



TRI-COUNTY
REGIONAL ENERGY NETWORK

SAN LUIS OBISPO • SANTA BARBARA • VENTURA

Heat Pumps for Heating and Cooling – Part 2: All-Electric Design & Construction Series

*Jennifer Rennick, AIA, CEA
In Balance Green Consulting*

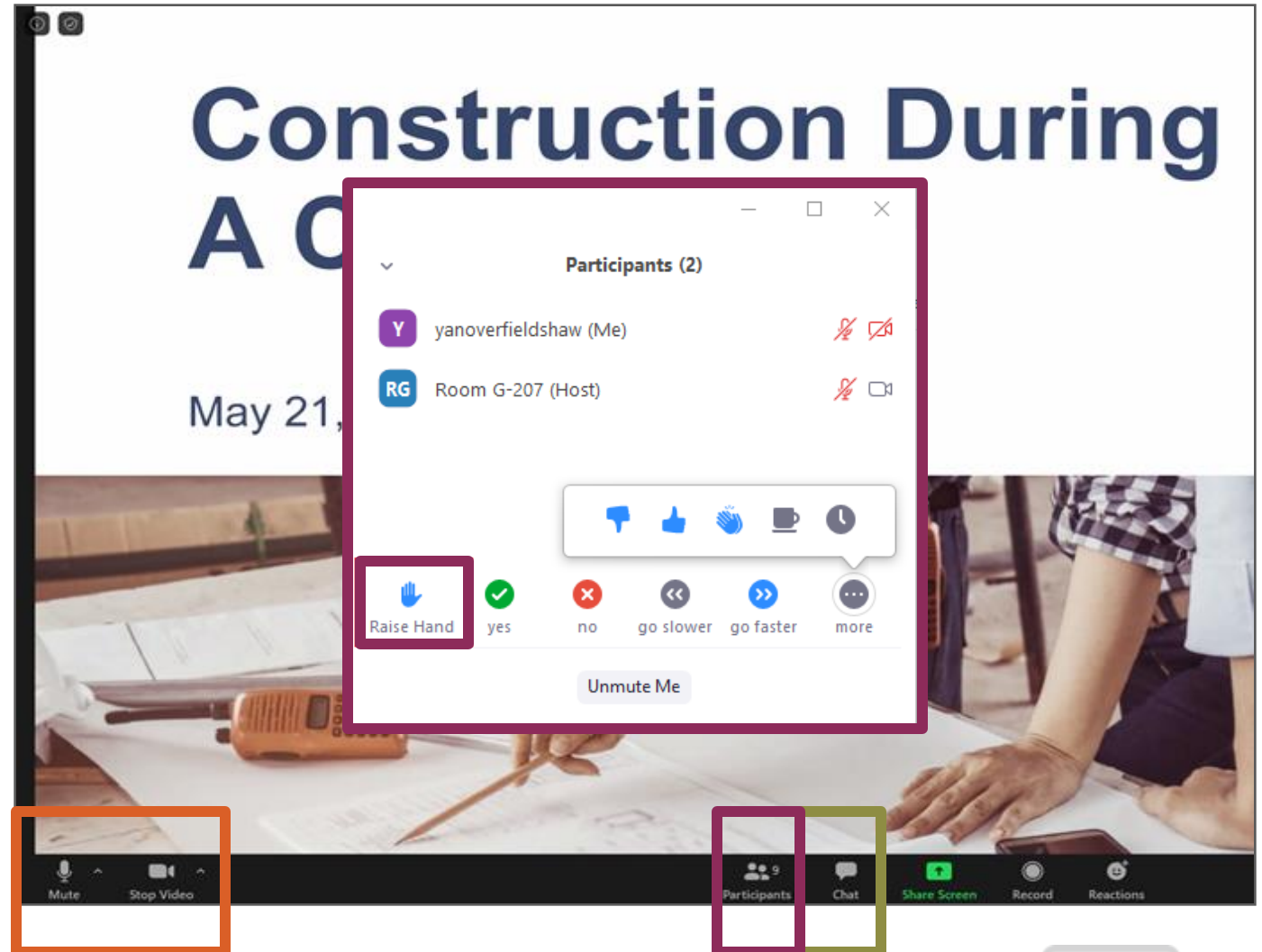
*Grant Murphy, CEA
In Balance Green Consulting*

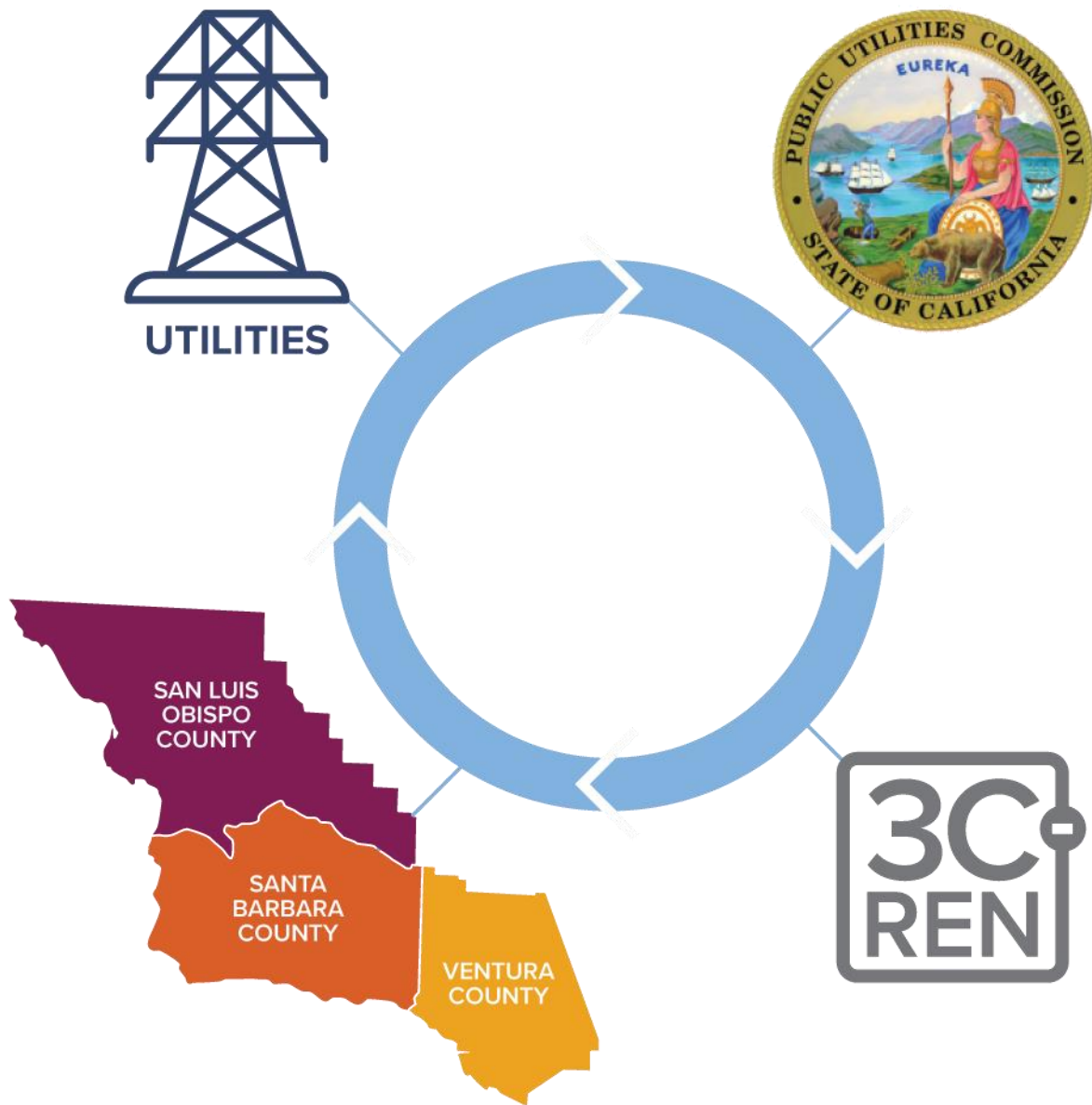
January 9, 2025



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



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

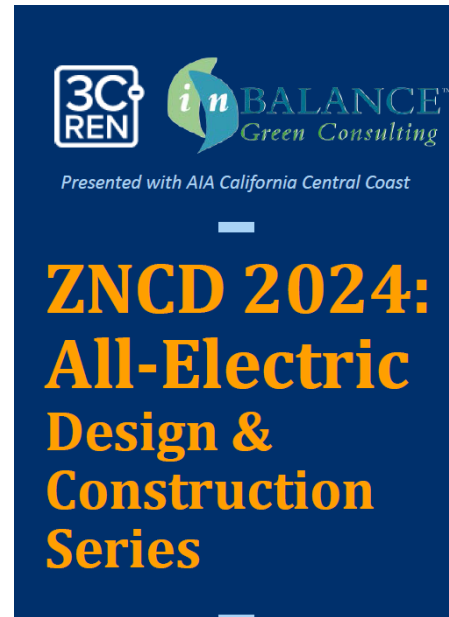


California Licensure & AIA Learning Units

- 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



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

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. Heat Pumps for Space Conditioning
3. Heat Pumps for the Consumer Market
4. Tips for Managing Client Expectations





ZNCD Buildings and California's Clean Energy Goals

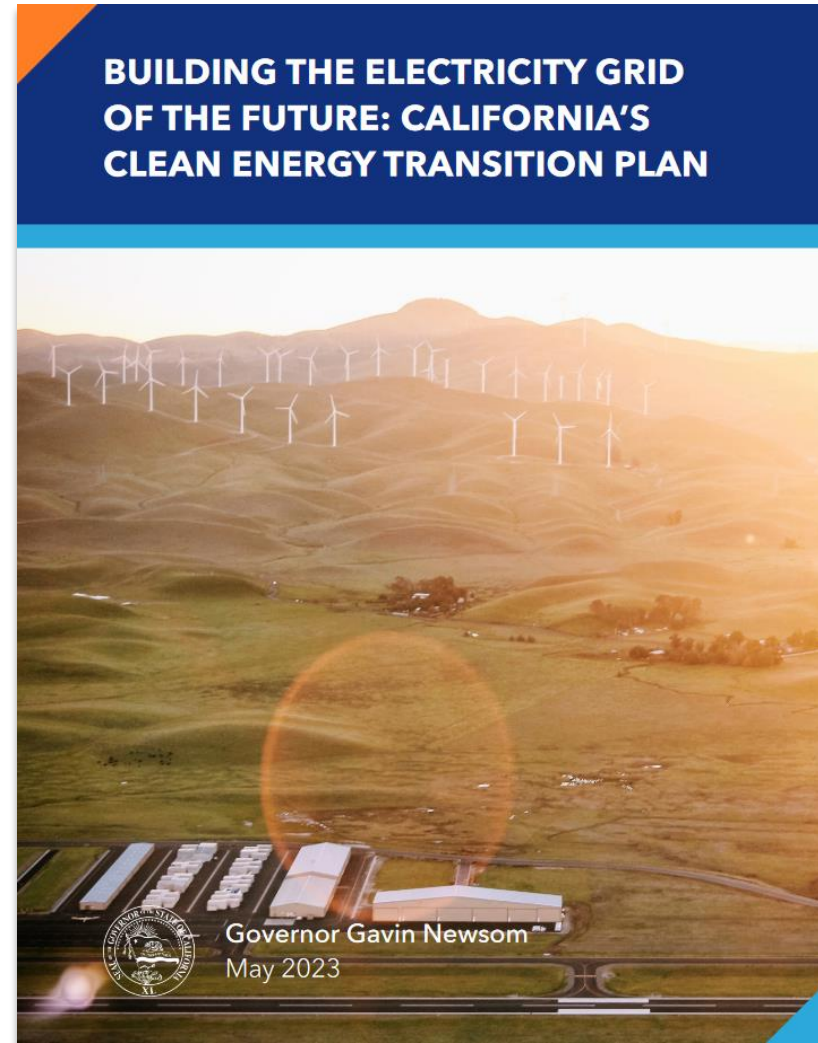


California Air Resources Board (CARB) - Mary D. Nichols Campus

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

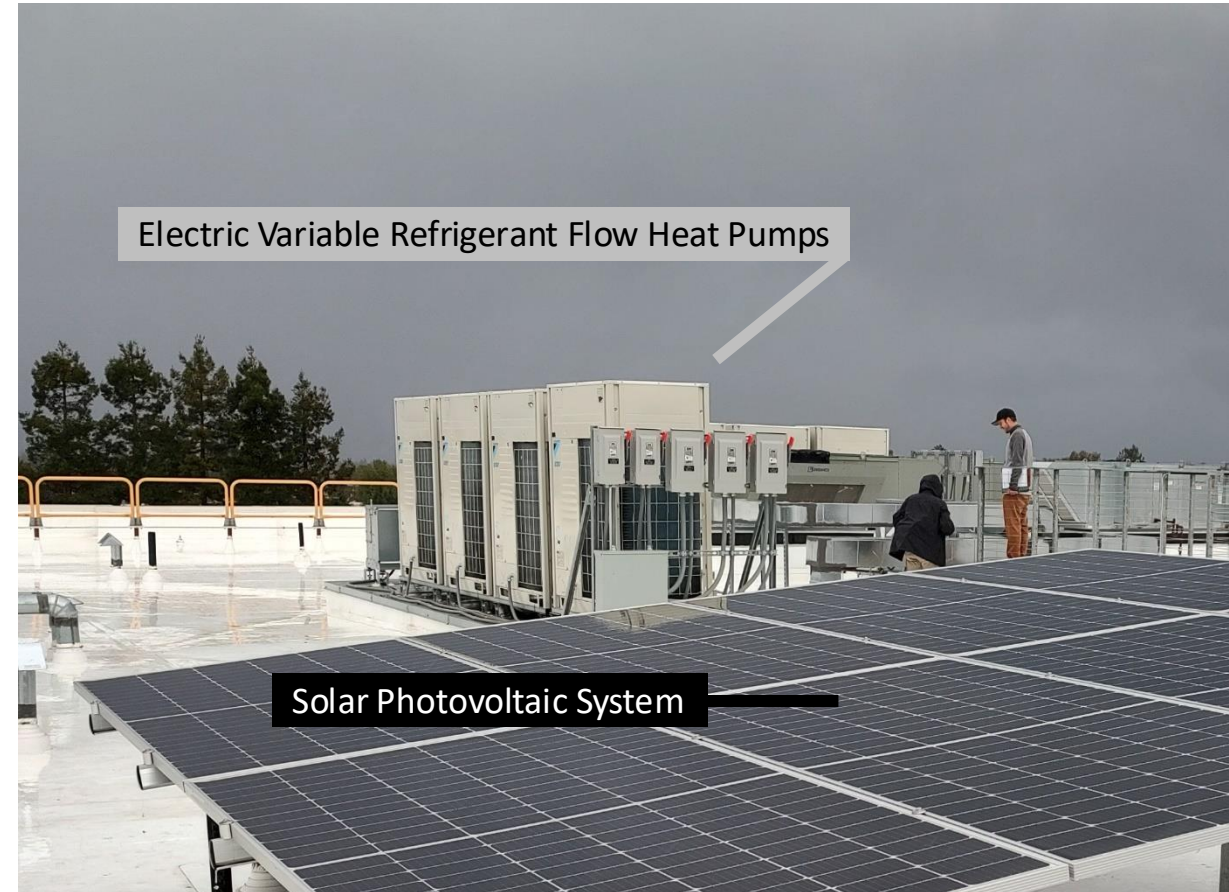


<https://www.gov.ca.gov/wp-content/uploads/2023/05/CAEnergyTransitionPlan.pdf>



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

- **New Construction** All-Electric is relatively easy, with some exceptions for large scale buildings and industrial applications
- **Existing Buildings** – Incremental opportunities for
 - HVAC Replacement
 - Appliance Replacement
 - On-site Solar and Batteries
 - Envelope Improvements
- **Existing Communities** – Infrastructure Approach
 - Decarbonize the Grid
 - Reduce Natural Gas Carbon Footprint



Morning Star Senior Living, San Jose, CA

Refrigerants and GWP

- Most heat pump equipment uses R-410A
- The American Innovation and Manufacturing (AIM) ACT calls for the phase out of refrigerants with a high GWP
- Under the AIM ACT, the EPA set a limit of 700 GWP for chillers, air conditioning, and heat pumps manufactured after Jan, 2025
- R-410A has a GWP of 2088...
- R-454B, with a GWP of 466, is being adopted by many manufactures
- R-32, with a GWP of 675, is slightly flammable – therefore most units using R-32 will have leak detection and a mechanism to clear the refrigerant



An ultra low GWP Refrigerant:
R-744 (CO2) has a GWP of 1



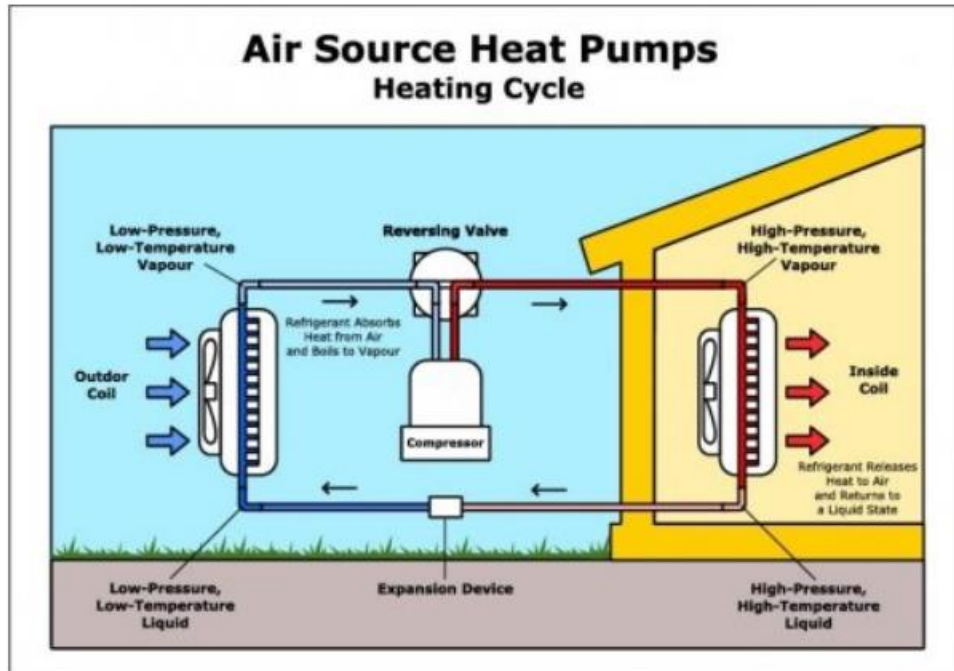


Heat Pumps for Space Conditioning



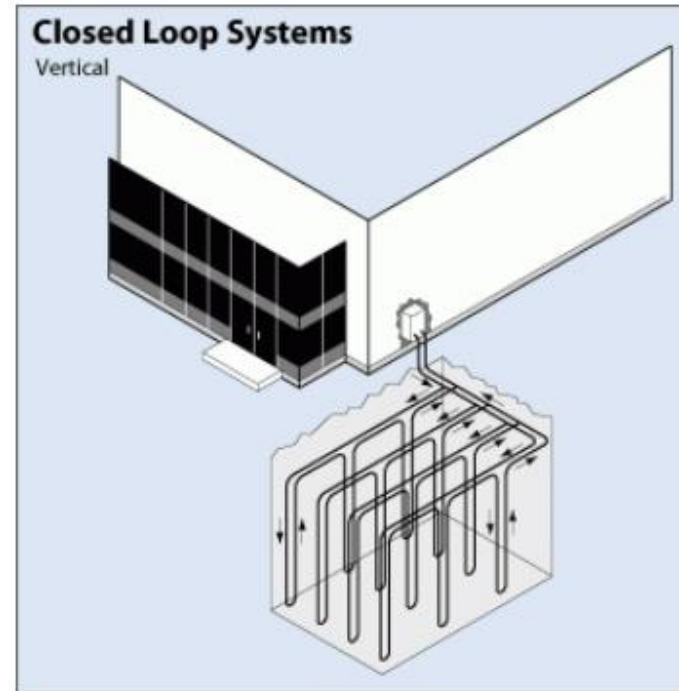
Types and Uses –Heat Pumps for Space Conditioning

■ Air-Source



<https://www.energy.gov/energysaver/air-source-heat-pumps>

■ Ground-Source / Geo-Thermal / Water-Source



Vertical systems are typical used in large commercial and school buildings where land area may be restrictive.

Holes approx. 4" dia are drilled about 20 ft apart and 100-400 ft deep.

A U-shaped pipe is grouted in place and connected to the building heat pump.

<https://www.energy.gov/energysaver/geothermal-heat-pumps>

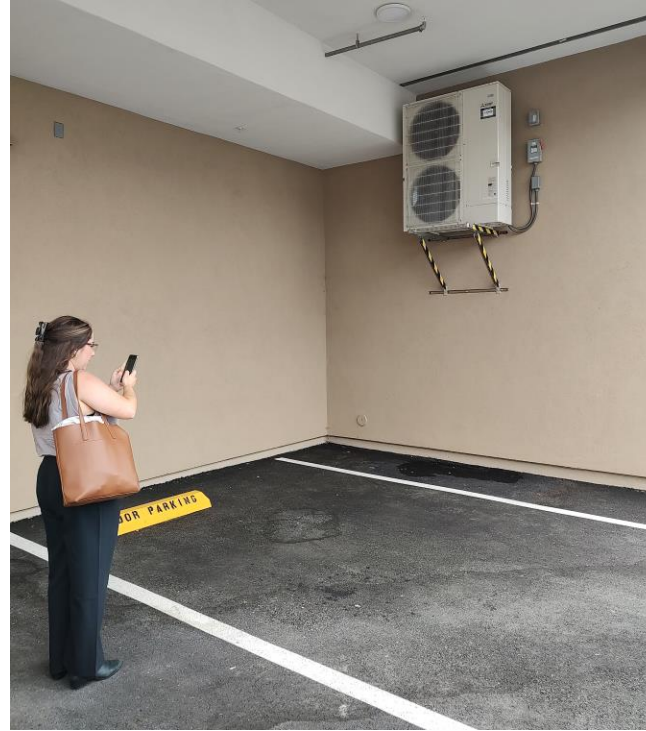


Heat Pumps –Where We Use Them

Small Scale Commercial and Residential –Single and Multifamily



Multi-family / Hospitality



Small Commercial / Non-Res



Residential

Heat Pumps –Where We Use Them

Large Scale and Commercial Applications

Source: www.mitsubishicomfort.com



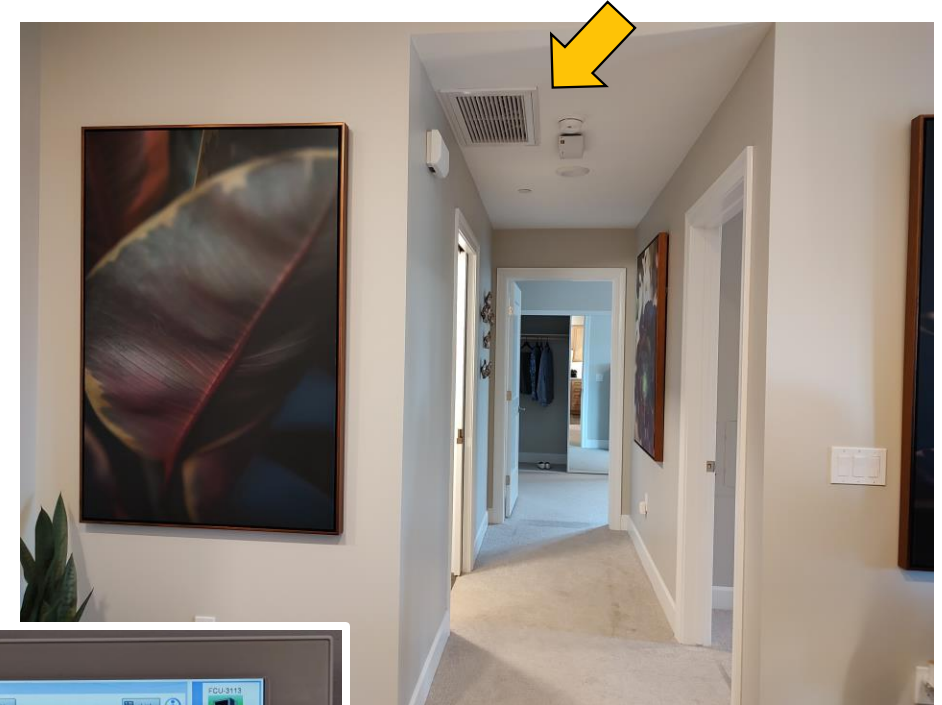
Office / Retail / Highrise



- Ducted and Ductless Systems
- Variable Capacity Systems
- Simultaneous Heating and Cooling

Heat Pumps –Where We Use Them

Multifamily / Senior Living –Ducted VRV/VRF



Indoor fan coil unit (FCU), i.e. ducted air-handler



Digital Building Control System –
Provides FCU monitoring for each dwelling



Heat Pumps –Where We Use Them

Small Commercial Multi-zone –Variable Refrigerant Flow (VRF)



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

Heat Pumps –Where We Use Them

Single zone systems –same building, different needs



Meeting /Flex Space –compact ducted system



Work Room – ductless wall mount unit

Heat Pumps –Where We Use Them

Hospitality / Hotel-Motel and Multifamily –package terminal air-conditioner (PTHP)



A ducted extension kit was used to heat/cool the adjacent bedroom



Heat Pumps – Where We Use Them

Space Conditioning Systems – Residential and Small Scale Commercial

■ Ducted Systems



■ Ductless Systems



■ Package System



Ductless 'Mini-Split' Heat Pump Overview

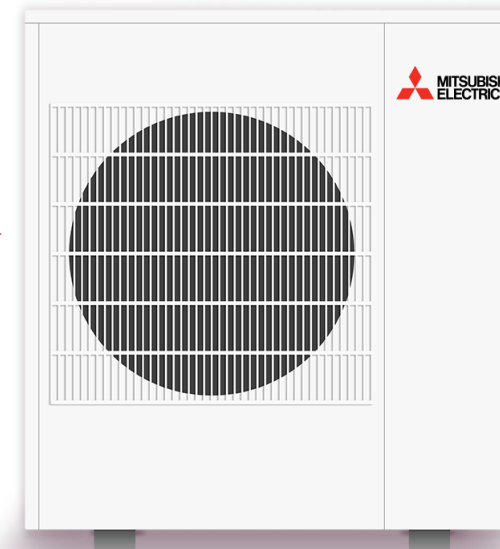
Indoor Unit –Head



Line Set Pair/Piping –Insulated Copper Refrigerant Tubing

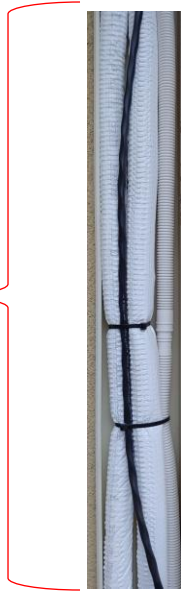
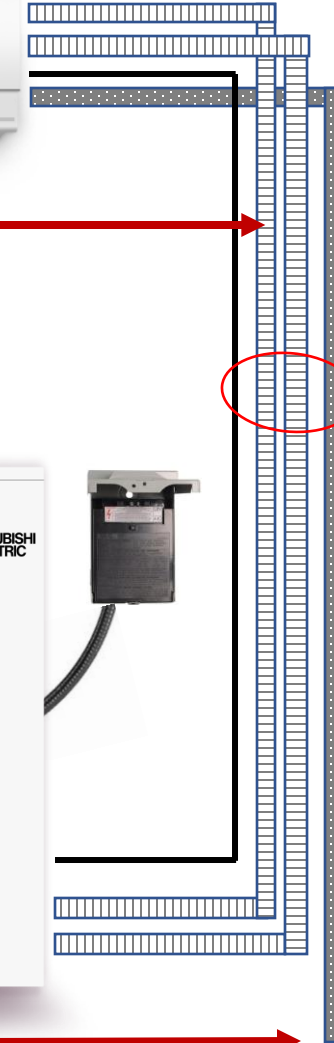
Power Cord – Connecting to the Indoor Unit (aka Communication Wire)

Outdoor Unit, i.e.
Compressor/Condenser

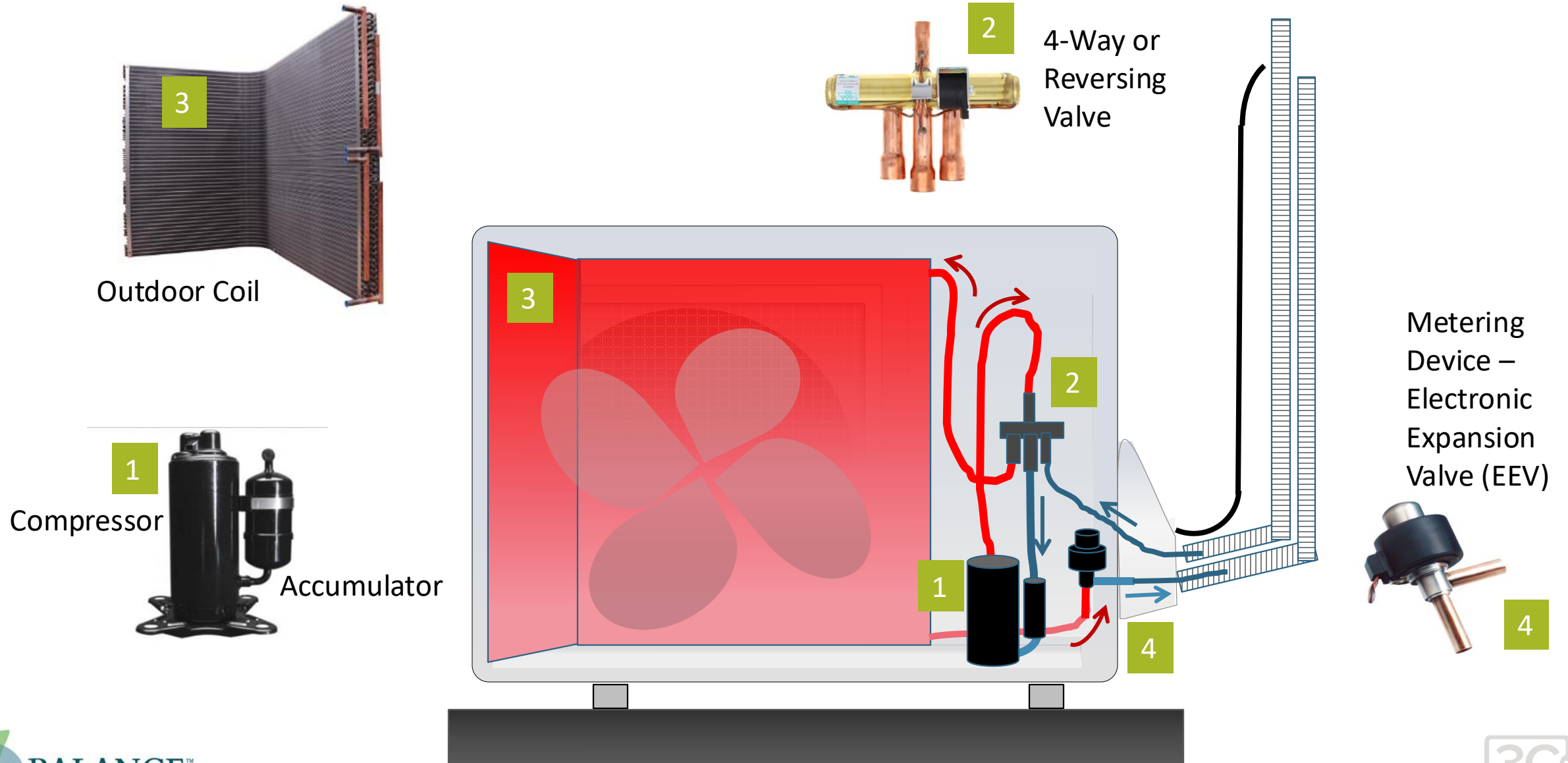


Electrical Connection (110 or 230v, 20 amp to 40 amp Breaker)

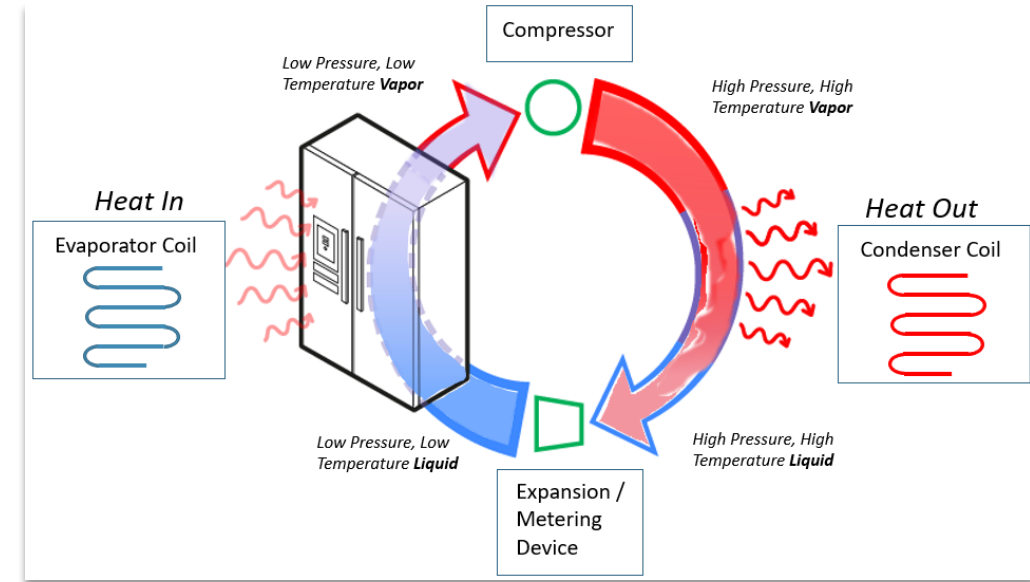
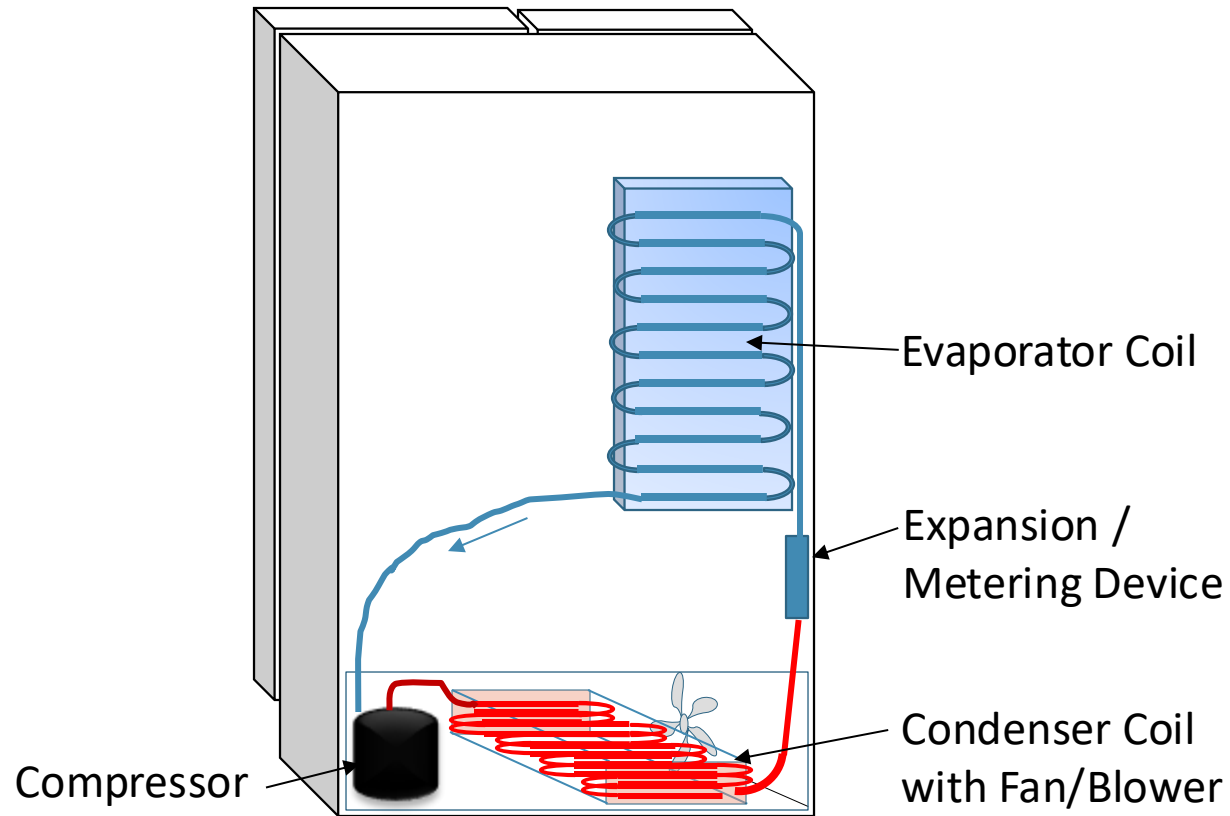
Condensate Line –Drain Hose



The Mini-Split – Some Basic Components of Outdoor Unit



Refrigerator – Simplified Components



Distribution – Ducted



- Locate indoor equipment in garage or equipment room
- Long duct runs: soffits, chases, pathways similar to gas FAU's
- Can theoretically utilize existing ducts in reno/remodel



Distribution – Concealed Duct



- Often located in attic or conditioned crawl space
- Multiple locations for large homes, multi-family, and commercial
- Shorter duct runs from indoor unit
- Vents appear like typical HVAC grilles in walls or ceilings

Distribution - Ductless



Image: Mitsubishi



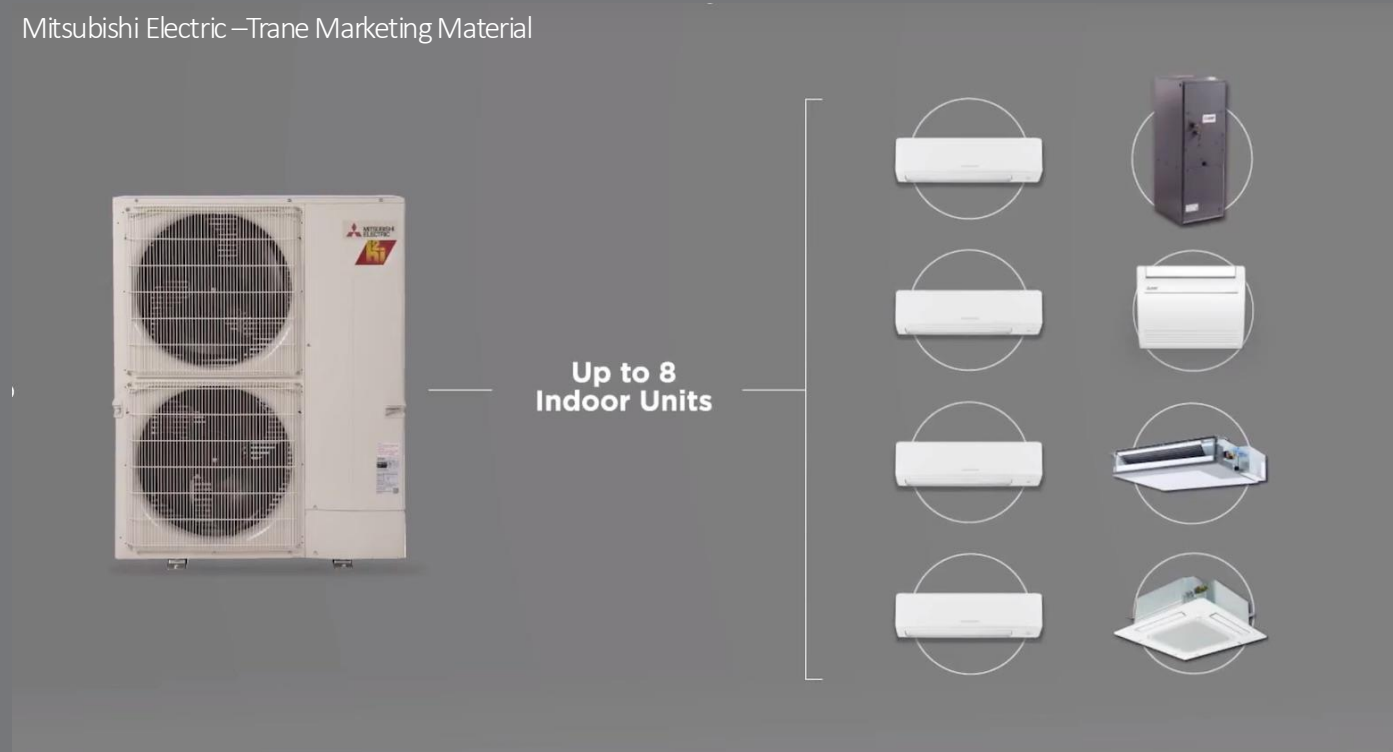
- Minimal space use
- Ceiling mount between joists
- Wall mount possible to conceal in furniture & built-ins
- +/- 20 SEER; +/- 15 EER





A Closer Look at Heat Pumps for the Consumer

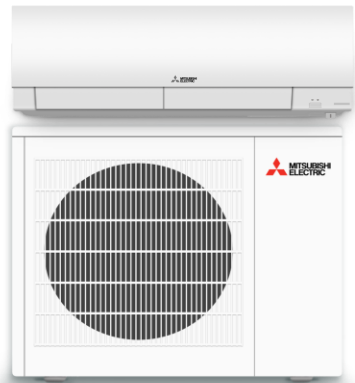
Mitsubishi Electric –Trane Marketing Material



Sizes and Options: Ductless and Ducted,
Single Zone and Multi-Zone

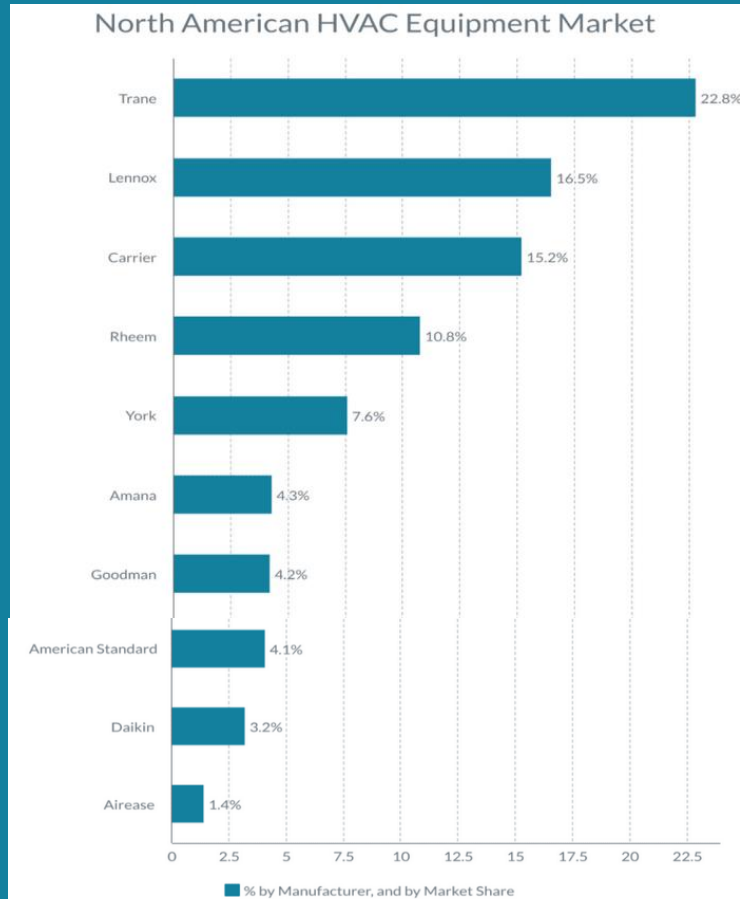
The Current Market

Many to Choose from... Full Service HVAC Installs to DIY Kits



Global Market Expected to Grow 40% by 2030

- Approx 218 brands of heat pumps are available in North America alone
- The top 10 manufactures control approx. 85% of the North American HVAC Market



The data source for this information is the 2020 ACHR News Magazine HVAC Market Report.

<https://buildops.com/commercial-construction/north-american-hvac-equipment-market-chart/>

- Manufacture's market share is constantly shifting, as the parent companies buy, sell and team up with other companies/brands.

www.reuters.com

July 23, 2024 (Reuters) - Robert **Bosch** has agreed to acquire **Johnson Controls'** and **Hitachi's** residential and light commercial heating, ventilation, and air conditioning businesses.

Bosch said it expects the **global market for the heating and cooling of buildings to grow 40% by 2030**, driven by technological progress, the fight against climate change and new regulations.

Common Brands Available in Calif Central Coast –Retailers

Home Depot

TURBRO	Pioneer
Tosot	MRCOOL
boreal	GREE
AUX	BHI
Bonaire Durango	Ramsond
Costway	DuctlessAire
Bosch	COOPER & HUNTER
Karl home	Hessaire

Lowe's

- | | |
|--|--|
| ☐ MRCOOL | ☐ LG |
| ☐ Celiera | ☐ LLOYD |
| ☐ Amana | ☐ OLMO |
| ☐ BHI | ☐ Premium Levella |
| ☐ Bosch | ☐ Whirlpool |
| ☐ Keystone | ☐ BONAIRE |
| ☐ Winado | ☐ Friedrich |
| ☐ DuctlessAire | ☐ Costway |
| ☐ GE | ☐ BLACK+DECKER |
| ☐ AUX | ☐ EdenDirect |
| ☐ Arctic Wind | ☐ Equator Advanced Appliances |
| ☐ LG Electronics | ☐ Frigidaire |
| ☐ Cooper & Hunter | ☐ Hisense |

Fergusons Supply House

- | | |
|--|---|
| ☐ Friedrich Air Conditioning (133) | ☐ Parker Hannifin (2) |
| ☐ Advanced Distributor Products (7) | ☐ DiversiTech® (1) |
| ☐ Supco (7) | ☐ Service First (1) |
| ☐ Rheem (4) | ☐ Spacepak (1) |
| ☐ Goodman® (2) | ☐ Stylecrest Sales (1) |
| | ☐ Trane (1) |

Through Professional Installers

Mitsubishi
Fujitsu
Daikin
Samsung

Costco On-line

MRCOOL

Manufacturer's 'Kits' Are Becoming More Common

Purchased by Professionals and Laypeople:

- Ensures Compatible Indoor and Outdoor Units
- Includes:
 - Remote Thermostat
 - Condensate Line
 - Refrigerant Line
 - Communication Wire/Line
- Some kits include tape, putty (patching holes), etc.
- Additional kits can include surge protectors and/or electrical disconnect

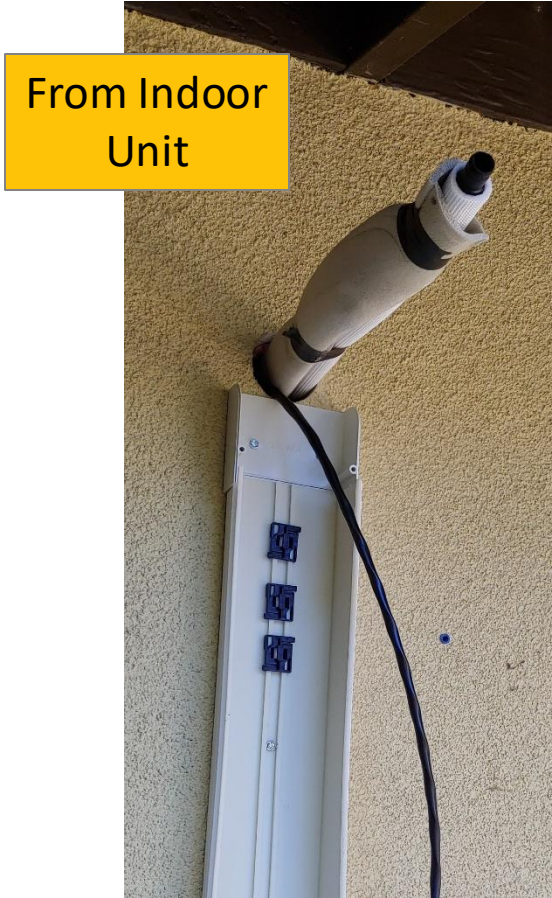


Typical Disclaimer: Equipment should be sized, selected and installed by a qualified professional to ensure proper installation, function, safe operation, adherence to federal, state and local codes and for valid warranty; see installation guide and manufactures warranty statement for more details

Popularity of Wall Mount –Ease of Installation



Out of the Box –Backside



Items and Features that Impact Purchase Price

- **Promotional Pricing**
- **Indoor Sound Rating:** “Very Quiet” ~22 dB(A)
more expensive
- **Efficiency –HSPF2 and SEER2:** Higher efficiency costs more, EnergyStar qualifies for Tax Credit
- **Rated Heating Capacity (BTU):** Higher capacity cost more
- **Cold Temp Limit:** “Low Ambient Temperature” units cost more, “Hyper Heat” cost the most
- **Electrical Voltage:** 230/240V less expensive than 115/120V units
- **Refrigerant Line:** Longer lengths cost more

Promotional Pricing Look for Sales and Deals

 32% OFF	 10% OFF	 29% OFF
Pioneer Diamante Ultra Indoor Section Ductless Mini- Spli...	MrCool Advantage 4th Gen 9K BTU Ductless Mini- Spli...	Goodman E-series Mini Split 9,000 BTU 18 SEER Single...
\$303.00 \$450	\$814.50 \$905	\$748.60 \$1,064
 Pioneer Mini S... , 2+	 Home Depot, 10+	 Mini Split Systems...
 Free by 8/19	 Free delivery	 Free delivery

Additional Items for a Complete Job

Better Quality Install and Site Specific Items

- **Insulation** –Refrigeration Lines
- **Exterior Line Set Covers**
- **Outdoor Unit Mounting Options:**
Ground Mount Pads, Racks, and Hangers, etc.
- **Hardwired thermostats, Smart Controls**
- **Electrical Work**
(power/breaker/junction box-shut off)



New Construction: Line Set Built-In to Wall

Remodel:
Exterior Line Set Cover



Single Zone Kit Example –Pioneer \$

- **Cost Range:** 9,000 Btu, Single Zone \$728 - \$1630
- **Installation Not Included** –Add between \$1200-\$4500 for equipment and another \$750-\$1400 for electrical
- **Availability:** Home Depot, Lowe's, direct manufacture's website, other on-line shops
- **Requires Professional Installation:** Yes, refrigerant line evacuation and brazed flare fit connections*
- **EnergyStar:** Yes, some models –Potential Tax Credit
- **Special Features:** LED Readout on Front Cover
- **Warranty:** 5 yr Standard (Options to extend to 7yr parts and 10 yr compressor)



*Note: These refrigerant line systems need a licensed professional with specialized tools.



Single Zone Kit Example –Pioneer \$

- **Efficiency:**
 - SEER2: Range 19 – 25.5
 - HSPF2 Region IV: Range 8.6 – 12
- **Sound Range:** 21.5 – 42 dB(A)
- **Fan:** 3 speed, 4 speed, variable
- **Cold Temp Range:**
 - +4 deg F
 - -13 deg F
 - -22 deg F
- **Sizing Guide Estimate:** Website includes interactive drop down menu guidance
 - Single Zone 9,000 BTU: 100-400 sf space
- **Color/Style Options:** White



*Note: These refrigerant line systems need a licensed professional with specialized tools.



Single Zone DIY –MRCOOL DIY Example \$\$

- **Cost Range:** 9,000 Btu, Single Zone \$1250 - \$1699
- **Installation Not Included** –Depending on your skill set budget for professional assistance, especially for electrical work.
- **Availability:** Home Depot, Lowe's, Costco, On-Line
- **Requires Professional Installation:** Not Necessarily, DIY Pre-charged refrigerant lines with No-Vac Quick Connect*
- **Electrical:** 115V / 120V
- **EnergyStar:** Yes, for Southern States Region –Tax Credit
- **Special Features:** “Follow Me” Function, WiFi enabled; Leak detection; some units come with a corrosion resistance coating for coastal climates
- **Color/Style Options:** White
- **Warranty:** 2 yr parts and 1 yr compressor



*Note: MRCOOL also makes a “HVAC-pro” line of products and states that those units should be installed by an authorized technician and are not intended for amateur installations.



Single Zone DIY –MRCOOL DIY Example \$\$

- **Efficiency:**
 - SEER2: Range up to 21.7
 - HSPF2 Region IV: Range up to 9.1
- **Sound Range:** 22 – 38 dB(A)
- **Fan:** 4 speed, variable
- **Cold Temp Range:**
 - +5 deg F
- **Sizing Guide Estimate:** Table based on square footage available on website
 - Single Zone 9,000 BTU: 180-375 sf space
- **Color/Style Options:** White



*Note: MRCOOL also makes a “HVAC-pro” line of products and states that those units should be installed by an authorized technician and are not intended for amateur installations.



Built-Up Single Zone –Mitsubishi MSZ-GS Example \$\$\$

- **Cost Range:** 9,000 Btu, Single Zone \$1600 - \$1950
- **Installation Not Included** –Add between \$3500-\$5000 for equipment and another \$1000-\$1400 for electrical
- **Availability:** Through your Installing Contractor
- **Requires Professional Installation:** Yes, refrigerant line evacuation and brazed flare fit connections*;
- **Electrical:** 208V / 230V
- **EnergyStar:** Yes, Fed Tax Credit; and California Tech Rebate
- **Special Features:** ‘Whisper Quiet’ mode; Anti-corrosion treatment on the coils; Unit's interior air duct/vane, coil and fan features dual barrier coating, which maintains efficiency by keeping the inside clean
- **Warranty:** Standard 7yr parts and 10 yr compressor. Extend to 12 yrs/12yrs if installed by Mitsubishi Diamond Contractor and register for product warranty.



*Note: These refrigerant line systems need a licensed professional with specialized tools.



Built-Up Single Zone –Mitsubishi MSZ-GS Example \$\$\$

- **Efficiency:**

- SEER2: 28.4
- HSPF2 Region IV: 10.9

- **Sound Range:** 19 – 43 dB(A)

- **Fan:** 5 Speed, variable

- **Cold Temp Range:**

- +5 deg F

- **Sizing Guide Estimate:** N/A

- **Color /Style Options:**

- 'Designer' Colors (Black, Grey, White) and Slim Styles Available



MSZ-EF
Wall-mounted Unit

*Note: These refrigerant line systems need a licensed professional with specialized tools.



Rough Cost Comparison of Ceiling Recess vs Wall Mount

MRCOOL DIY Example

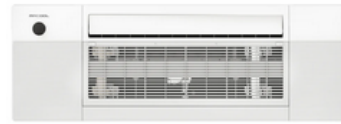


MRCOOL DIY Mini Split – 18,000 BTU 2 Zone Ceiling Cassette Ductless Air Conditioner And Heat Pump With 16 Ft. And 25 Ft. Install Kit, DIYM218HPC00C01

MRCOOL

★★★★★ 6 reviews

\$4,164.00 ~~\$5,205.00~~



MRCOOL DIY Series 9K BTU Ceiling Cassette, DIYCASSETTE09HP-230C25

\$1,495
\$1,177



MRCOOL DIY 4th Generation 9K BTU Wall Mount Air Handler 230 Volt with Enhanced WiFi, DIY-09-HP-WMAH-230C25

\$1,449
\$442



MRCOOL DIY Mini Split – 18,000 BTU 2 Zone Ductless Air Conditioner And Heat Pump With 16 Ft. And 25 Ft. Install Kit, DIYM218HPW00C01

MRCOOL

★★★★★ 28 reviews

\$2,694.00 ~~\$3,199.00~~

Key Differences:

- Promotional Pricing – Equipment Only
- Labor Costs – Ceiling vs Wall Mount
- Condensate Line – Drainage Path

Rough Cost Comparison of a 3-Zone Ductless vs Ducted Core Components –Mitsubishi 24 kBTu Example

- 3 Indoor Units or a Ducted Central System?
- Efficiency of System – Ducts in Attic or in Conditioned Space?
- Thermostats / Zoning
- Installation Costs:
 - Labor
 - Additional Materials
 - Ducts vs Ductless



Mitsubishi 24,000
BTU 20 SEER 3-
Zone Ductless Mi...
\$4,698.00



Mitsubishi - 24k
BTU Cooling +
Heating - P-Series
Multi-Position Air
Handler Air...
\$5,187.00



Mitsubishi - 24k BTU
Cooling + Heating -
M-Series Multi-...
\$4,510.20

*Note: These refrigerant line systems need a licensed professional with specialized tools.

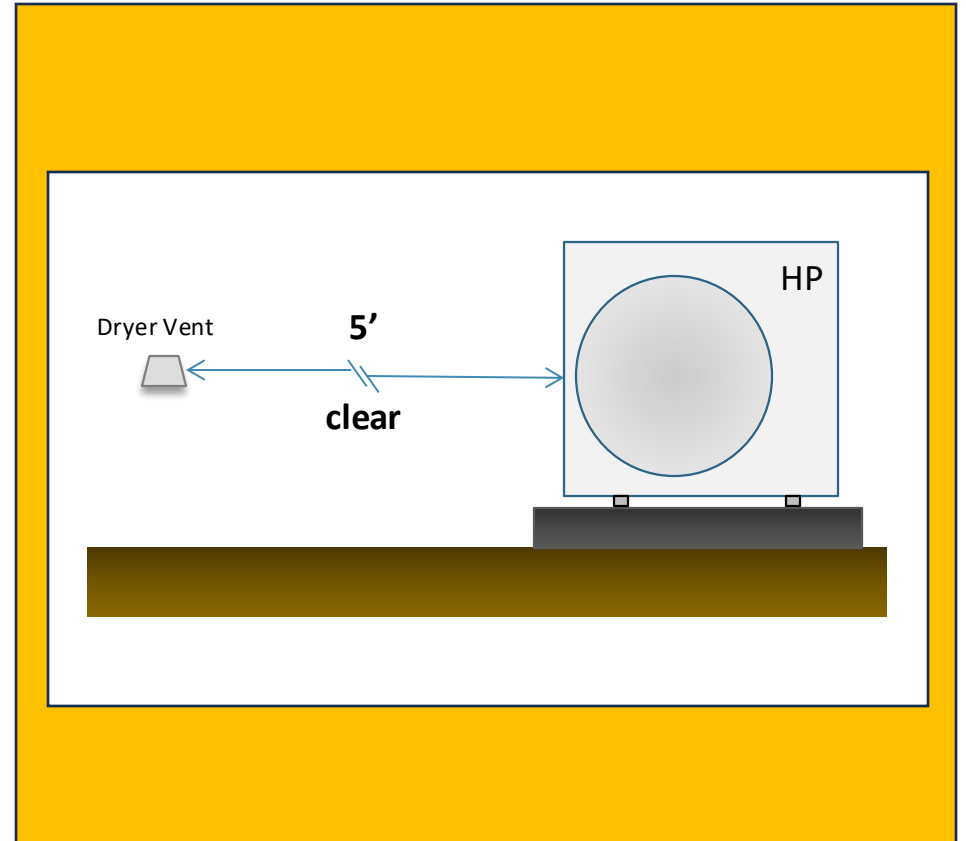




Tips for Managing Client Expectations and Title 24 for Residential Occupancies

Managing client expectations

- **DIY and Kits with set line lengths:**
 - Coil **horizontally in the attic** vs outdoors
 - **Avoid** coiling extra line *vertically*
- **Outdoor Unit:** Locate at least 5 ft away from dryer vents
- **Owner Maintenance:** Some manufactures recommend cleaning the filters **every two weeks** and some come with an LED reminder on the front cover
- **Owner Operation:** Set the thermostat and leave it; don't turn it off and on daily like an old-school furnace/AC
- **Professional Maintenance:** Most manufactures recommend a professional check-up **once a year**



Owner Maintenance –Clean Filters Regularly



Under the Hood –with dirty Filters

**POOR
PERFORMANCE**



Dirt and Dust
Build-up



Under the Hood –with clean Filters

**Excellent
PERFORMANCE**



Clean and Clear

- Wall Mount Units –Filters are easy to remove
- Filters can be cleaned with a light vacuuming and with a water rinse
- Some brands offer accessory allergy enzyme filters and/or PM2.5 microfilters



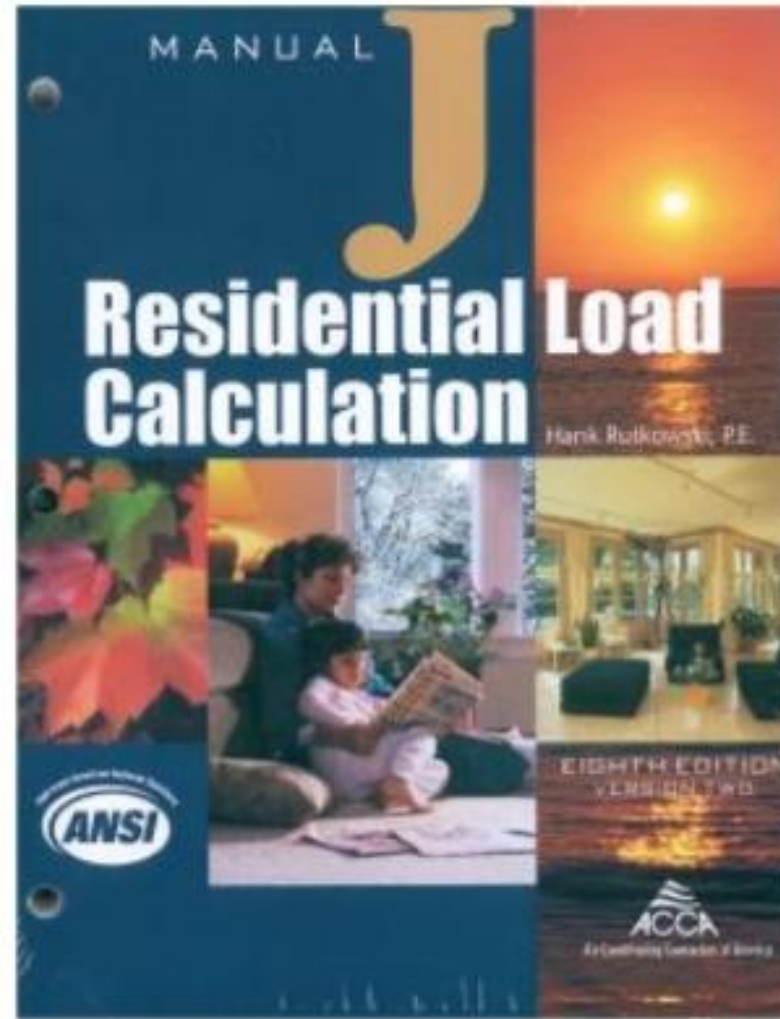
Right Sizing the System

Hire a Professional –Title 24 Required

- ACCA Manual J Load Analysis
- ASHRAE Load Analysis

Manufacture's Resources

- “Rules of Thumb” System Sizing
 - Some use a Table based on Floor Area
 - Some have more detailed assumptions in a pull down menu form
- System Component Compatibility

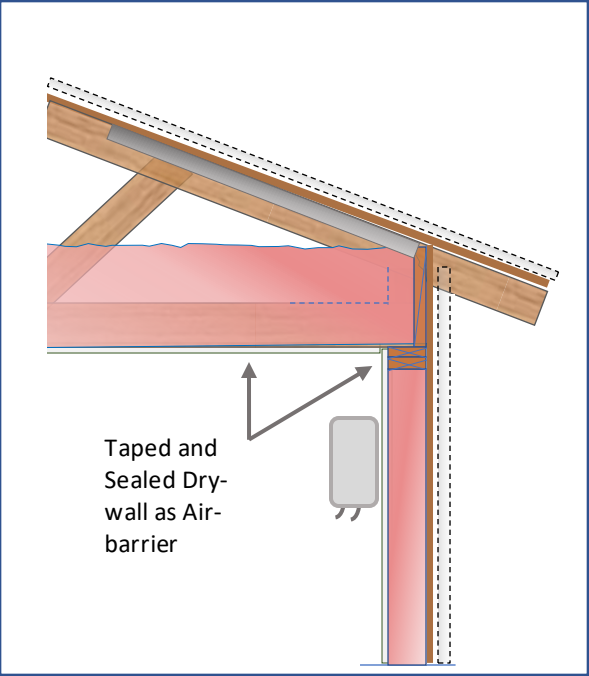
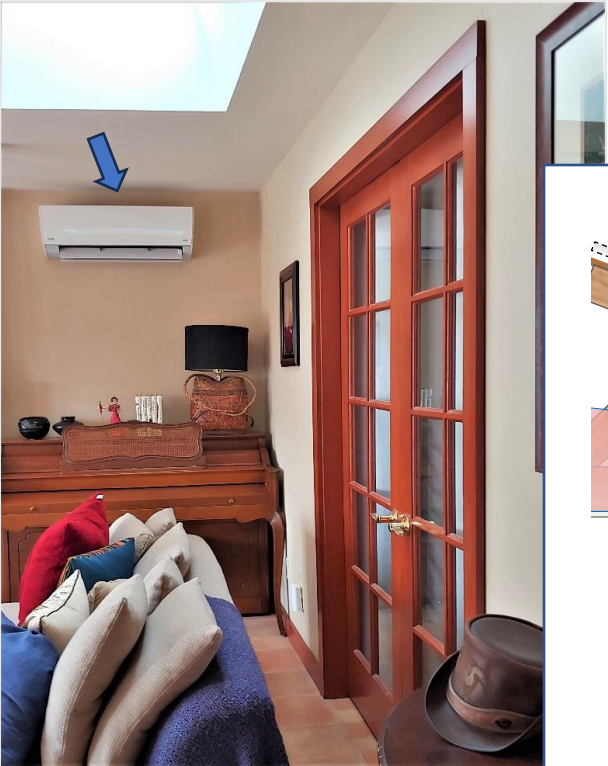


- ACCA Manual J is an approved method for properly sizing the mechanical equipment.
- The computer model includes the location (climate data) and orientation, envelope assemblies, infiltration, etc.

VCHP Compliance Option –Variable Capacity Heat Pump

Indoor units shall be installed within the air and thermal boundaries, with air flow to each habitable room, i.e. each bedroom and living area; wall thermostats required.

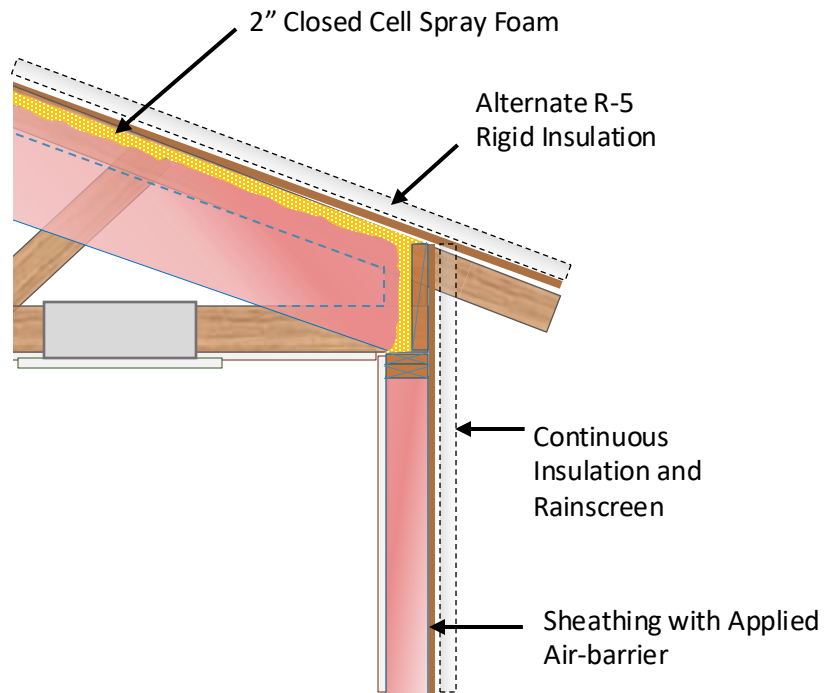
CERTIFICATE OF VERIFICATION		CF3R-MCH-33-H		
Variable Capacity Heat Pump Compliance Credit		(Page 2 of 4)		
C. Verification: Ducted Indoor Units Located Entirely in Directly Conditioned Space - RA3.1.4.3.8				
This section does not apply to this project.				
D. Verification: Ductless Indoor Units Located Entirely in Directly Conditioned Space - RA3.1.4.1.8				
A visual inspection shall confirm that ductless indoor units are located entirely in conditioned space in accordance with the procedures of SC3.1.4.1.8.				
01	02	03		
Indoor Unit Name or Description of Area Served	Indoor Unit Installation Location Verification	Compliance Statement		
Living Unit	Indoor unit mounted entirely on the surface of walls, ceilings, or floors	Complies		
Right Bed Unit	Indoor unit mounted entirely on the surface of walls, ceilings, or floors	Complies		
Left Bed Unit	Indoor unit mounted entirely on the surface of walls, ceilings, or floors	Complies		
Notes:				
E. Verification: Wall Mounted Thermostats - SC3.4.5				
Field verification according to the procedure in SC3.4.5 shall confirm that VCHP space conditioning zones that are greater than 150 ft ² , are controlled by a permanently installed wall-mounted thermostat.				
01	02	03	04	05
Indoor Unit Name or Description of Area Served	Is a Wall-mounted Thermostat Installed in the Zone Served by the Indoor Unit?	Does the Thermostat Control the Zone's Indoor Unit?	Is the Thermostat Mounted Permanently to the Wall?	Compliance Statement
Living Unit	Yes	Yes	Yes	Complies
Right Bed Unit	Yes	Yes	Yes	Complies
Left Bed Unit	Yes	Yes	Yes	Complies
Notes:				



Vented Attic with a Continuous Air and Thermal Boundary

VCHP Compliance Option –HERS Measures for both Mechanical and Envelope Enclosure

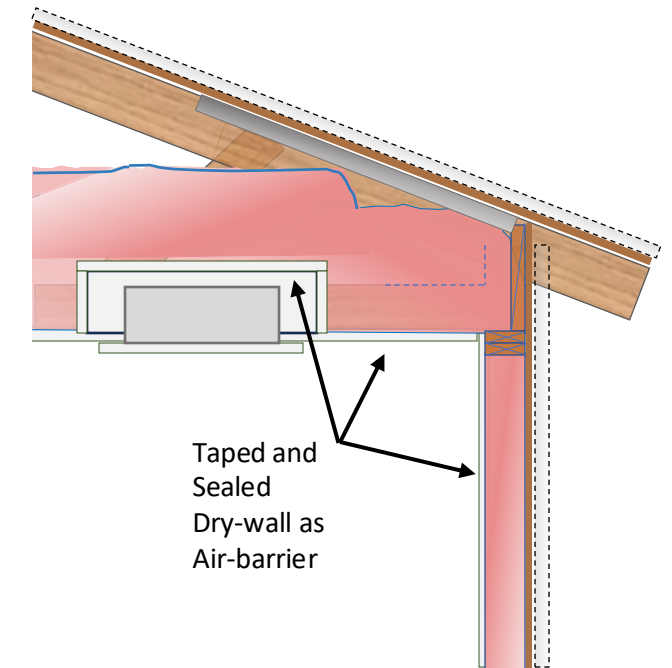
Wall and Ceiling Penetrations for the Mechanical System Refrigerant, Condensate, and Communication Lines need to be Air Sealed.



Unvented Attic with a Continuous Air and Thermal Boundary



Ductless Recessed-Ceiling



Vented Attic with a Continuous Air and Thermal Boundary

Refrigerant Charge Verification – Required HERS Measure

Straight forward to verify when the HERS Rater can observe the process.



CALIFORNIA ENERGY COMMISSION

REFRIGERANT CHARGE VERIFICATION

CEC-CF2R-MCH-25-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:

A. System Information

Each system requiring refrigerant charge verification will be documented on a separate certificate.

01	Space Conditioning System Identification or Name	
02	Space Conditioning System Location or Area Served	
03	Condenser (or package unit) Make or Brand	
04	Condenser (or package unit) Model Number	
05	Nominal Cooling Capacity (tons) of Condenser	
06	Condenser (or package unit) Serial Number	
07	Refrigerant Type	
08	Other Refrigerant Type (if applicable)	
09	Liquid Line Filter Drier Installed According to Manufacturer's Specifications (if applicable)	
10	System Installation Type	
11	Fault Indicator Display (FID) Status (Note: Even systems with a FID must have refrigerant charge verified by installer)	
12	Is the system of a type that the minimum airflow can be verified for all indoor units using an approved measurement procedure (RA3.3 or RA3.3.3)?	



Installing Contractor

Heat Pump – Outdoor Unit

Refrigerant

Recommend Listing the VCHP Credit 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'

EXAMPLE PROJECT
4630 NOGALES AVE., ATASCADERO, CA 93422
INITIAL SUBMITTAL DATE: _____
PIET # _____

GENERAL NOTES

PROJECT DATA

SHEET INDEX

GOVERNING CODE

SUPPORTING DOCUMENTS

VICINITY MAP

SUPPORTING DOCUMENTS

- TITLE 24 ENERGY REPORT
- NOTE: HERS MEASURES REQUIRED ON THIS PROJECT:
 - ALL PIPES INSULATED -HERS
 - EQUIPMENT VERIFICATION -HERS
 - VCHP - CREDIT

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:

- Domestic Hot Water – Part 3: All Electric Design and Construction (1/16)
- Introduction to the Energy Code (1/22)
- Ventilation and HRV – Part 4: All Electric Design and Construction (1/23)
- Appliances and Energy Storage – Part 5: All Electric Design and Construction (1/30)

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



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

