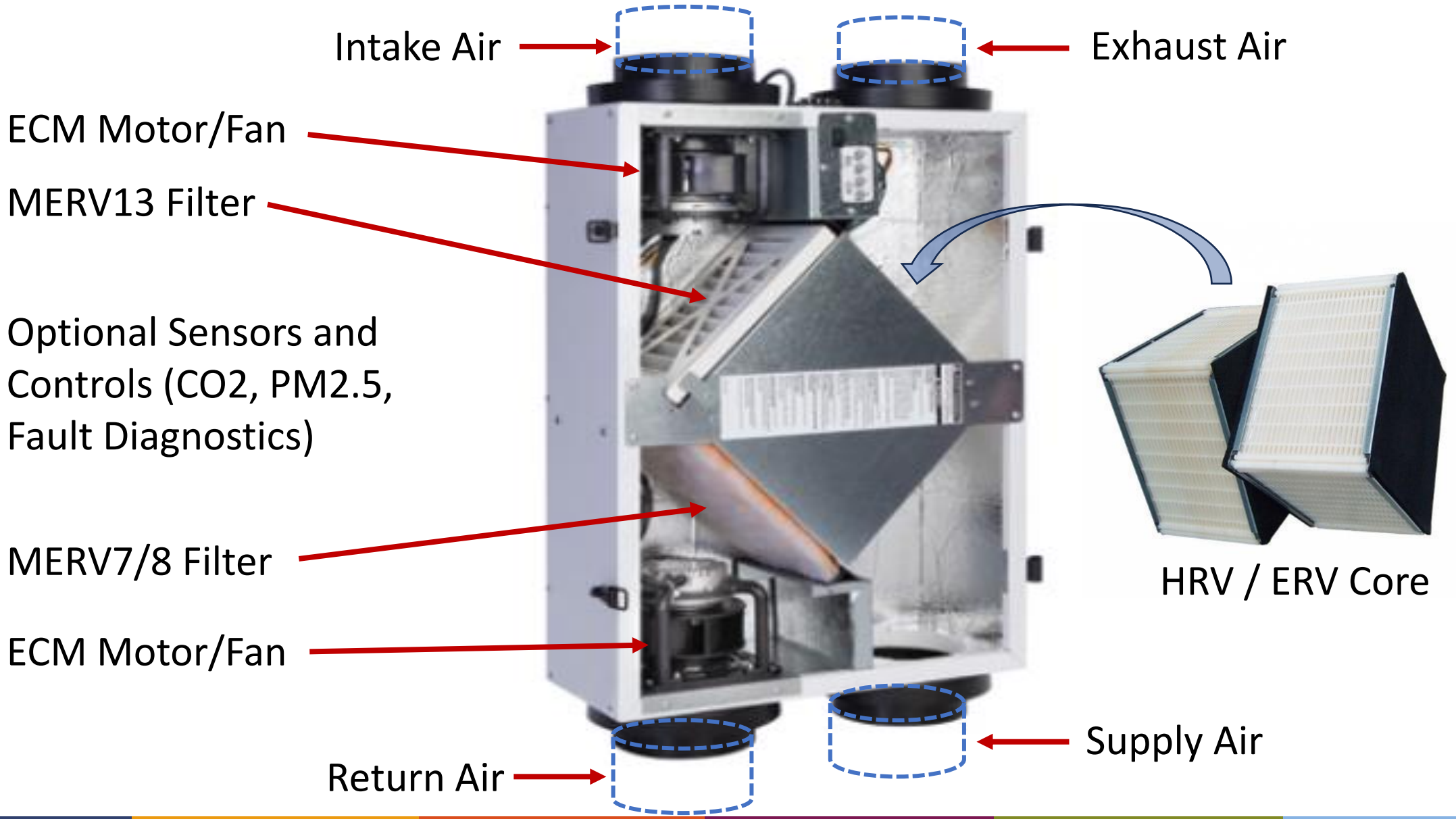
H/ERV – Heat/Energy Recovery Ventilation



Components of a Ducted ERV / HRV



Step 1: Calculate OA Ventilation Needed (Q_{tot})

$$Q_{tot} = 0.03A_{floor} + 7.5(N_{br} + 1)$$

Where:

Q_{tot} = total required ventilation rate (CFM)

A_{floor} = conditioned floor area (ft^2)

N_{br} = number of bedrooms (not less than one)

Floor Area	No. of Bedrooms	Q_{tot}: Outside Air (OA) (CFM)
166 SF	1	20
500 SF	1	30
800 SF	1	39
800 SF	2	47
1,200 SF	3	66
1,800 SF	3	84
2,400 SF	4	110

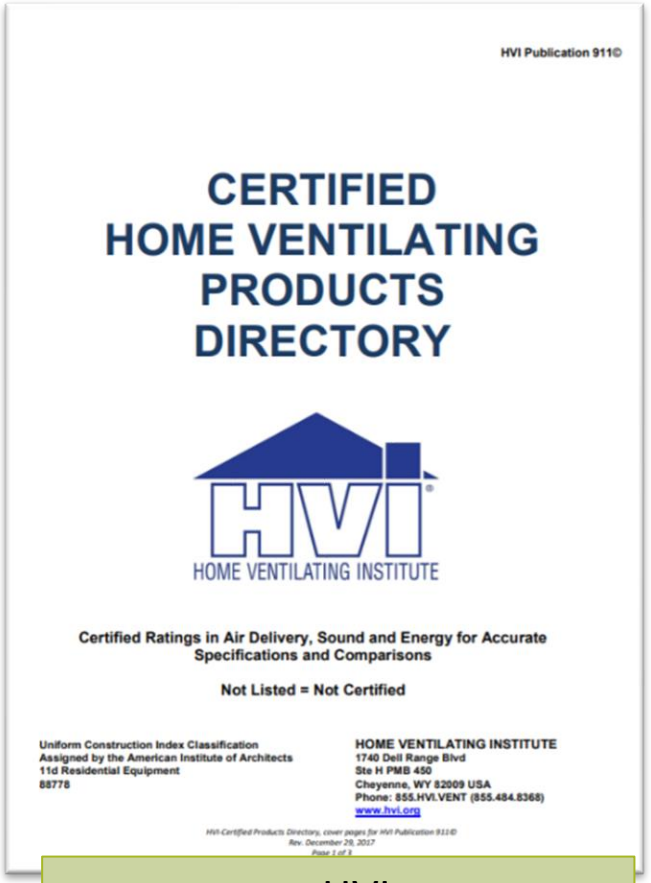
Note: HERS Rater will measure actual OA. Some systems may not perform as intended with long or complicated duct runs.

Step 2 …Keep Title 24 Verification Requirements in Mind

Verification

- CF1R, CF2R, CF3R
- Dwelling unit ventilation airflow rate
- HVI certification for kitchen range hood fans

HOME VENTILATING INSTITUTE (HVI)


HVI Publication 911©

CERTIFIED HOME VENTILATING PRODUCTS DIRECTORY

HVI HOME VENTILATING INSTITUTE

Certified Ratings in Air Delivery, Sound and Energy for Accurate Specifications and Comparisons

Not Listed = Not Certified

Uniform Construction Index Classification
Assigned by the American Institute of Architects
11d Residential Equipment
88778

HOME VENTILATING INSTITUTE
1740 Dell Range Blvd
Ste H PMB 450
Cheyenne, WY 82009 USA
Phone: 855.HVI.VENT (855.484.8368)
www.hvi.org

HVI Certified Products Directory, cover pages for HVI Publication 911©
Rev. December 28, 2017
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www.HVI.org

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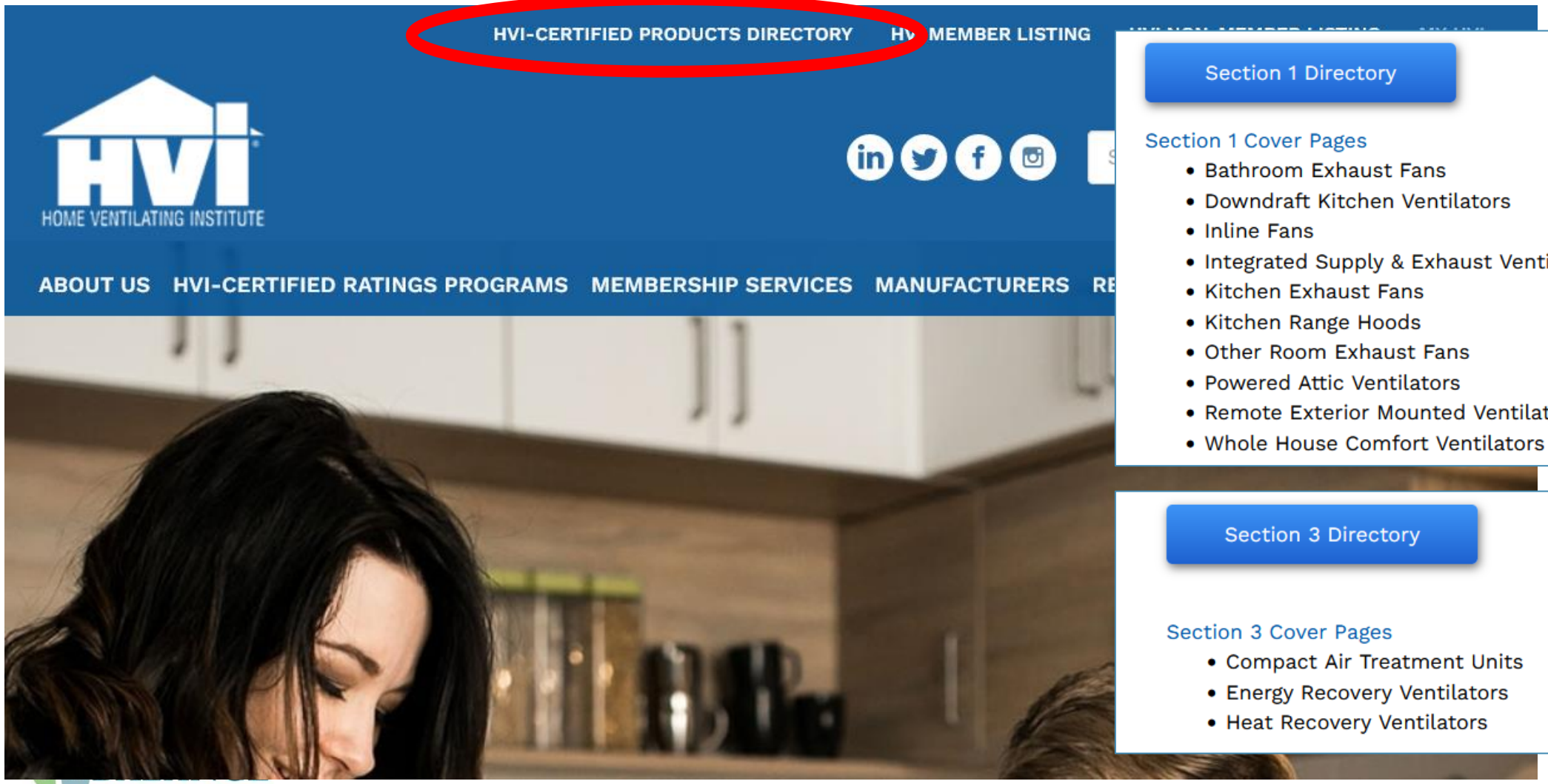
Heat/Energy Recovery Ventilators Directory

HVI.org Home Page:



Section 1 Directory

Section 1 Cover Pages

- Bathroom Exhaust Fans
- Downdraft Kitchen Ventilators
- Inline Fans
- Integrated Supply & Exhaust Ventilators
- Kitchen Exhaust Fans
- Kitchen Range Hoods
- Other Room Exhaust Fans
- Powered Attic Ventilators
- Remote Exterior Mounted Ventilators
- Whole House Comfort Ventilators

Section 3 Directory

Section 3 Cover Pages

- Compact Air Treatment Units
- Energy Recovery Ventilators
- Heat Recovery Ventilators

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Section 3: HRV and ERV –HVI Certified Brands

Airia Brands Inc
- Lifebreath
- Airflow

ALDES Canada
Alnor Systemy
AprilAire
Auroris Inc.
Broan-NuTone LLC
Canac-Marquis Grenier
- NEKTRA

Carrier Corporation
Daikin Comfort Technologies North America Inc
- Clean Comfort

Delta Electronics Inc
Goodman Manufacturing L.P.
- Clean Comfort

Greenheck Fan Corporation
Industrie Orkan Inc.
- Epurair

Industries Dettson Inc.
Innovair Solutions Inc.
Johnson Controls Inc.
Lennox International
- Healthy Climate

MINOTAIR Ventilation Inc.
Nu-Air Ventilation Systems Inc.
Ortech Industies Inc.
Ouellet Canada Inc.
- Global Commander
- Ouellet

Oxygen8 Solutions Inc.
Panasonic Eco Systems North America
Powrmatic of Canada Ltd.
- Direct Air

RenewAire LLC
Resideo Technologies Inc.
- Honeywell

Reversomatic Manufacturing Ltd.
- Reversomatic
- Softaire

RHT Industries Limited
S&P USA Ventilation Systems LLC
Swegon North America Inc.
Systemair Inc.
- Fantech
- Greentek

Trane US Inc.
- Envirowise

Venmar Ventilation ULC
- VenEE
- Venmar

Vents-US
Zehnder America

- 41 Brands Listed
- 40 Brands are H / ERV
- 1 Brand (Minotair) is a CATU -Compact Air Treatment Unit, i.e. includes HP air heating, dehumification, etc.

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Ventilation with Exhaust or Supply

Ceiling Mount (Bath Exhaust) with Simple Duct Runs

Panasonic

Exhaust Only… Can be very simple

- Typical Sizes: 20-110 cfm
- ECM Motors; Variable Speed Options
- Easy Installation
- No Filter
- No Energy Recovery
- Residential
- Can be Least Expensive (<$100-$300)

Supply System, In-line Fan, with Simple Duct Runs

Broan FIN-180B

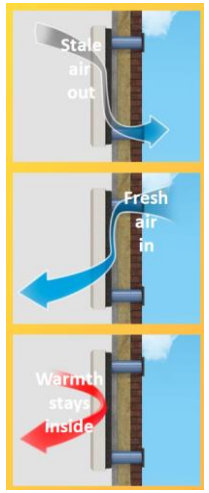
BROAN Fresh In™

- Adjustable: 30-180 cfm
- ECM Motor; Variable Speed In-Line Fan
- Flexible Installation
- MERV13 Filter Option
- No Energy Recovery
- Residential
- Affordable (approx. $240-$360))

Ventilation with HRV/ERV –Spot or Distributed Ventilation

Wall Mount

Pioneer



Fresh-r

- Single Room or Small Homes: 20-50 cfm
- Filters are easily accessible
- MERV13 and HEPA Filter Options
- Wall mount type can be surface mounted or recessed
- Cost Effective for small spaces ($600 approx.)

Through the Wall

TwinFresh

Lunos

- Single Room or Small Homes: 20-30 cfm
- Often work in Pairs
- Reversible Flow, i.e. pulls air in and then pushes air out
- High Efficacy
- Look for MERV13 Filter Options
- ERV Ceramic Honeycomb Core
- Cost Effective for small spaces ($600 approx. ea.)

Ducted Ceiling

Panasonic ERV

- Small Homes: 20-50 cfm
- Filters are easily accessible
- MERV13 Filter
- Cost Effective for small homes ($600 approx.)

Note: These products are *not* HVI Listed

Ventilation with HRV/ERV –Ducted Whole House

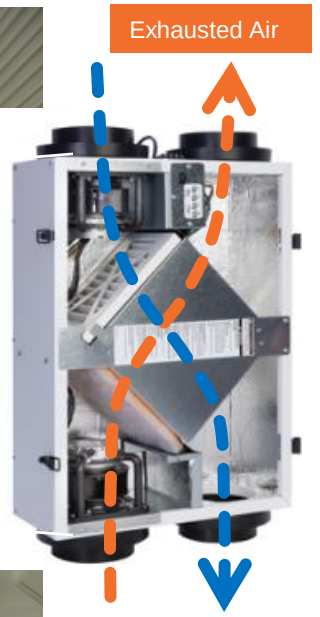
Remote Location with Extensive Duct Runs

Zehnder

ComfoAir Q 350

- Large or Small Homes: 30-230 cfm
- ECM Motors; Variable Speed
- Advanced Controls
- High Efficacy
- MERV13 / HEPA Filter Options
- ERV Core
- Custom Residential
- High End

Accessible Location with Simple Duct Runs



RenewAire SL75H

- Slim Lines: 30-150 cfm
- ECM Motors; Variable Speed
- Easy Balancing
- MERV13 Filter Option
- ERV Core
- SF/Multifamily and Light Commercial
- Affordable (approx. $800-$1700)

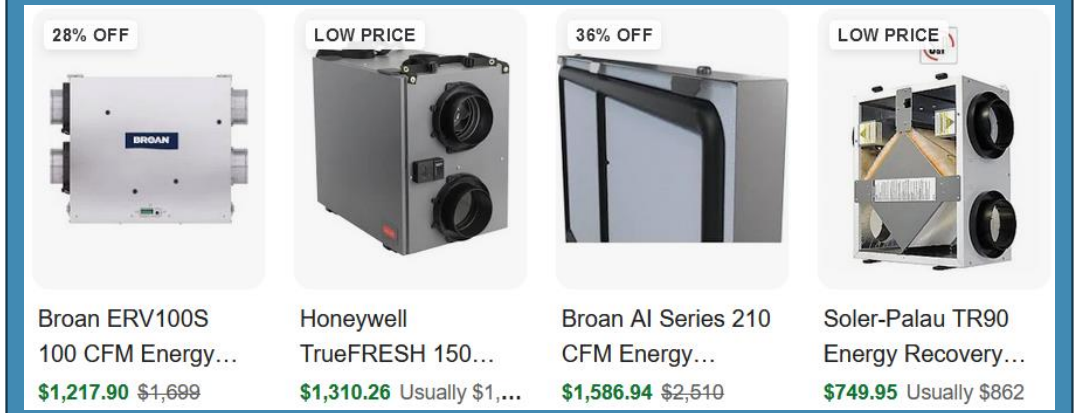
Items and Features that Impact Purchase Price

- **Exhaust vs Supply vs Balanced vs HRV vs ERV**

  $ ⟶ $$$+

- **Promotional Pricing:** Older or discontinued models
- **Capacity (CFM):** more air volume, higher cost
- **Efficiency**: Higher efficiency can cost more
- **Controls**: Default Diagnostics; CFM flow monitoring; WiFi Smart enabled; Timers / Occupant / CO2 / PM10 or PM2.5 Sensors
- **Lower Temp Limits:** Some HRV/ERV units have freeze controls: shut off, recirculate warm air; line heaters; humidity sensors; some operate to -14 F.
- **Warranty:** Varies – mid range is 5 yrs Core and Parts; higher end units have 10 yr Core or Limited Lifetime Core

Promotional Pricing
Older vs Newer Models



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Additional Items for a Complete Job

Better Quality Install and Site/Design Specific Items

- **Ducting:** Flex or Rigid; Diameter & Run Length; Elbows vs Curve; Restricted/Crushed Duct; Termination Fittings –affects sound and static pressure
- **Exhaust Termination –**Wall, Soffit, or Roof – Aesthetic choices or relative location to air intake
- **Supply/Intake** –Wall or Soffit; Wind Impacts; Locate away from pollutants; Insect and Small Debris Filter/Screen recommended
- **Electrical Work –**120V or Low-Voltage (12V) depending on type of ventilation system
- **Access to Unit**: Supply Only or Balanced Systems and H/ERV systems need routine maintenance.

PANASONIC

EZSoffitVent™ 110 CFM

- Designed for ventilation fans up to 110 CFM, using 4" ductwork

Soffit Termination: Can be used with exhaust and/or intake

HVI 2100 CERTIFIED

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Care and Maintenance

Regular maintenance is required for Supply and H/ERV Systems

MERV 13 Filter –Supply Air side for code compliance; typically disposable; some brands recommend changing monthly, others recommend only needed 4 times per year.

MERV7/8 Filter –Return/Exhaust Air filters help keep the H/ERV Core clean. Some are disposable; some brands are washable and/or can be vacuumed.

Filters Cost: $26 - $53 brand depending; Unit flow/volume impacts cost; Bulk purchasing typically saves money.

HRV Core typically can be washed;

ERV Core typically can only be vacuumed.

Supply side / Air Intake at Exterior of Home –Some manufactures sell Air Intake fittings with replaceable filters or washable screens. These can be cleaned as needed –monthly or less frequent.

Note: Often the Supply side / Air Intake at Exterior of Home does *not have a filter*:

- Consider screening for bugs and other small debris before the supply air hits the MERV7/8 filter inside the Unit.
- Consider termination intake grills that allow for the homeowner to easily clean or replace the filter without the need for tools and grill removal. Consider an easily accessible intake grill location.

Zehnder promotes that it has the only ERV Core that can be washed.

Exhaust-Only Bathroom Fan – Panasonic Example $

- **Cost Range**: $90 - $300+ depending on Features and model generation –i.e. improved efficiency, WiFI Smart Controls, styling, etc.
- “WhisperValue DC Pick-a-Flow” starts at $128
- **Availability**: Home Depot, Lowe’s, Ferguson’s, online and supply houses
- **HVI Certified**: Yes
- **EnergyStar**: Yes
- **CalGreen / ASHRAE 62.2**: Yes, when paired with humidistat; meets Sone Rating requirements
- **Features**: Enclosed brushless ECM motor technology rated for *continuous* run; SmartFlow optimized CFM output; LED Light; Motion Sensor; WiFi Control module for shut-down during *poor outdoor air quality.*
- **Warranty**: 3 yr Parts; 6 yr ECM motor

FV-0511VK / -1115VK WhisperGreen

Home Depot and Lowe’s:
WhisperGreen Select Pick a Flow

Newest models include Pick-a Flow with Time Delay (approx. $60 add.)

Controller allows installer to choose continuous operation or intermittent operation on an hourly basis to meet ASHRAE 62.2 requirement.

“Spot” Energy Recovery – Ducted 2-Port Panasonic ERV $$

- **Cost Range**: $600 - $800; ducts and termination, etc. not included
- **Availability**: Home Depot, Lowe’s, Ferguson’s, online and supply houses
- **HVI Certified**: Yes
- **EnergyStar**: Yes
- **CalGreen / ASHRAE 62.2**: Yes, when installed with Sone Rating 1 or less
- **Features**: MERV 13 Standard; Independent Exhaust and Supply Fan Controls, Multi-speed 20-50 cfm; Occupant Boost to 60 cfm
- **Warranty**: 5 yr Parts; 10 yr ERV Core; Limited Lifetime HRV Core

Take Away: might be appropriate for small dwelling units w/ very low static duct pressure design; potential for T24 Performance ERV credit

FV-06VE1 (Replaced the FV-04VE1)
WhisperComfort 60

Performance Specifications : WhisperComfort® 60 FV-06VE1

Mode	Supply Temperature		Net Air Flow		Power Consumption (w)	Sensible Recovery Efficiency	Adjusted Sensible Recovery Efficiency	Net Moisture Transfer
	°F	°C	L/s	CFM				
Heating	32	0	9	20	9	70%	73%	0.7
	32	0	28	60	39	60%	63%	0.5
Cooling	95	35	13	27	12	Total Recovery Efficiency		
						60%		

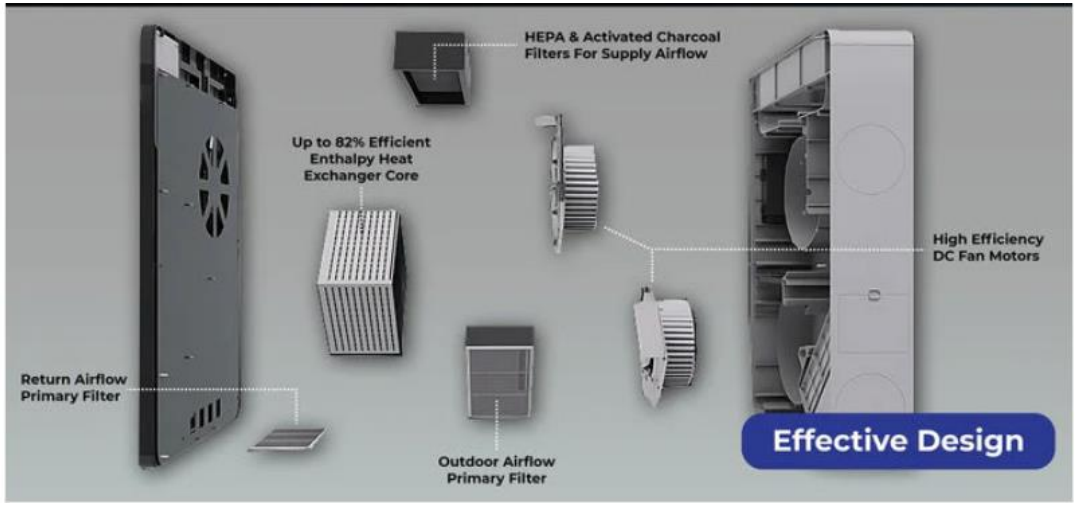
Sound Specifications: WhisperComfort® 60 FV-06VE1

	Static Pressure "W.G	Exhaust(CFM)	Supply(CFM)	Sones
4" Duct	0.1"	40	40	0.9
	0.25"	30	30	1.2
	0.1"	50	50	1.5
	0.25"	43	42	2.0
	0.1"	60	60	2.5
	0.25"	54	52	2.5

“Spot” Wall Mount ERV – Pioneer Example $$

- **Cost Range**: $685 - $1050
- **Availability**: on-line and manufacture direct
- **Requires Professional Installation**: Yes, or Advanced DIY
- **Electrical:** 120V, 60Hz, Grounded
- **Sound Level:** 23 - 37.9 dB(A) (Lowest fan setting is <1 sone)
- **Capacity / Fan Flow**: 8 Speeds up to 100 cfm
- **Special Features**: HEPA Filter, PM2.5 Sensor, CO2 Sensor, Temp and Humidity Sensors; WiFi Smart Control
- **Warranty**: 5 year

Note: This product is *not* HVI Listed



Technical Specifications

Model Number	ERV150AHRPM25L		
Airflow (CFM)	88		
Voltage (V)	110/120	IP Class	IPX2
Filtration Capacity (%)	99	Frequency (Hz)	60
Temp. Efficiency (%)	82	Noise dB(A)	36
Weight (Lb)	22	Input Power (W)	35
Serial Number	Located on the ventilator body	Dimensions WDH (in.)	17"-3/4 x 6"-1/8 x 26"

36 dbA =1.7 Sones

HRV / ERV Ducted – Comparison Cost Example w/ Broan AI $$$

- **Cost Range**: typically under $1200 for this capacity
- **Availability**: Ferguson's, on-line supply houses
- **Requires Professional Installation**: Yes
- **HVI Certified**: Yes, but order MERV13 Option for Title 24
- **Capacity / Fan Flow**: 35 – 150cfm *vs* 35 – 160cfm
- **SRE @ 32degF**: 75%, 36W *vs* 68%, 33W at 64 cfm
- **Features**: Advanced Controllers and Fault Diagnostic Display (FID) –meets T24 for some additional compliance credit
- **Warranty**: 5 yr Parts; 10 yr ERV Core; Limited Lifetime HRV Core

Broan AI Series™ 150 cfm Heat Recovery Ventilator

Part #BB150H75NS
Item #9292189
Mfr. Part #B150H75NS

★★★★☆ (2)

$1,177.00 EACH

Supply Temperature		Net Airflow		Power Consumed Watts	Sensible Recovery Efficiency	Adjusted Sensible Recovery Efficiency	Apparent Sensible Effectiveness*
°C	°F	l/s	cfm				
Heating							
0	32	30	64	36	75	78	80
0	32	62	131	100	66	71	72
-25	-13	30	64	39	60	61	81

Higher Efficacy typically Costs More

BROAN

160 cfm Heat Recovery Ventilation (HRV) 19-1/8 in.

Part #BB160H65RS | Item #9292217 | Manufacturer Part #B160H65RS

☆☆☆☆☆ (0) Write a Review

$960.63 EACH

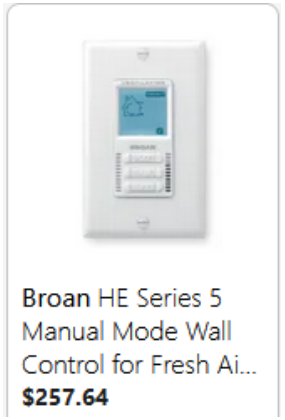
CFM: 160 ft3/min

Supply Temperature		Net Airflow		Power Consumed Watts	Sensible Recovery Efficiency	Adjusted Sensible Recovery Efficiency	Apparent Sensible Effectiveness*
°C	°F	l/s	cfm				
Heating							
0	32	30	64	33	68	71	72
0	32	43	90	47	63	66	68
0	32	52	110	69	58	62	64
0	32	62	131	94	55	61	63
-25	-13	30	64	33	60	62	72

HRV / ERV Ducted –Broan HE Example $$$+
– Larger Homes; Colder Climates

- **Cost Range**: HRV $1800 & ERV $2800 typ.
- **Availability**: : Ferguson's, on-line supply houses
- **Requires Professional Installation**: Yes
- **HVI Certified**: Yes, but order HEPA Filter Option for Title 24
- **Capacity / Fan Flow**: 50 – 227cfm
- **SRE @ 32degF**: 81%, 19W at 64 cfm
- **Special Features**: HEPA Filter Option; Extended Defrost for Cold Climates (-14F)
- **Warranty**: 5 yr Parts; 10 yr ERV Core; Limited Lifetime HRV Core

BROAN® HRV200 ECM
Part no. HRV200TE
50 to 227 CFM (0.4 in. w.g.)



ENERGY PERFORMANCE

Supply Temperature		Net Air Flow			Power Consumed Watts	Sensible recovery efficiency	Adjusted Sensible Recovery Efficiency	Apparent Sensible Effectiveness*	Latent Recovery/ Moisture Transfer
°C	°F	L/s	CFM	m^3/h					
Heating									
0	32	30	64	109	19	81	82	84	0
0	32	47	100	170	28	75	77	79	0
0	32	66	140	238	48	70	72	75	0
-25	-13	30	64	109	32	70	71	87	0

Prices can vary greatly between re-sellers…

Color: **N/A**

Broan 226 CFM Heat Recovery Ventilator with Top Ports

Model: **HRV200TE**

$3,400.76

226 CFM HE Series High Efficiency Heat Recovery V...

SKU: **HRV200TE**

SHR Series Heat Recovery Ventilator w/ Recirculation...

SKU: **SHR260RD**

HERO 250H Heat Recovery Ventilator w/ Electronicall...

SKU: **HERO250H-EC**

(1)

Broan	Fantech	Fantech
120v	120v	120v
2.2	2.5	6.4
6"	8"	6"
5 Year Parts/Limited Lifetime o...	5 Year (Parts) 7 Year (Motor) Limited Lifetime (Aluminum Core)	5 Year (Parts) 7 Year (Motor) Limited Lifetime (Aluminum Core)
− + **$1,849.33** each	− + **$1,623.66** each	− + **$1,826.16** each

Note: Pricing above is for HRVs, Expect to add $600 to $1000 for ERV pricing for this capacity / fan flow range.

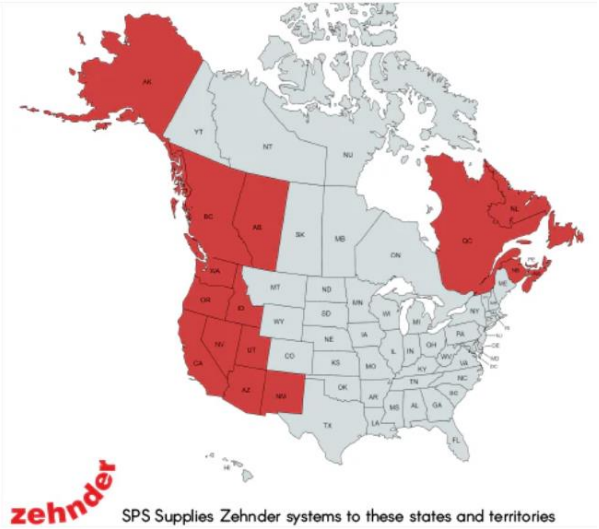
HRV / ERV Ducted System – Zehnder Example $$$$

- **Cost**: $4400 approx. for ERV unit only. Full pricing will include all components for a complete install, support and commissioning.
- **Availability**: Builder / Small Planet Supply
- **Requires Professional Installation**: Yes
- **HVI Certified**: Yes, but order F7 (MERV13) Filter Option for Title 24
- **Capacity / Fan Flow**: 23.5 – 206cfm
- **SRE @ 32degF**: 83%, 28W at 95 cfm
- **Special Features**: Advanced Controls (“Away” mode; Fault Display; Temp monitoring, Seasonal detection, etc.); Washable ERV Core
- **Electrical:** 240V
- **Warranty**: 2 years

ComfoAir Q 350

Model	Temp Mode ↓	C	F	Net Outdoor Airflow (L/s) ↑	Net Outdoor Airflow (cfm) (cfm)	Power Consumed (Watts)	Rated Efficacy (L/s/W)	Rated Efficacy (cfm/W)	SRE	ASRE
CAQ350 ERV	HEATING	0	32	45.0	95	28	1.60	3.3	83.0	85
CAQ350 ERV	HEATING	0	32	65.0	138	47	1.38	2.9	80.0	82
CAQ350 ERV	HEATING	0	32	87.0	184	90	0.96	2.0	76.0	79
CAQ350 ERV	COOLING	35	95	46.0	97	30	1.53	3.2		
CAQ350 ERV	COOLING	35	95	65.0	138	56	1.16	2.4		

Zehnder Distributor



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PLAN IT WITH THE PLANET IN MIND

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Zehnder HRV and ERV Systems

Call For Pricing

Zehnder Home Ventilation & Heat Recovery Units

Zehnder Systems' Heat Recovery Ventilators (HRVs) and Enthalpy Recovery Ventilators (ERVs) bring fresh air into your home 24 hours a day while keeping your energy and cooling costs low. Zehdner systems are the most efficient residential HRV and ERV systems in the market. The Zehnder page of our small planet supply website describes more about Zehnder systems and why they are a wise investment for any home and the people who live in them.

Ordering Zehnder Units and System Components from Small Planet Supply

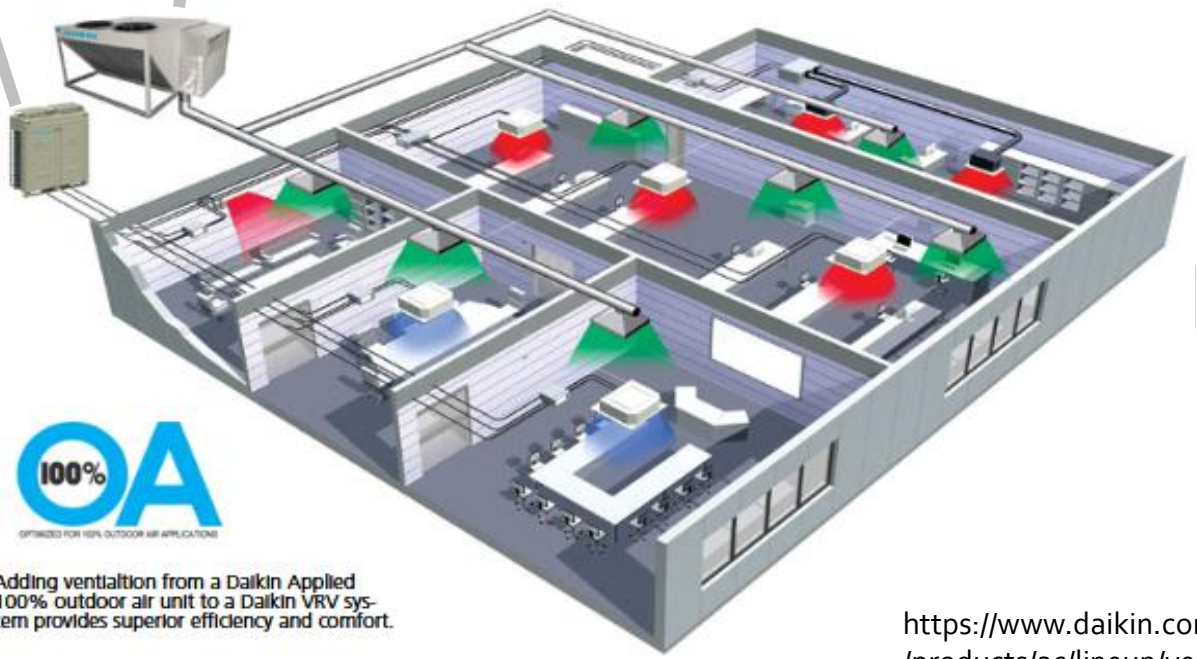
Small Planet Supply is the exclusive dealer for Zehnder heat recovery and enthalpy recovery ventilators in much of the Western USA (WA, OR, CA, AZ, ID, MT, NM, AK, & UT), Western Canada (BC & AB) and the Canadian Maritimes (NB, NS, PEI, NFLD, MB, QC). If you

Dedicated Outside Air System –Non-Residential

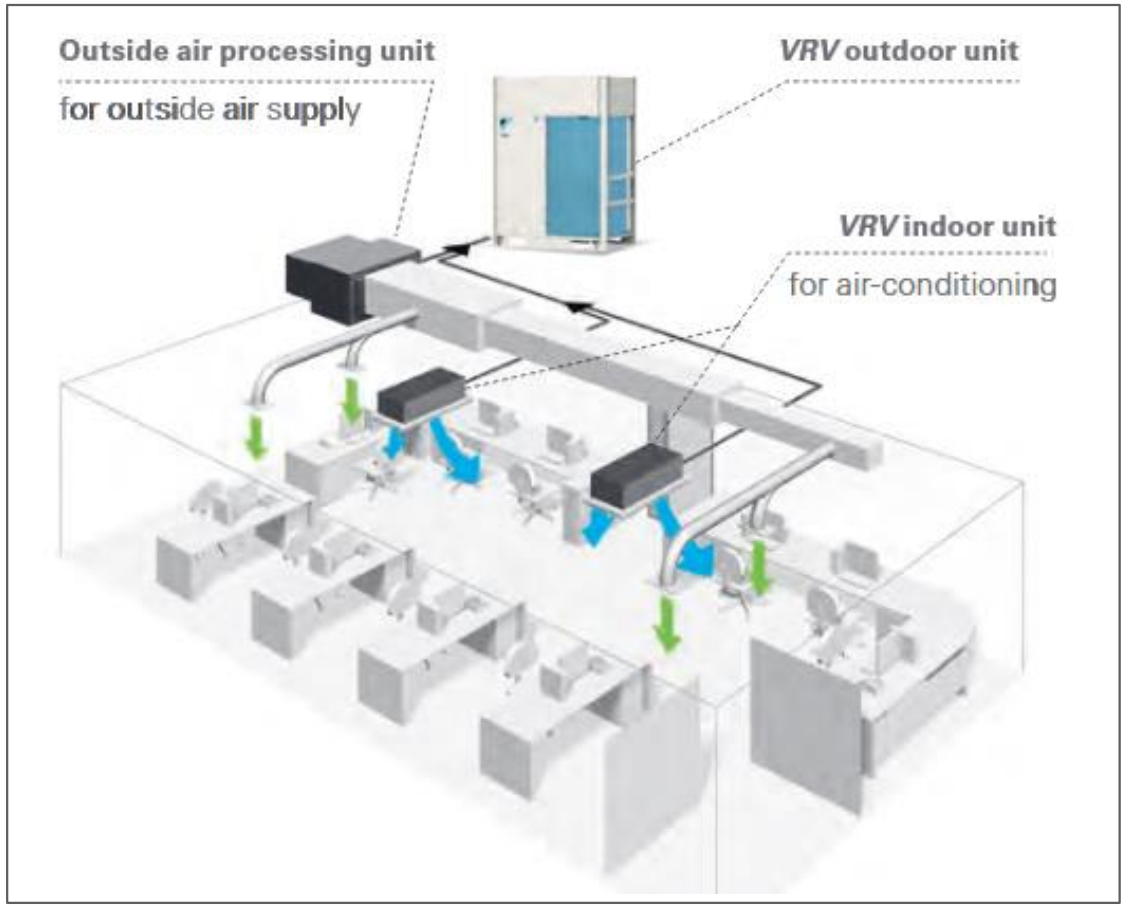
Multifamily / Commercial / Schools / Office –Ducted VRV/VRF with a DOAS

Electric Variable Refrigerant Flow Heat Pumps

Dedicated Outside Air System (DOAS)



https://www.daikin.com/products/ac/lineup/ventilation



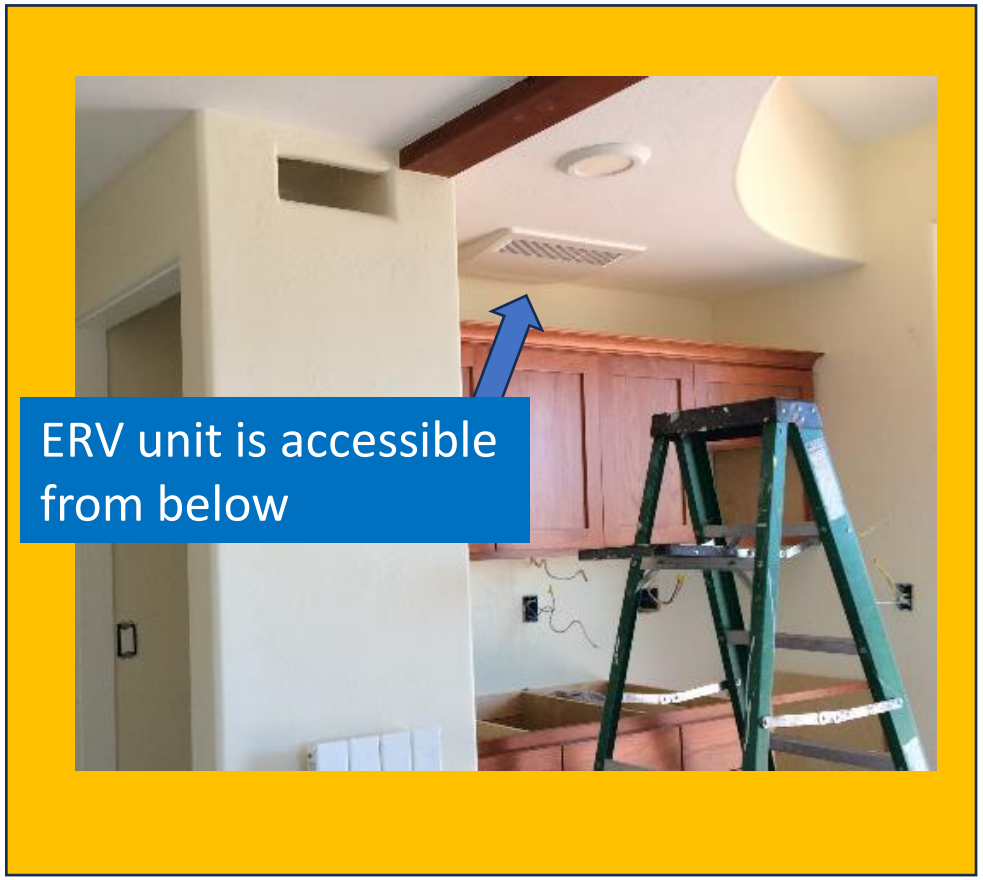
inBALANCE™ Green Consulting

3C REN

Tips for Managing Client Expectations and Meeting Title 24

Managing client expectations

- **Unit Access:** Can homeowner easily access filters?
- **Expectation**: Is homeowner / occupant able to locate and purchase the proper filters?
- **Owner Maintenance:** MERV 13 / HEPA filters may need replacing 4 times/yr; Other dust filters need washing/vacuuming 4 times/yr; Core HRV/ERV Filters need to be cleaned once a year min.
- **Owner Operation**: Does homeowner / occupant know how to turn off the system in case of poor outdoor air quality? Are the controls easily accessible and labeled?
- **Unit Location:** Reminder that noise and cold/cool air can be problematic for some occupants



Equipment Access Criteria –Visual HERS Verification

Table 22: IAQ System Component Accessibility Criteria

Dwelling Unit Ventilation System Component	Location	Accessible Determination
Outdoor Air Intake	All locations	Intake louvers, grilles, or screens shall be >3/8 inches except where prohibited by local jurisdictions or other code requirements.
Outdoor Air Intake	Exterior wall, soffit, or gable end	A point on the perimeter of the outdoor air intake shall be located within 10 feet of a walking surface or grade or the system shall meet the IAQ System FID requirements in the ACM Reference Manual.
Outdoor Air Intake	Roof	Access shall be provided in accordance with California Mechanical Code Section 304.3.1 requirements for appliances.
Filters and Heat Exchangers	Serviceable from conditioned space, unconditioned basements, or mechanical closets. Heat exchangers may also be serviceable from unconditioned attics if the IAQ system meets the FID requirements in the RACM Reference Manual.	The H/ERV or supply ventilation system access panel shall be located within 10 feet of the walking surface.

Indoor Air Quality Ventilation (IAQ) and Local Exhaust–MCH-27-H and MCH 32-H

CF1R-PRF-01-E

Calculation Description: Title 24 Analysis

Input File Name: **Sample Res Project.ribd22**

HERS FEATURE SUMMARY

The following is a summary of the features that must be field-verified by a certified HERS Rater as a condition for meeting the modeled energy performance for this computer analysis. Additional detail is provided in the building tables below. Registered CF2Rs and CF3Rs are required to be completed in the HERS Registry

- Quality insulation installation (QII)
- Indoor air quality ventilation
- Kitchen range hood

HERS IAQ Work Flow:

- Triggered on CF1R
- Job Site Meeting “Review Requirements”
- HERS Inspection:
  - Measure the air flow of fans

CF2R and CF3R Forms

- CF2R-MCH-27a-H Indoor Air Quality and Mechanical Ventilation - Single Family Attached
- CF2R-MCH-27d-H Indoor Air Quality and Mechanical Ventilation - Non-Dwelling Unit
- CF2R-MCH-32-H Local Mechanical Exhaust

- CF3R-MCH-27a-H Indoor Air Quality and Mechanical Ventilation - Single Family Attached
- CF3R-MCH-32-H Local Mechanical Exhaust

Indoor Air Quality and Mechanical Ventilation for Low-rise Multifamily LMCI-MCH-27-H

INDOOR AIR QUALITY AND MECHANICAL VENTILATION

CALIFORNIA ENERGY COMMISSION — CEC-LMCI-MCH-27-H

SAMPLE FORM – NOT VALID FOR SUBMISSION TO BUILDING DEPARTMENTS

CERTIFICATE OF INSTALLATION

Note: This table completed by HERS Registry.

Project Name:	Enforcement Agency:
Dwelling Address:	Permit Number:
City and Zip Code:	Permit Application Date:

Title 24, Part 6, Section 160.2(b)2 **Ventilation and Indoor Air Quality for Attached Dwelling Units.** All dwelling units shall meet the requirements of ANSI/ASHRAE Standard 62.2-2019 Ventilation and Acceptable Indoor Air Quality in Residential Buildings subject to the amendments specified by Title 24, Part 6, Section 160.2(b)2A

A. Whole-Dwelling Mechanical Ventilation - General Information

Note:

Non-dwelling units do not meet the definition for a dwelling unit as defined in Section 100.1(b). Non-dwelling units are not designed to provide independent living facilities and do not provide permanent provisions for living...

03	**7.3 Exhaust Ducts.** 7.3.1 **Multiple Exhaust Fans Using One Duct.** Exhaust fans in separate dwelling units shall not share a common exhaust duct. If more than one of the exhaust fans in a single dwelling unit shares a common exhaust duct, each fan shall be equipped with a backdraft damper to prevent the recirculation of exhaust air from one room to another through the exhaust ducting system. 7.3.2 **Single Exhaust Fan Ducted to Multiple Inlets.** Where exhaust inlets are commonly ducted across multiple dwelling units, one or more exhaust fans located downstream of the exhaust inlets shall be designed and intended to run continuously, or a system of one or more backdraft dampers shall be installed to isolate each dwelling unit from the common duct when the fan is not running.
04	**7.4 Supply Ducts.** Where supply outlets are commonly ducted across multiple dwelling units, one or more supply fans located upstream of all the supply outlets shall be designed and intended to run continuously, or a system of one or more backdraft dampers shall be installed to isolate each dwelling unit from the common duct when the fan is not running.

Multifamily Project

Hardworking HERS Rater

Forms are similar to Single Family. Some big differences include backdraft dampers and air sealing to stop air movement between dwellings.

Multifamily IAQ:
Balance Ventilation per Each Dwelling Unit vs Dwelling Unit Compartmentalization

Balanced Ventilation
ERV Provides Outside Air (OA)

VS

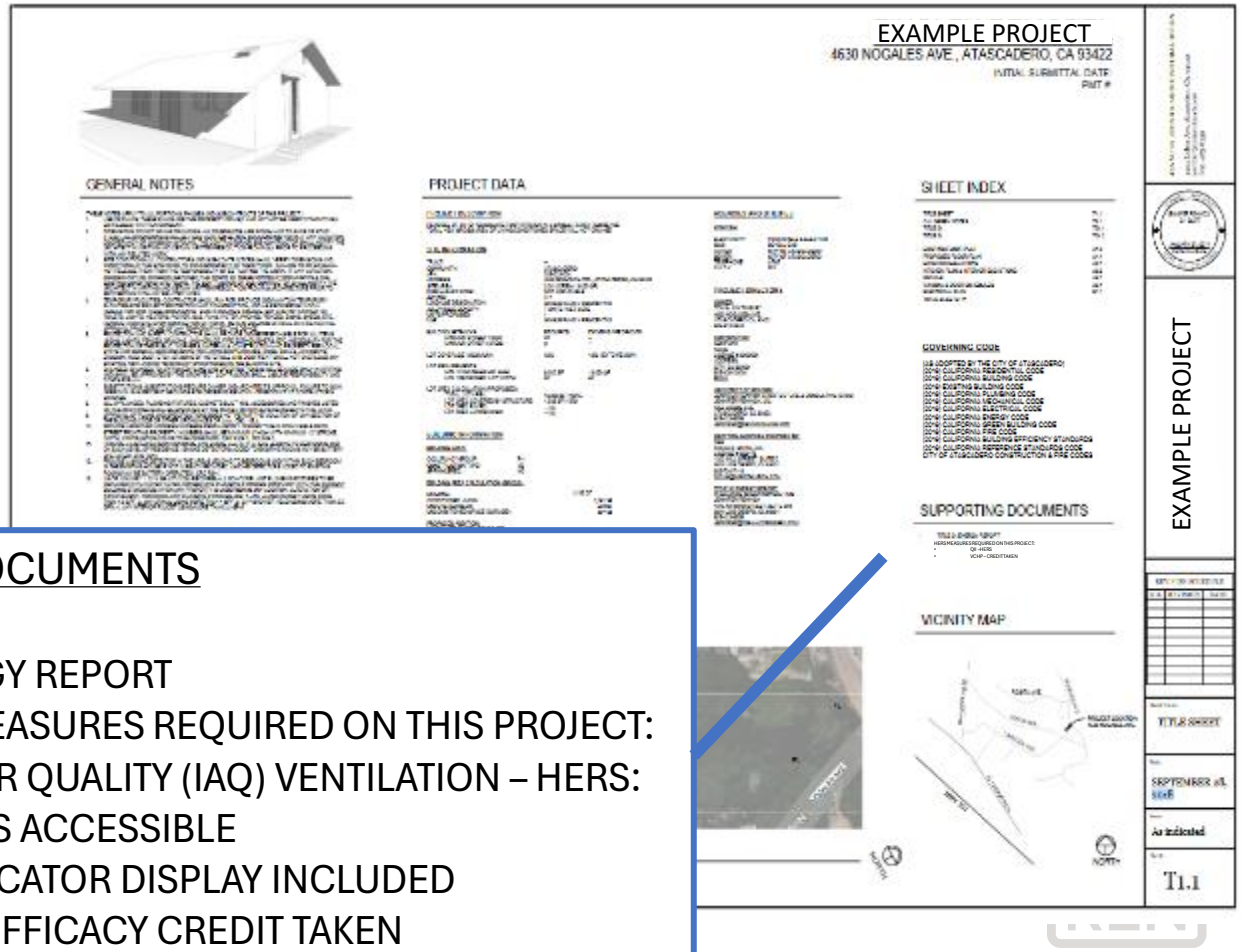
Blower Door Compartmentalization Testing

Exhaust Only Fan System: Depends on leaky outside walls for OA and sealed interior shared walls to eliminate transferred air between dwelling units.

Recommend Listing the Approach on the Cover Sheet

Include the HERS measures (See CF1R or LMCC) on the Cover Sheet, suggested locations:

- ‘Code Summary’
- ‘Code Analysis’
- ‘Supporting Documents’
- ‘HERS Summary’

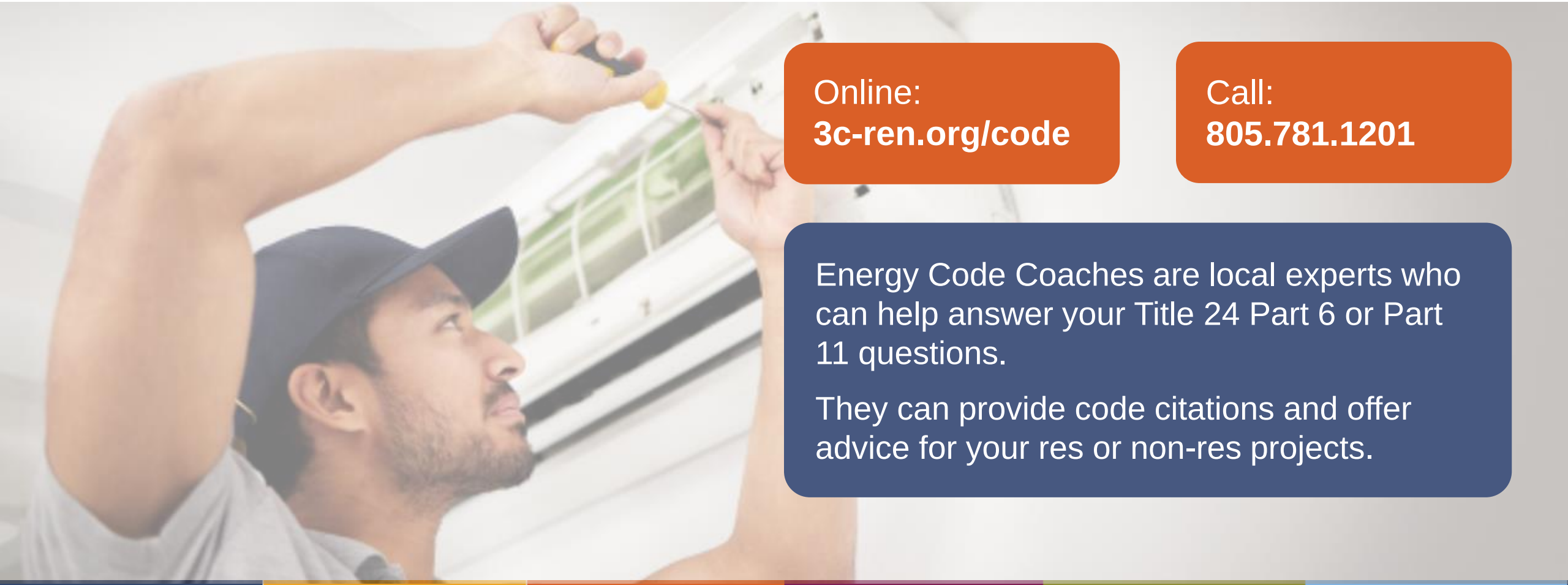


SUPPORTING DOCUMENTS

- TITLE 24 ENERGY REPORT
- NOTE: HERS MEASURES REQUIRED ON THIS PROJECT:
  - INDOOR AIR QUALITY (IAQ) VENTILATION – HERS:
  - HRV /ERV IS ACCESSIBLE
  - FAULT INDICATOR DISPLAY INCLUDED
  - HRV /ERV EFFICACY CREDIT TAKEN

Questions about Title 24?

3C-REN offers a *free* Code Coach Service



Online:
3c-ren.org/code

Call:
805.781.1201

Energy Code Coaches are local experts who can help answer your Title 24 Part 6 or Part 11 questions.

They can provide code citations and offer advice for your res or non-res projects.

Closing

Continuing Education Units Available

- Contact chloe.swick@ventura.org for AIA LUs

Coming to Your Inbox Soon!

- Slides, Recording, & Survey – Please Take It and Help Us Out!

Upcoming Courses:

- Appliances and Energy Storage – Part 5: All Electric Design and Construction (1/30)
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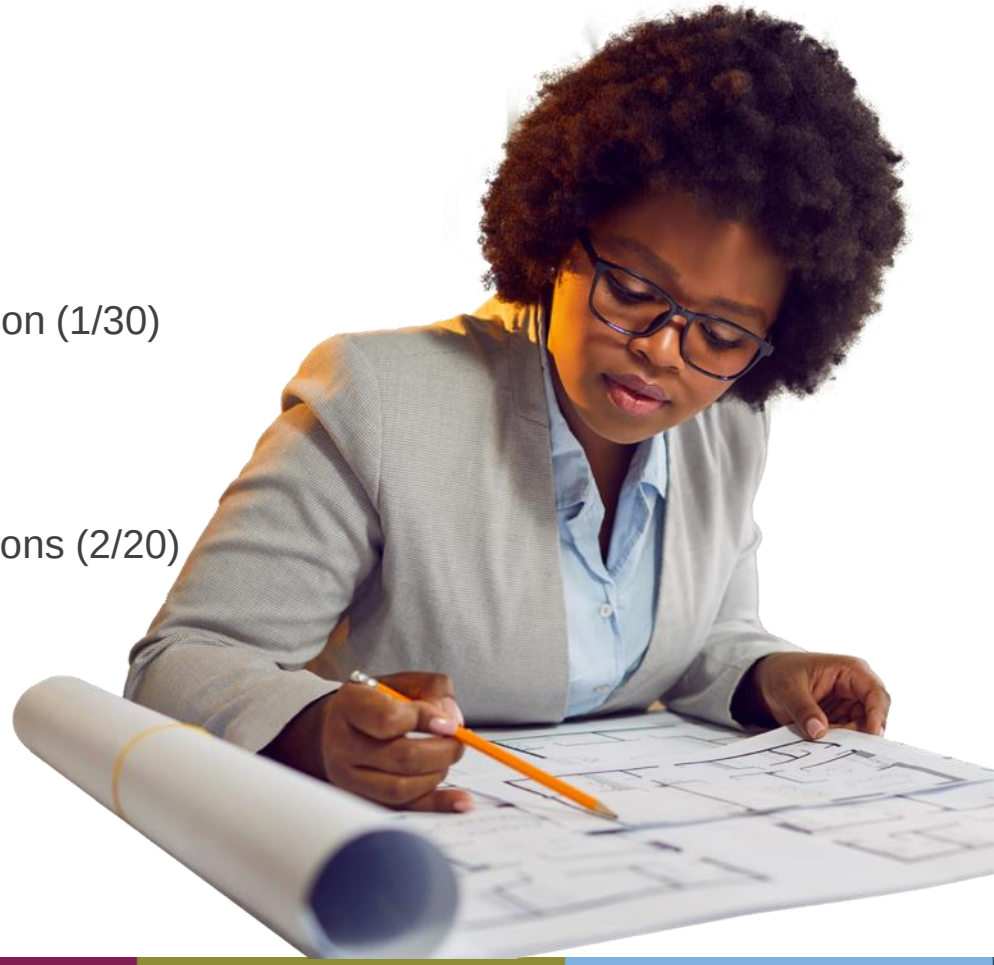
- High Performance Buildings: Designing for Utility Costs and Carbon Emissions (2/20)



Any phone numbers who joined? Please share your name!

Thank you!

More info: **3c-ren.org**

Questions: **info@3c-ren.org**

Email updates: **3c-ren.org/newsletter**

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