Meet and Exceed Energy Code in Oregon

2023

Energy Trust of Oregon

Today's agenda

1. Timeline for next Oregon Residential Specialty Code (ORSC)
2. What changes are in the 2023 ORSC?
3. Balanced Ventilation
4. Cash incentives, tax credits and technical resources to exceed code

About us

Independent nonprofit

Serving 1.6 million customers of Portland General Electric, Pacific Power, NW Natural, Cascade Natural Gas and Avista

Providing access to affordable energy

Generating homegrown, renewable power

Building a stronger Oregon and SW Washington


Field-Designing at its worst!

Early design assistance

- Energy Trust incentives available for Early Design Assistance (EDA) meetings
  - Gather critical team members to achieve energy goals
  - At least $500 incentive per EDA
  - Position your development to earn increased cash incentives to stay ahead of code

What can we anticipate for the next ORSC?

Oregon Code Update Timeline

CODE SCHEDULE	2023			2024				2025
	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
2021 ORSC mandatory for new homes								
2023 ORSC mandatory for new homes								

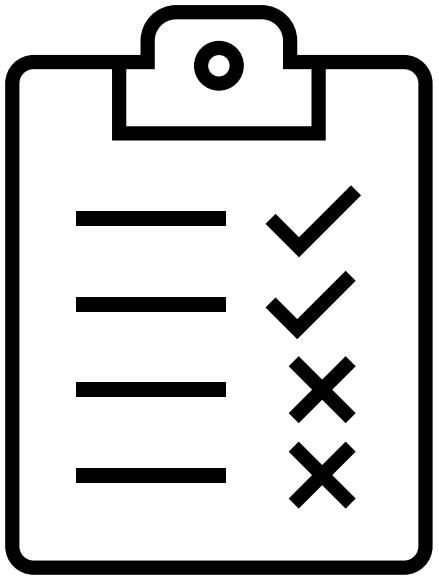
Key Concepts for Building Codes

- **ANYONE can participate in code development**

  https://www.oregon.gov/bcd/codes-stand/pages/residential-structures.aspx

- **ORSC:**
  - **Prescriptive Minimums:** *Base Code*
  - **Challenges**: *Additional Measures*
  - **Exceptions**
  - **Technical Bulletins**

2023 ORSC: Key changes



- **Updated *Additional Measures* table**
  - Homes with deeply buried ducts must choose a second additional measure

2021 ORSC: Choose one additional measure

1. High-efficiency HVAC system
2. High-efficiency water heating system
3. Wall insulation upgrade
4. Prescriptive advanced envelope
5. Ductless heat pump
6. UA Performance Advanced envelope (8%)
7. Glazing area *
8. 3.0 ACH air leakage control and 66% HRV

Proposed

Proposed 2023 ORSC: Choose 1-2 additional measures

1. High-efficiency HVAC system
2. High-efficiency water heating system
3. Wall insulation upgrade
4. Prescriptive advanced envelope
5. Ductless heat pump
6. UA Performance Advanced envelope (8%)
7. 2.75 ACH air leakage control and 66% HRV*

TABLE N1101.1(2)
ADDITIONAL MEASURES

1	**HIGH EFFICIENCY HVAC SYSTEM[a]** a. Gas-fired furnace or boiler AFUE 94 percent, or b. Air source heat pump HSPF 10.0/~~14.0~~ 16.0 SEER cooling or 8.5 HSPF2 / 15.0 SEER2, or c. Ground source heat pump COP 3.5 or Energy Star rated
2	**HIGH EFFICIENCY WATER HEATING SYSTEM** a. Natural gas/propane water heater with minimum 0.90 UEF, or b. Electric heat pump water heater with minimum ~~2.0 COP~~ 3.45 UEF, or c. Natural gas/propane tankless/instantaneous heater with minimum 0.80 UEF and Drain Water Heat Recovery Unit installed on minimum of one shower/tub-shower
3	**WALL INSULATION UPGRADE** Exterior walls—U-0.045/R-21 conventional framing with R-5.0 continuous insulation
4	**ADVANCED ENVELOPE** Windows—U-0.21 (Area weighted average), and Flat ceiling[b]—U-0.017/R-60, and Framed floors—U-0.026/R-38 or slab edge insulation to F-0.48 or less (R-10 for 48"; R-15 for 36" or R-5 fully insulated slab)
5	**DUCTLESS HEAT PUMP (Dwelling units with all-electric heat)** a. Provide ductless heat pump of minimum HSPF 10.0 or HSPF2 9.0 in primary zone replaces zonal electric heat sources, and b. Provide programmable thermostat for all heaters in bedrooms
6	**HIGH EFFICIENCY THERMAL ENVELOPE UA[c]** Proposed UA is 8 percent lower than the code UA
~~7~~	~~**GLAZING AREA**~~ ~~Glazing area, measured as the total of framed openings is less than 12 percent of conditioned floor area~~
7 ~~8~~	~~3~~ 2.75 **ACH AIR LEAKAGE CONTROL AND EFFICIENT VENTILATION** Achieve a maximum of ~~3.0~~ 2.75 ACH50 whole-house air leakage when third-party tested and provide a whole-house ventilation system including heat recovery with a minimum sensible heat recovery efficiency of not less than 66 percent and total fan efficacy of 1.6 CFM/Watt (combined input for supply and exhaust).

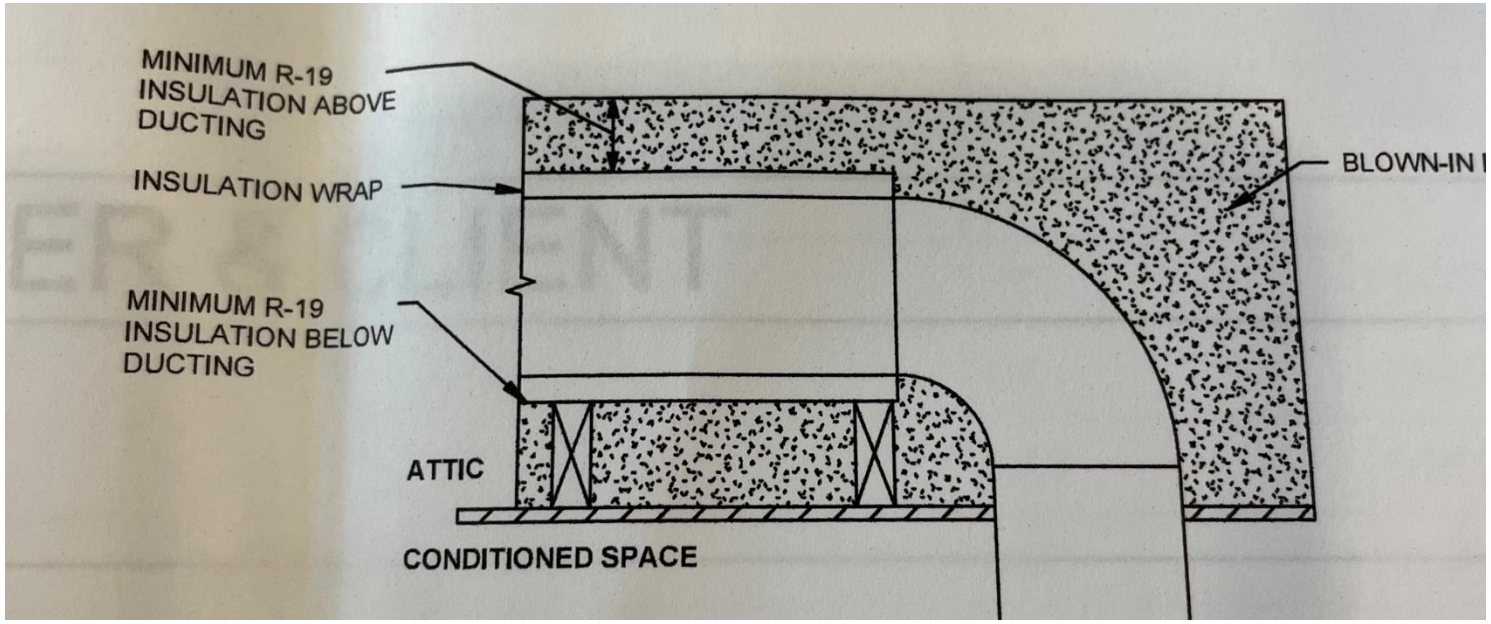
What are Deeply Buried Ducts?

Current Rules:

- Ducts deeply buried in insulation in accordance with all of the following:
  - Insulation shall be installed to fill gaps and voids between duct and ceiling, and a minimum of R-19 insulation shall be installed above the duct between the duct and the unconditioned attic
  - Insulation depth marker flags shall be installed on the ducts every 10 feet or as approved by the building official
  - All ductwork R-8

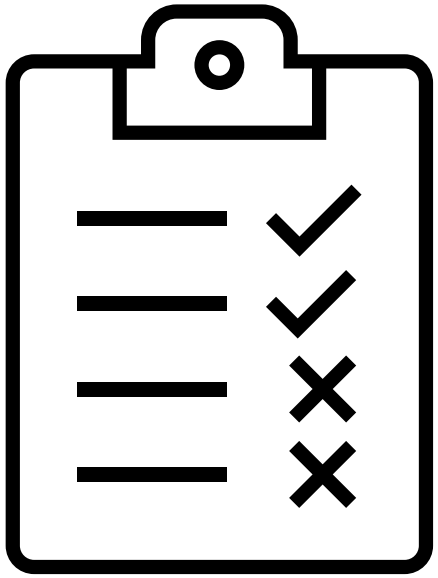
Deeply buried ducts

- Well-described in the 2018 International Energy Conservation Code (IECC) and Building America Solution Center (BASC)
- Requires a minimum insulation for both the duct and insulation above the duct



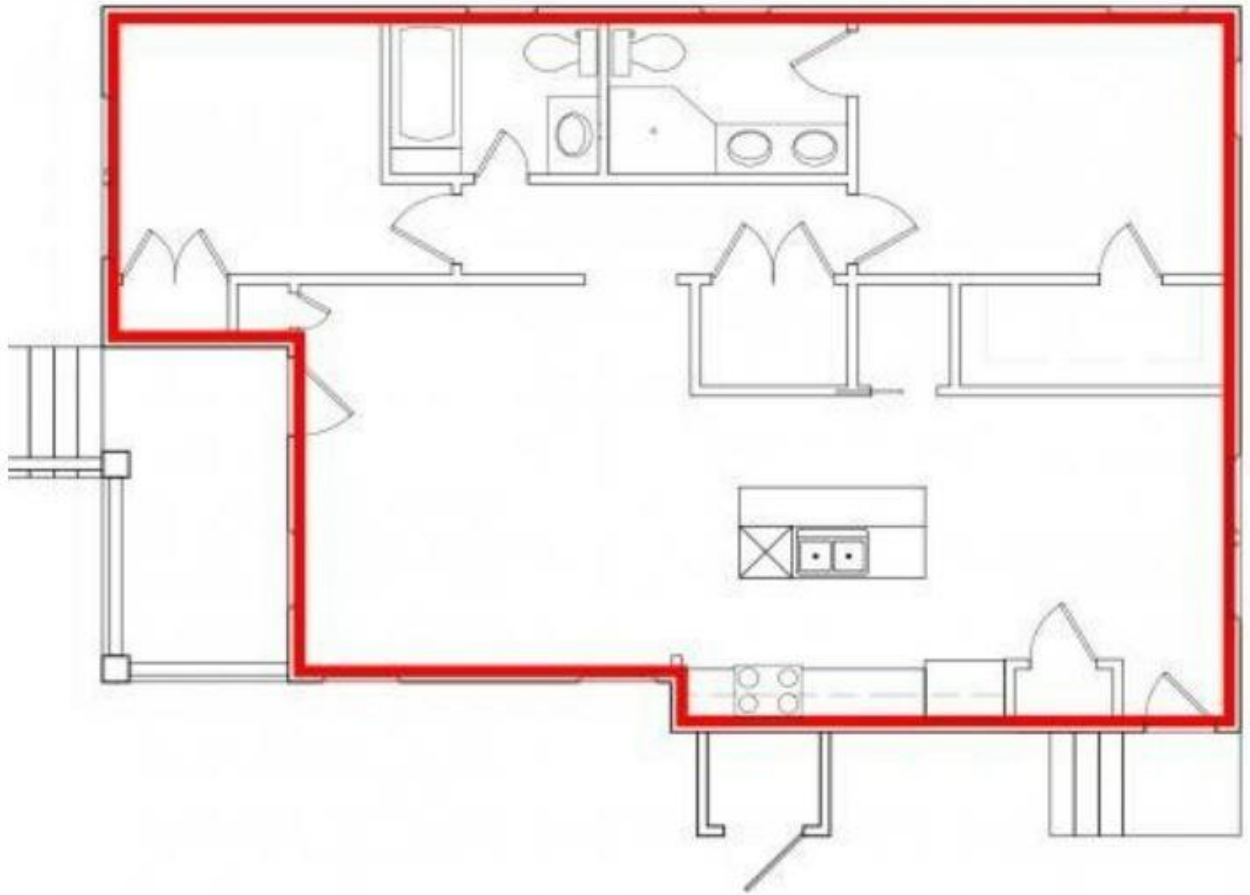
Deeply buried ducts in real life

2023 ORSC: Key changes



- Updated *Additional Measures* table
  - Homes with deeply buried ducts must choose a second additional measure
- **Air handler must be located inside the thermal envelope in <u>all</u> situations**

Before you build



Engage all trades

Proper sequencing

Verifier

How to prepare? Have a plan for the air handler

- The size of the mechanical closet depends on the equipment
- In most cases, you can install a central air handler in a 36” deep x 60” wide closet
- Refer to the manufacturer’s specifications on the space requirements

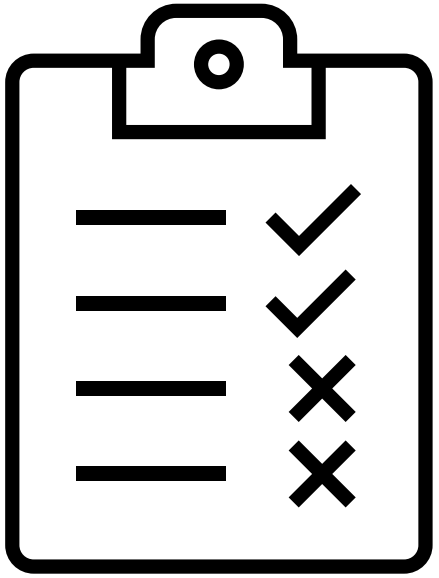
Mechanical system inside thermal envelope

- Move the system to inside the thermal envelope

Mechanical system inside thermal envelope

- Build the thermal envelope around the system

2023 ORSC: Key changes



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- Air handler inside the thermal envelope in all situations
- **Maximum 10’ of ductwork outside the thermal envelope**

Install all ducts and equipment within the building thermal envelope

- Exceptions:
  - Ventilation intake ductwork and exhaust ductwork for whole home ventilation
  - Up to ***10 feet*** of HVAC ductwork shall be permitted outside of the thermal envelope.
    - No longer a (5%) percentage allowance
    - No exception for the HVAC air handler
  - Deeply buried ducts or those in an unvented crawlspace → choose 2 additional measures

Where and how the ducts live

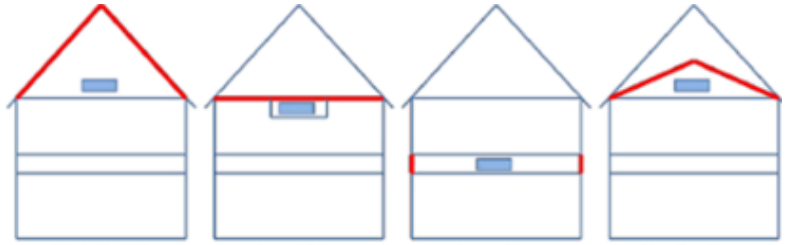
- We can’t do this anymore
- Now we need to limit the amount of ductwork above the thermal envelope to 10 ft.

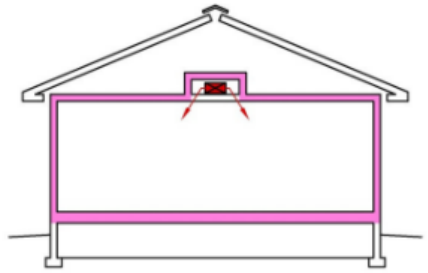
This return is more than 10 feet

How best to Prepare? Plan to move the HVAC system completely inside the thermal boundary

Better Options: Ducts Inside

1. Mini-splits with no ducts
2. Between floors & in interior walls
3. Dropped soffits for single-story homes
4. “Oregon” truss or Modified Plenum Truss





Two-story homes: between floors

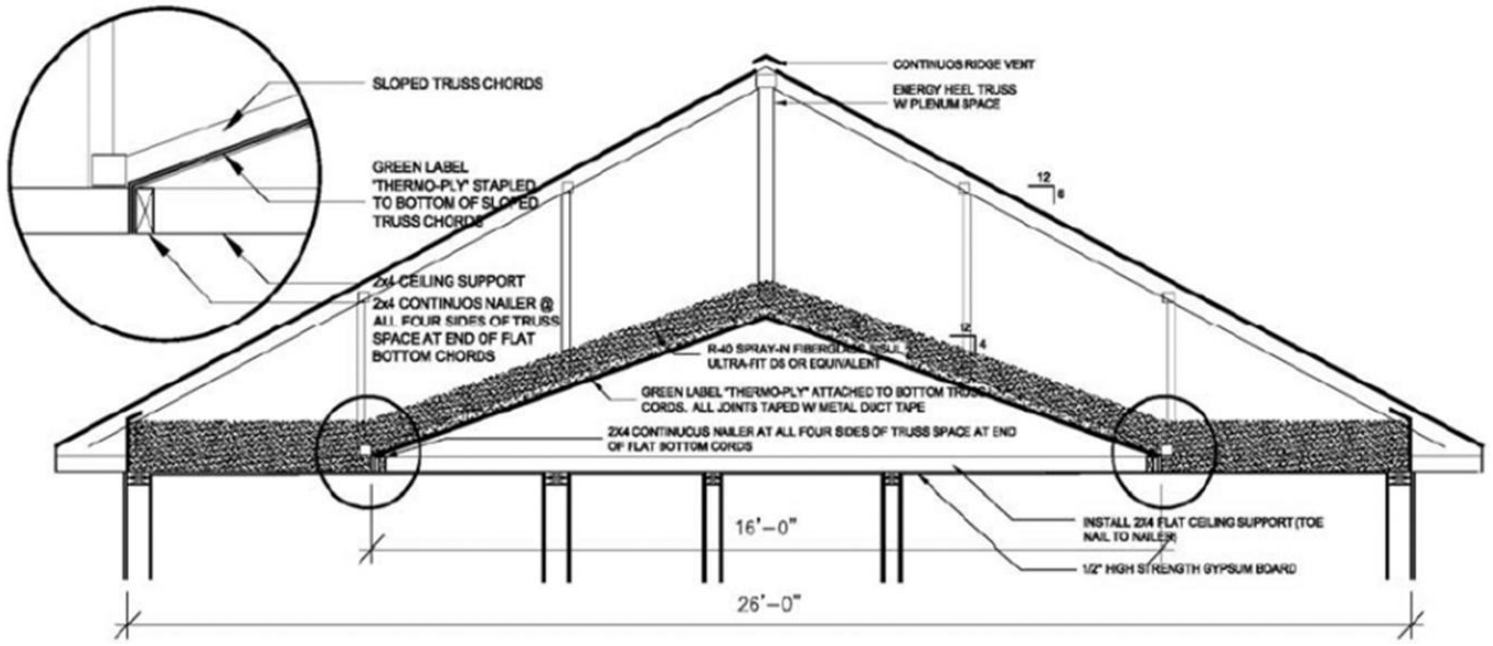
- Air handler probably on the second floor
- Can work with floor trusses or I-Joists
- Need to plan with HVAC to avoid beams
- Better long-term solution than deeply buried ducts

Single-story homes: Dropped soffit

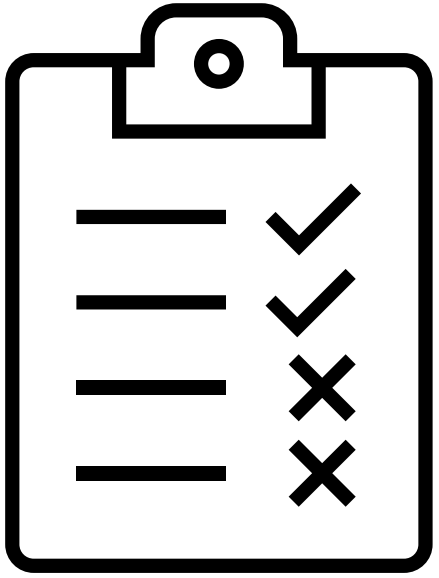
- Work for single story
- Work for second-story attics
- Help to minimize HVAC ductwork
- Requires good planning with your HVAC
- Require a good envelope for shorter duct runs
- Return will likely not fit in soffit

Plenum truss

- Not new (from the 1990s, late 2000s)
- Modified plenum truss
- “Oregon truss”
- Many variations



2023 ORSC: Key changes



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- Air handler inside the thermal envelope in all situations
- Max 10’ of ductwork outside the thermal envelope
- **Base case for air leakage is 3.25 ACH50 (if testing)**

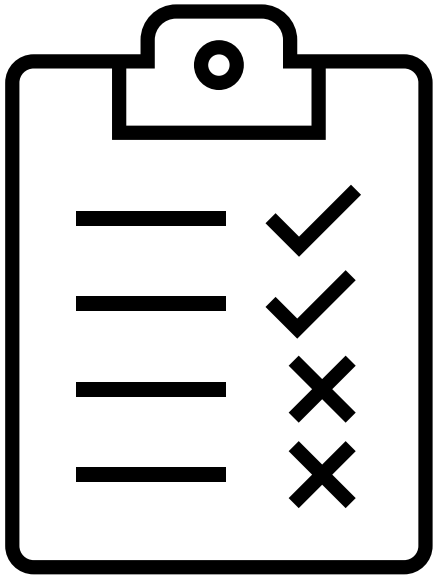
Prescriptive Air Sealing…

TABLE N1104.8
AIR BARRIER INSTALLATION AND AIR SEALING REQUIREMENTS

COMPONENT	AIR BARRIER CRITERIA
General requirements	A continuous air barrier shall be installed in alignment with the building thermal envelope.
	Breaks or joints in the air barrier shall be sealed.
Ceiling/attic	The air barrier in any dropped ceiling or soffit shall be aligned with the insulation and any gaps in the air barrier shall be sealed.
	Access openings, drop-down stairs, or knee wall doors to unconditioned attic spaces shall be gasketed and sealed.
Walls	The junction of the foundation and sill plate shall be sealed.
	The junction of the top plate and the top of interior walls shall be sealed between wall cavities and windows or door frames.
	All penetrations or utility services through the top and bottom plates shall be sealed.
	Knee walls shall be sealed.
Windows, skylights and doors	The space between framing and skylights, and the jambs of windows and doors shall be sealed.
Rim/band joists	Rim/band joists shall be a part of the thermal envelope and have a continuous air barrier.
Floors Including cantilevered floors and floors above garages	The air barrier shall be installed at any exposed edge of insulation.
Crawl space walls	Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.
Shafts, penetrations	Duct shafts, utility penetrations and flue shafts opening to exterior or unconditioned space shall be sealed.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be sealed to the finished surface.
Shower/tub on exterior walls	The air barrier installed at exterior walls adjacent to showers and tubs shall separate the wall from the shower or tub.
Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical and communication boxes. Alternatively, air-sealed boxes shall be installed.
HVAC register boots	HVAC supply and return register boots that penetrate building thermal envelope shall be sealed to the subfloor, wall covering or ceiling penetrated by the boot.

…or Blower Door testing meeting 3.25 ACH50

2023 ORSC: Key changes



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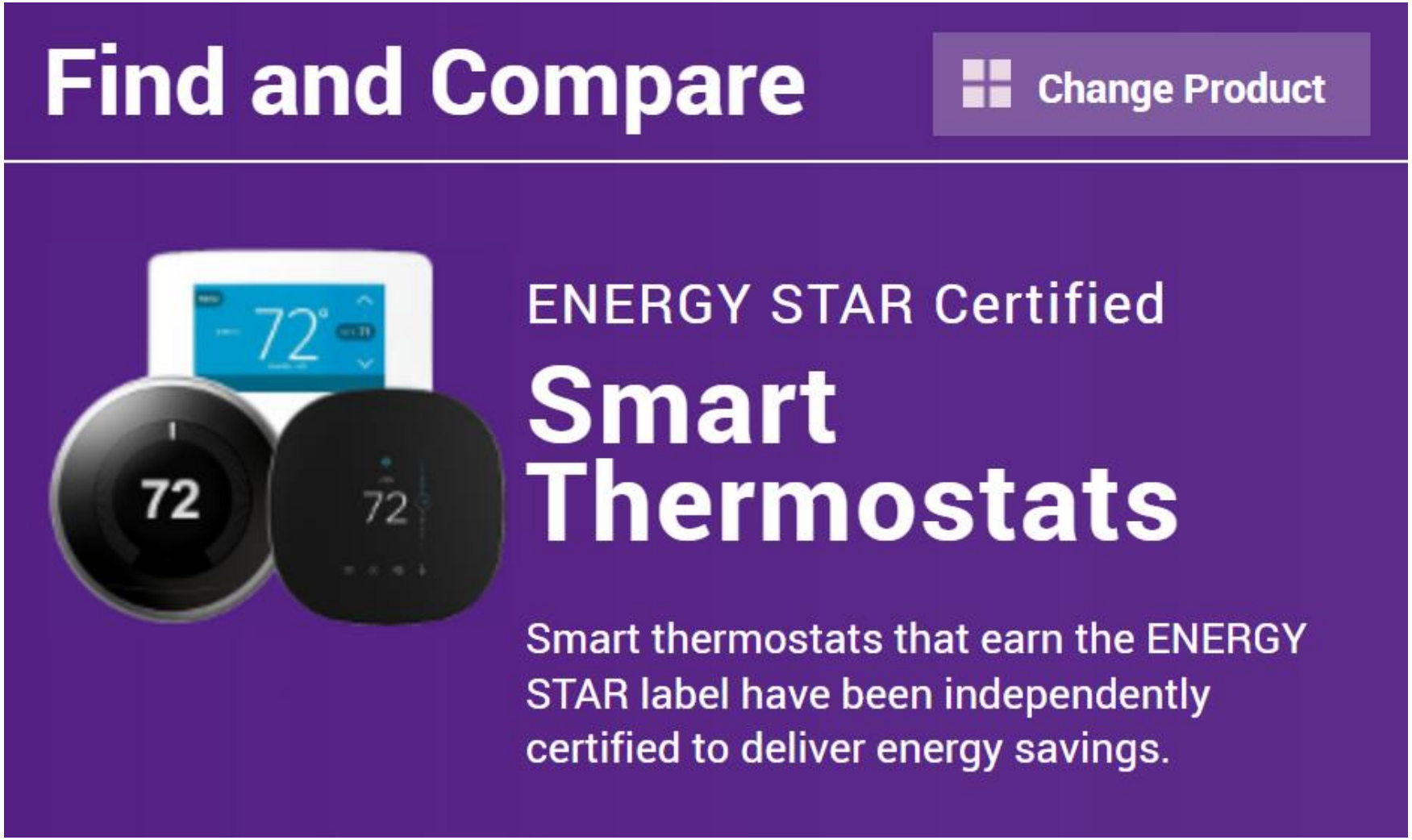
- **ENERGYSTAR smart thermostats**

ENERGY STAR smart thermostats for select systems (20 brands)



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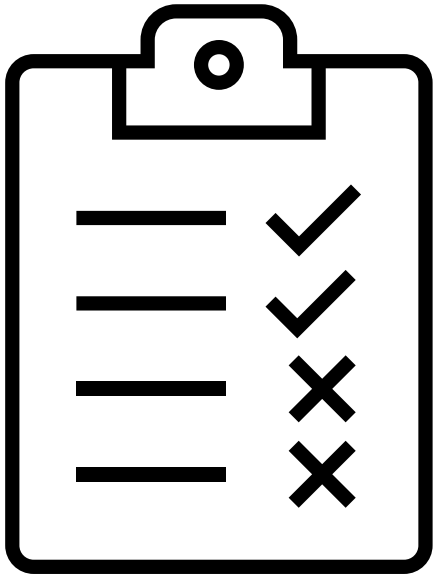

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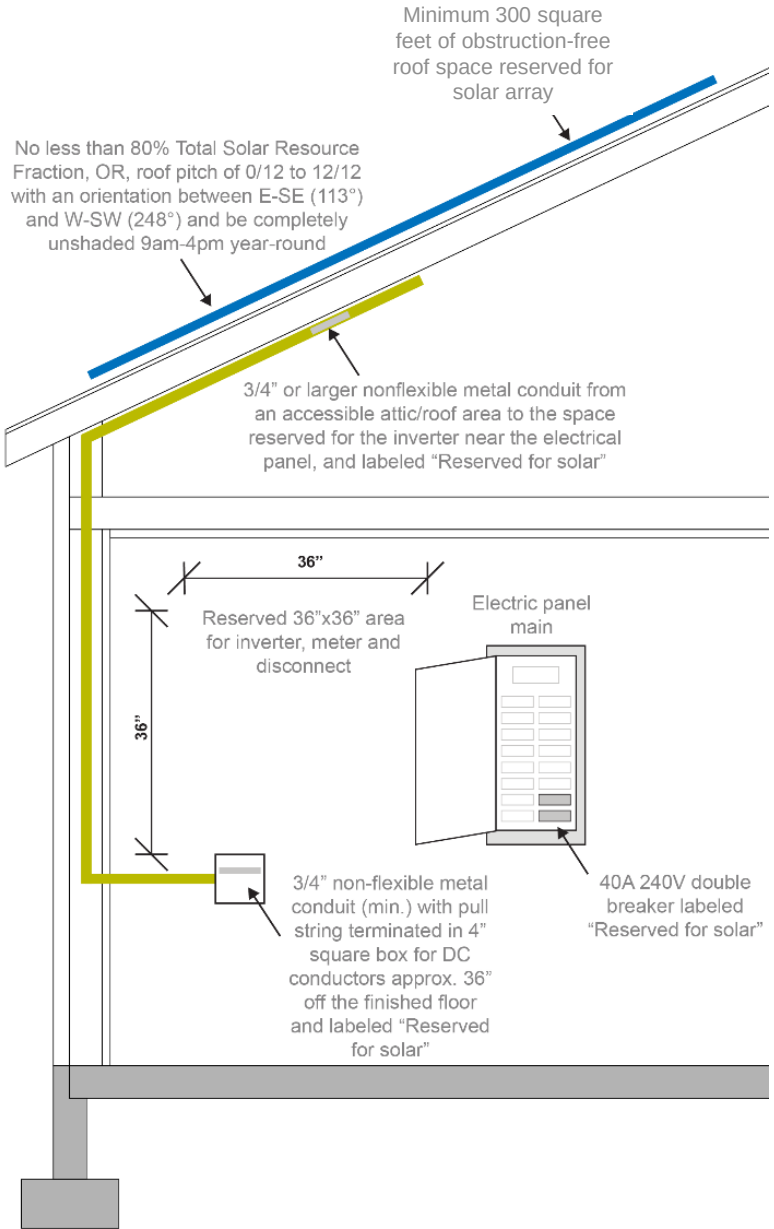
- ENERGYSTAR smart thermostats
- **Revised Solar Ready requirements**

Proposed solar ready requirements

- Changes:
  - Exceptions include shaded homes or homes without 600 sf of roof on sunny side
  - Building plans show solar ready requirements
  - Solar ready zone of no less than 300 sq. ft. free of obstructions
  - Solar interconnection pathway with pull-string and termination installed
  - Electrical service reserved space on panel



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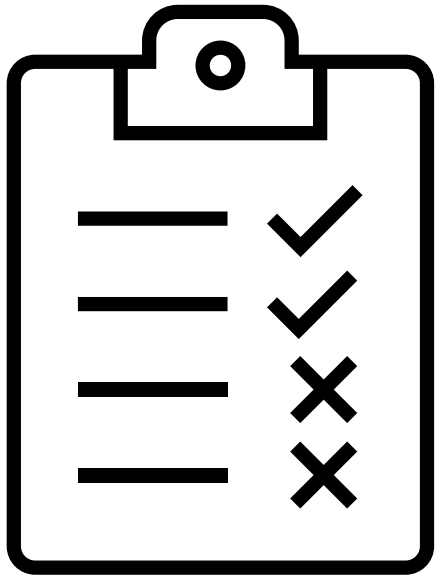

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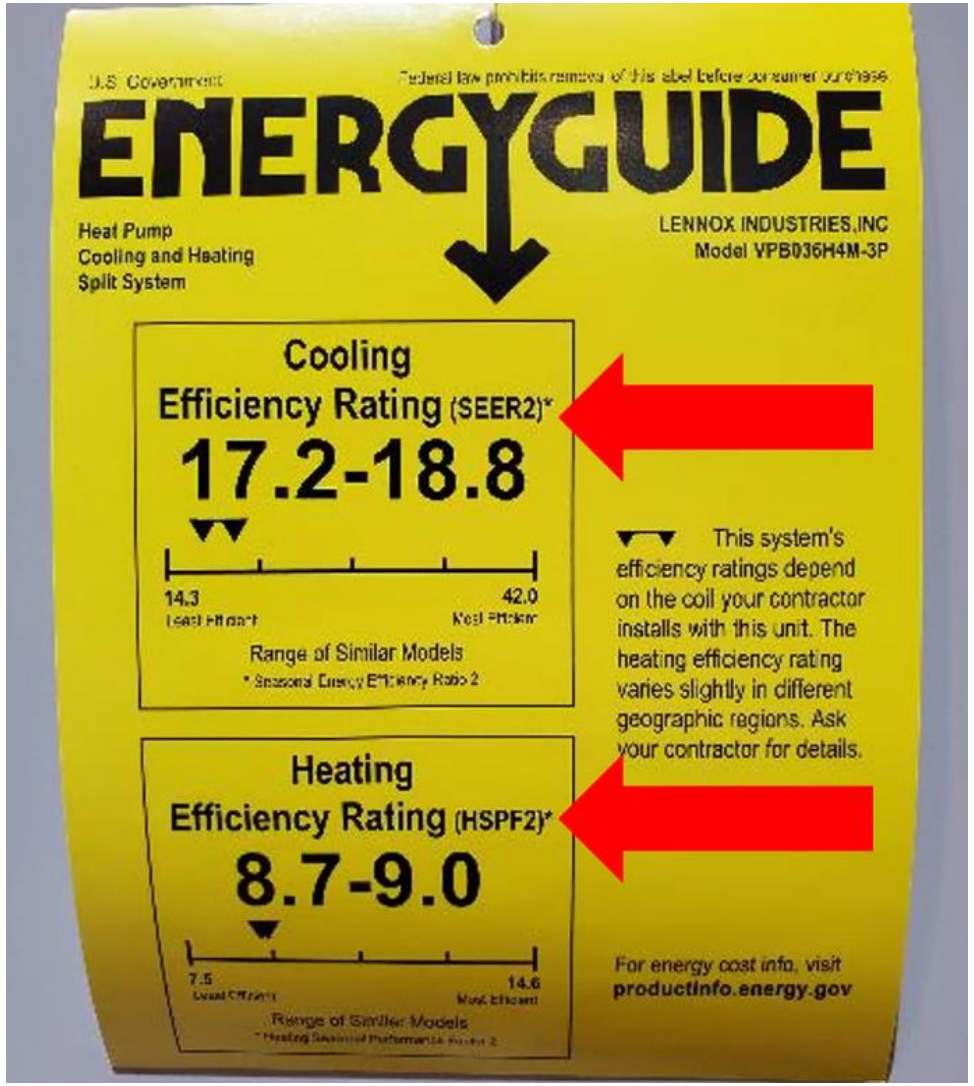
- Revised Solar Ready Requirements
- **Change in units of measurement**



Change of measurements

- New minimum federal efficiency standards began January 1, 2023
  - HVAC manufacturers have new minimum standards (about 1% difference)
  - The units of measurement will change
    - SEER2, EER2, HSPF2
  - Testing procedures change
    - Better represents actual operating conditions rather than laboratory conditions

Recap of major changes in the 2021 ORSC:

Balanced ventilation

2017 ORSC: mechanical ventilation optional

- Previously, mechanical ventilation (fresh air) systems, ***when installed***, could be “supply only” relying on passive exhaust through fan dampers or “exhaust only” relying on air leakage to supply makeup air
  - EPS required whole house ventilation but did not require balanced ventilation.

Thanks to the OHBA for the excellent summary

2021 ORSC: balanced ventilation required

- Requires a “balanced” ventilation system where **“concurrently operating mechanical exhaust and mechanical supply”** are within 10% of the same airflow rate
- ASHRAE 62.2-2010: 7.5 CFM per person + 1% of floor area
- Example: 2,500 sq. ft. 3-bedroom home
  - 2500 x .01 = 25 CFM
  - 4 x 7.5 = 30 CFM
  - 30 + 25 = 55 CFM continuous

Thanks to the OHBA for the excellent summary

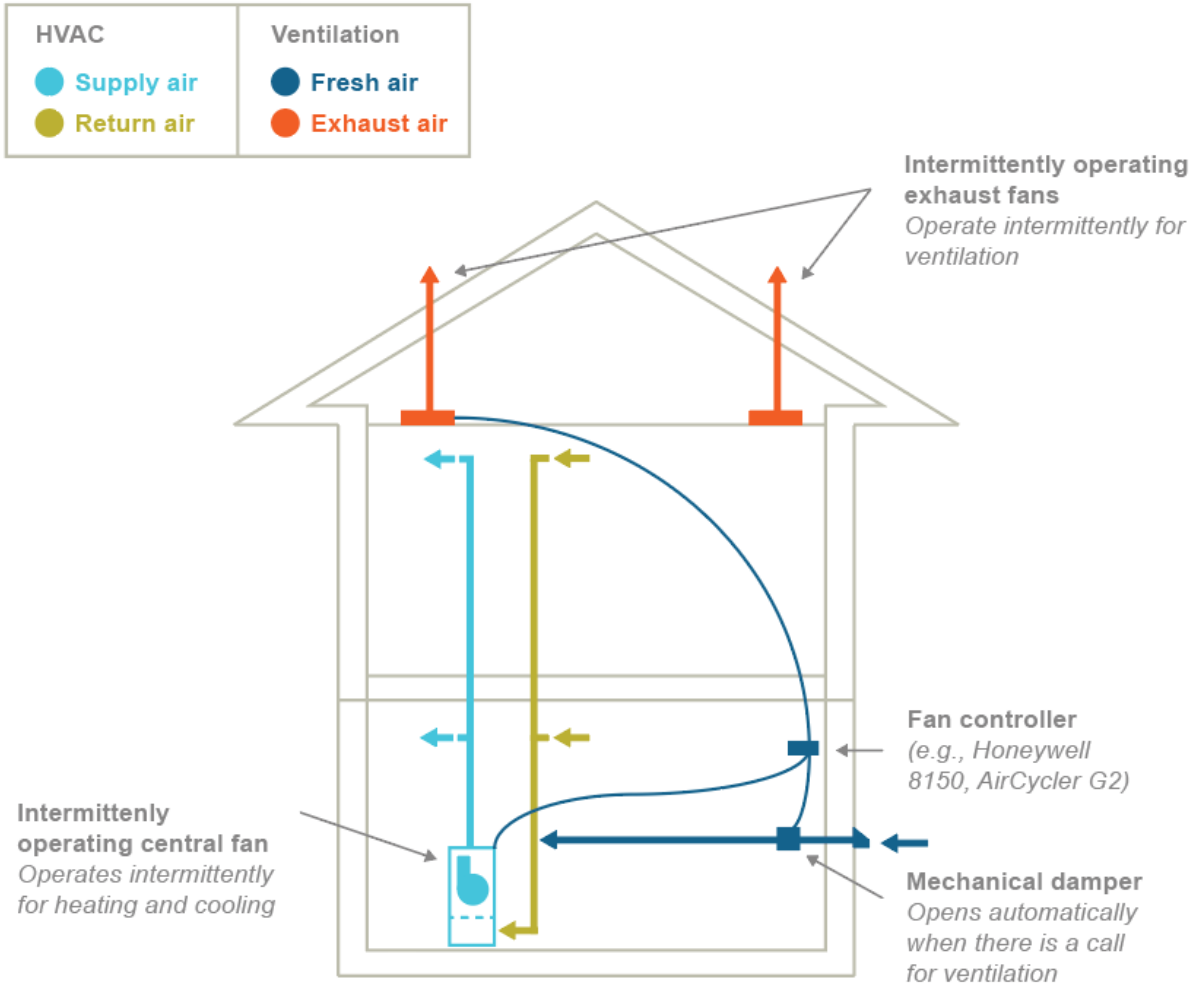
Continuous vs intermittent operation

- Both are allowed
  - Ideally use fan that are quiet and run at the lowest speed possible
- Need to be able to turn off the system and shut any fresh air intake dampers
- Considerations in addition to cost:
  - Comfort
  - Filtration
  - Distribution
  - Commissioning
  - Homeowner operation and maintenance

Balanced ventilation system options

No heat recovery	With heat recovery
Exhaust + central air handler integrated supply	Spot energy recovery
Air Exchangers (boxes without heat recovery)	Stand alone heat or energy recovery
Two fan strategies	Heat recovery integrated to central air handler

Intermittent design – central fan with exhaust



Balanced ventilation: return side + exhaust

Balanced ventilation with heat recovery

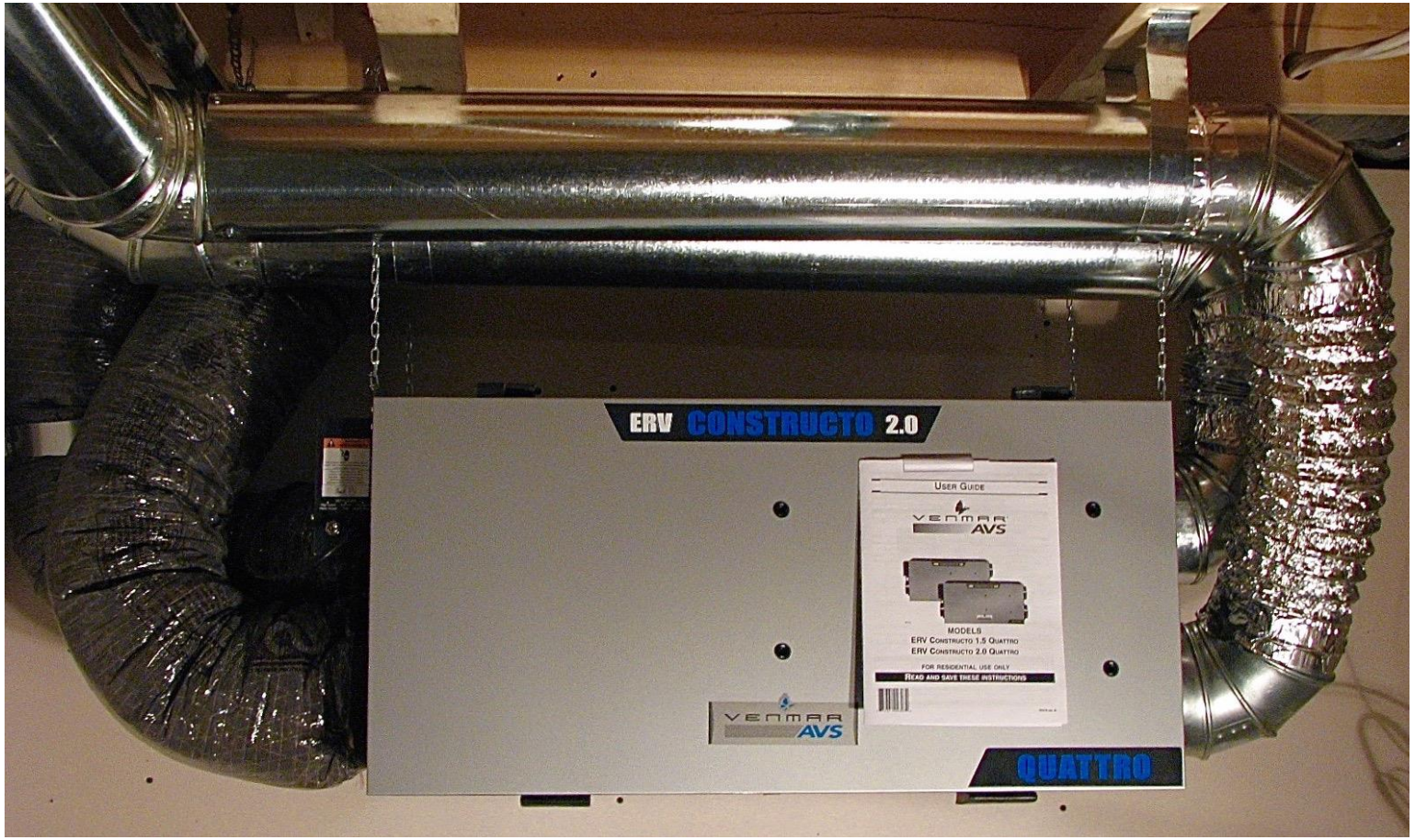
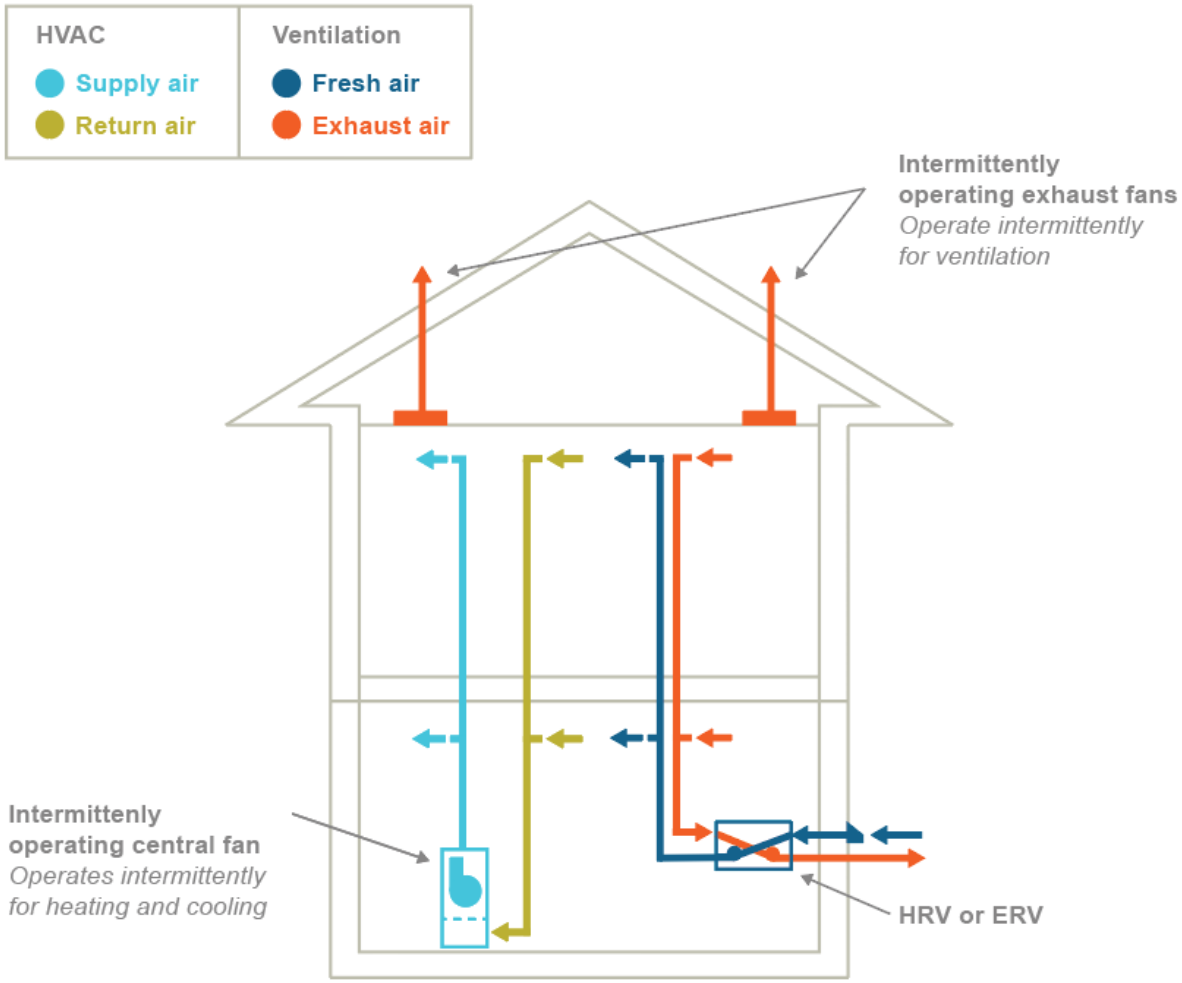


Photo courtesy Zero Energy Project

Standalone HRV/ERV



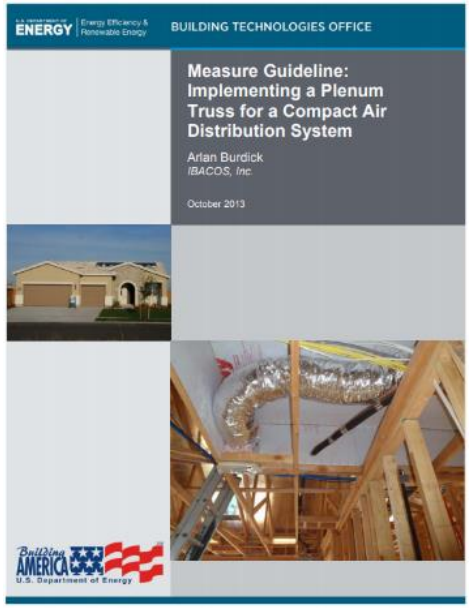
Other balanced ventilation options

- Two-fan strategy
- Air exchangers
- Single point “spot” ERV’s

Resources

- Ducts Inside

- Measure Guideline: Implementing a Plenum Truss for a Compact Air Distribution System

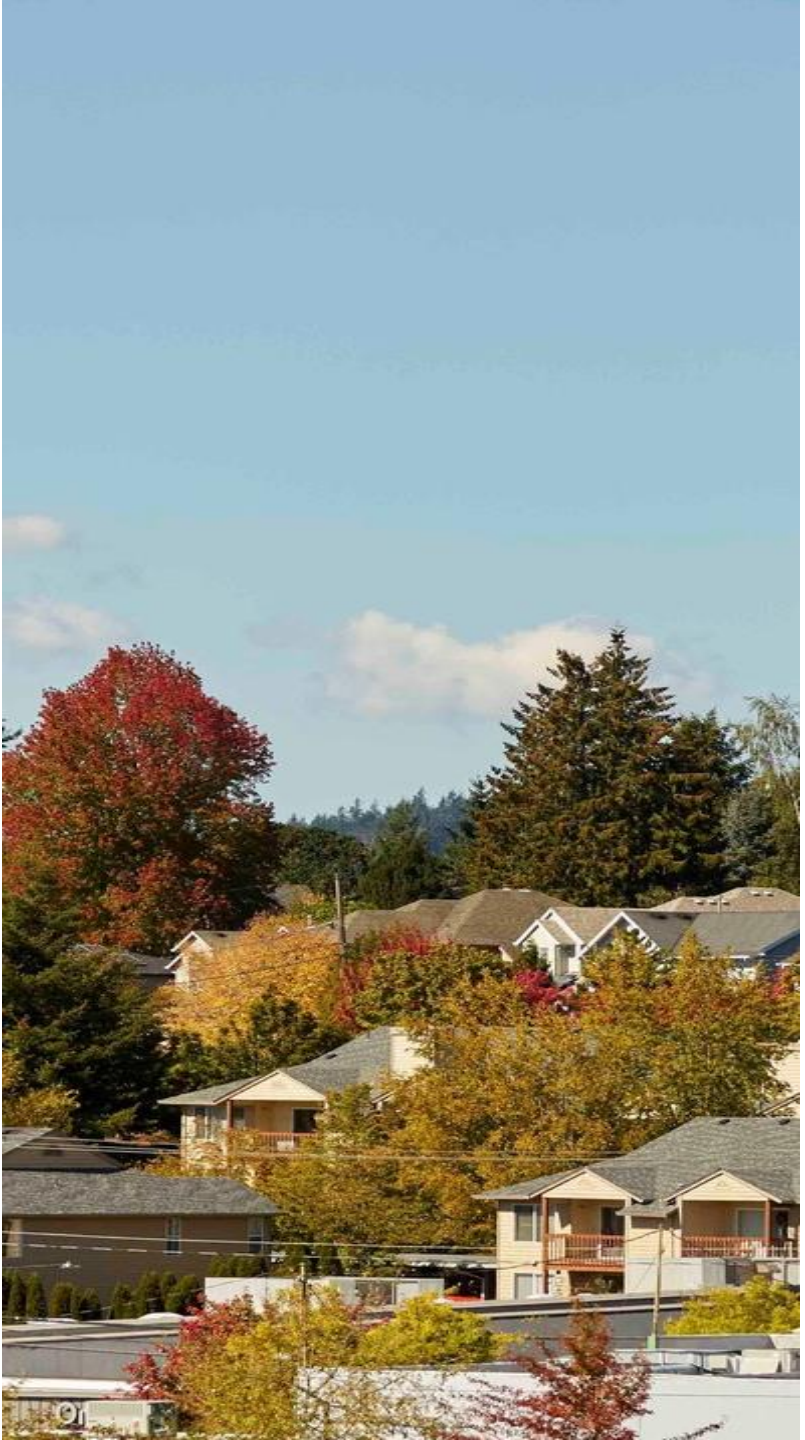


Resources

- Design Options for Locating Ducts within Conditioned Space

- Measure Guideline: Summary of Interior Ducts in New Construction, Including an Efficient, Affordable Method to Install Fur-Down Interior Ducts

Financial incentives to go beyond code



EPS New Construction

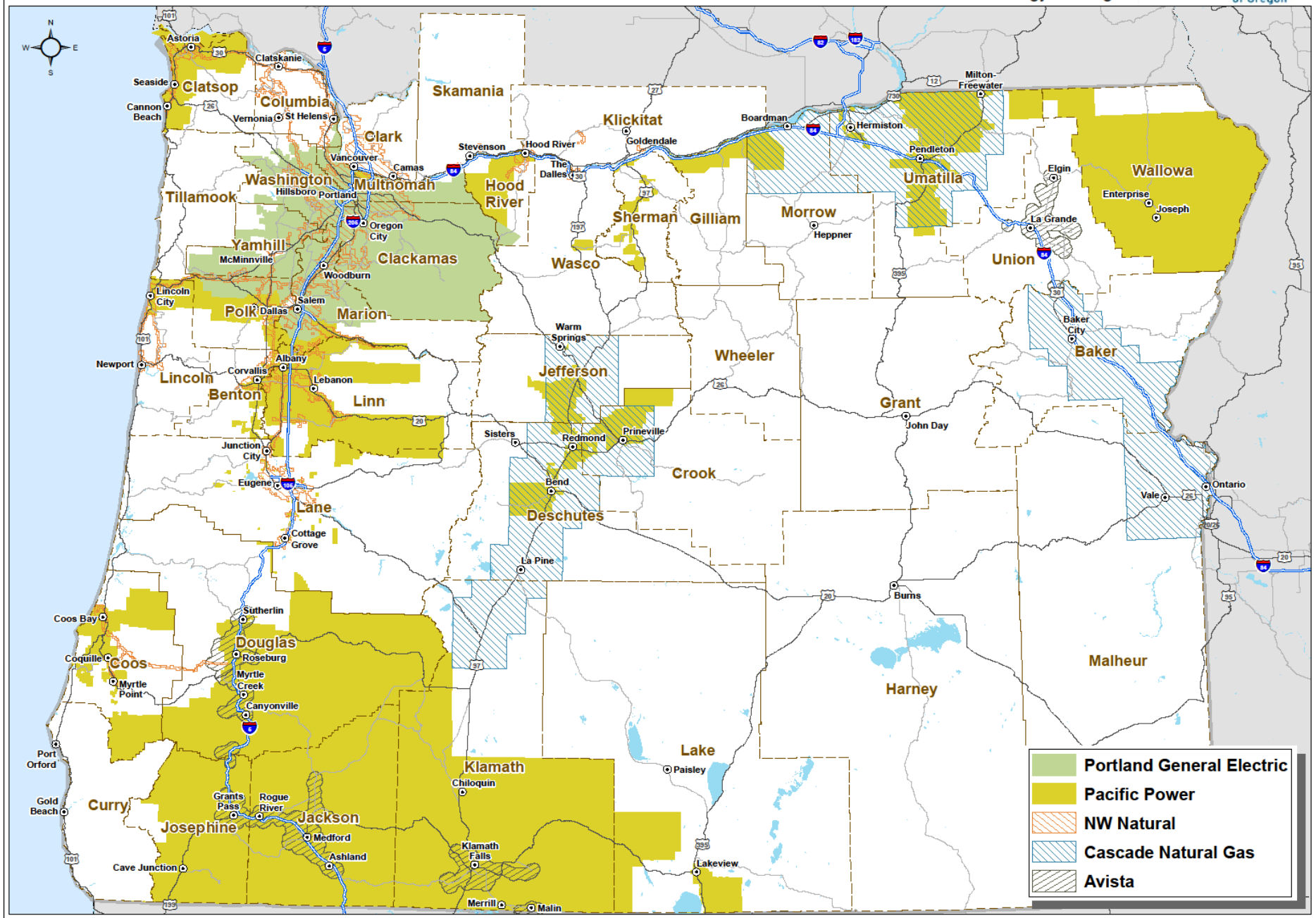
- Supports energy efficient improvements beyond code
- Works with trade allies from design phase through final verification
- Offers marketing and technical assistance, training and financial incentives

Energy Trust Service Territory

20 10 0 20 40 60 Miles

1.866.368.7878
energytrust.org

Energy Trust of Oregon



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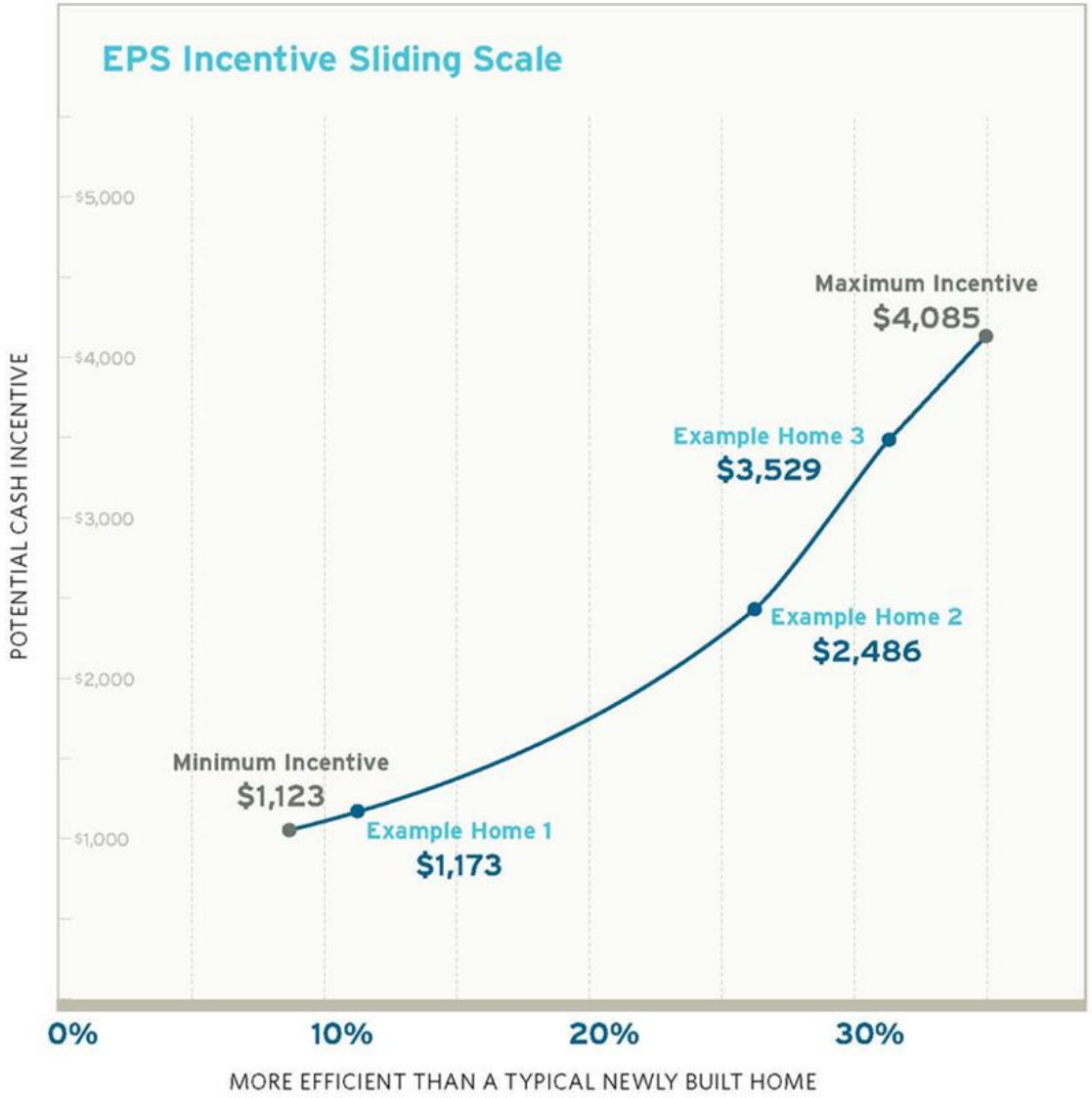
Builder participation

Work with an Energy Trust approved verifier

Sign up as an Energy Trust Trade Ally

Build to EPS requirements

Oregon builder cash incentives

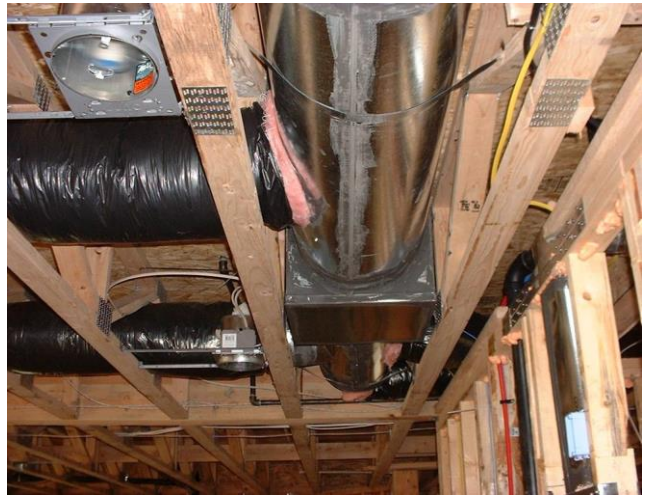


[EPS New Construction | Energy Trust Insider]

EPS New Construction—SW Washington

- EPS New Construction verification and modeling requirements identical to Oregon
- Washington code
  - Different savings baselines and incentive pathways than Oregon
- Homes must have gas heating to qualify
- Compatible with Clark PUD's Home Performance Program

45L & the Inflation Reduction Act



- The old 45L for projects through December 31, 2022
- $2,000 tax credit
  - Homes must be modeled with 50% energy savings for heating and cooling over the 2006 IECC
  - At least one-fifth of the energy savings had to come from building envelope improvements

NEW 45L Tax Credit

45L provisions under the Inflation Reduction Act:

- **10-year extension** of the tax credit
  - January 1st 2023, through December 31st 2032

Single-family or manufactured home tax credits

- **$2,500** per home certified **ENERGY STAR**
- **$5,000** per home certified **Zero Energy Ready Home**

Multi-family tax credits

- $500 per unit certified ENERGY STAR
  - Increases to $2,500 if prevailing wage requirements satisfied
- $1,000 per unit certified Zero Energy Ready Home
  - Increases to $5,000 if prevailing wage requirements satisfied

Thank you

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EPS New Construction Insider website