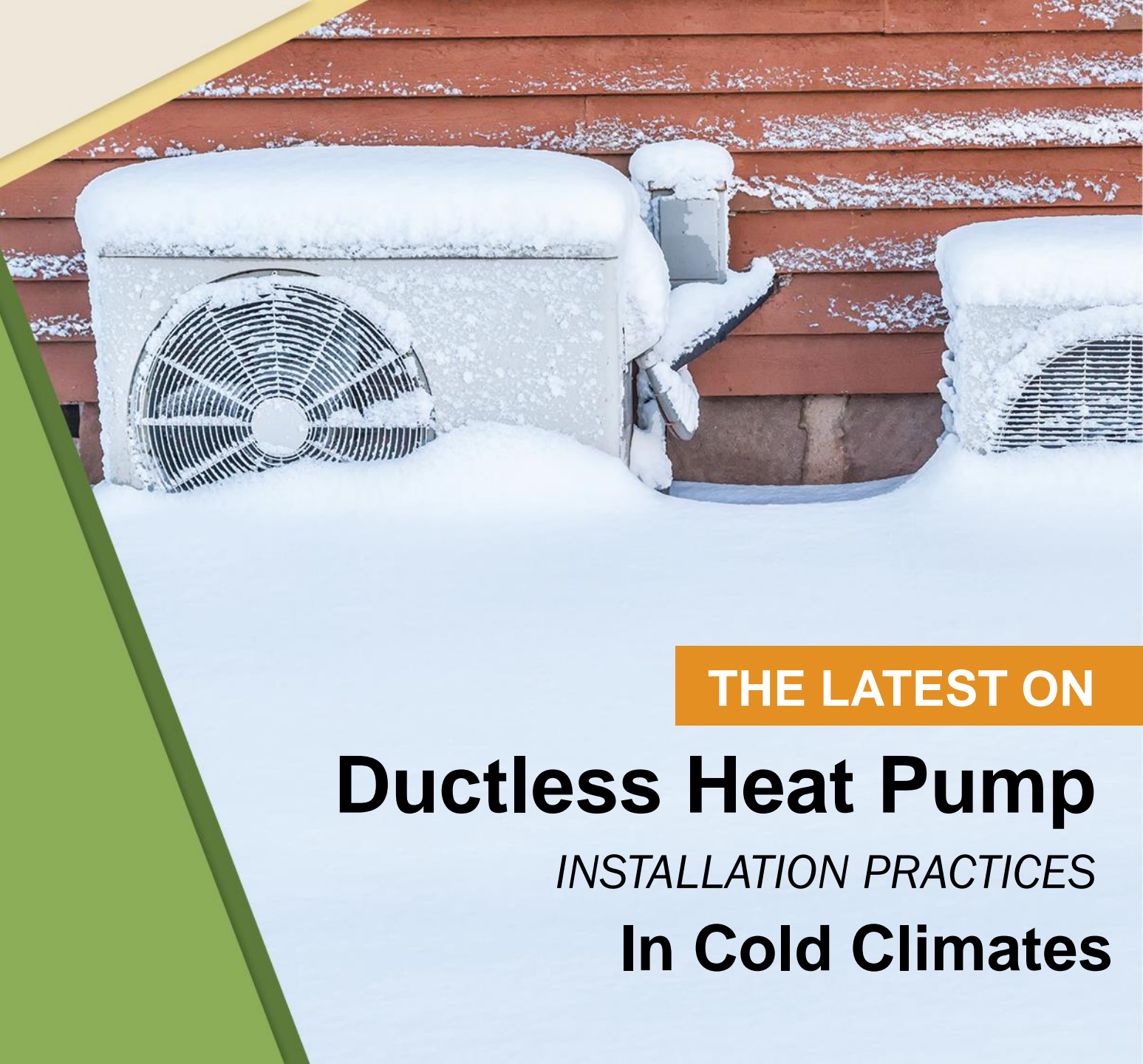


Presented by:

NW DUCTLESS HEAT PUMP PROJECT



THE LATEST ON

Ductless Heat Pump

INSTALLATION PRACTICES

In Cold Climates



Recorded Webinar

WELCOME

to the webinar



About NEEA:
An alliance of utilities

NW DUCTLESS HEAT PUMP PROJECT



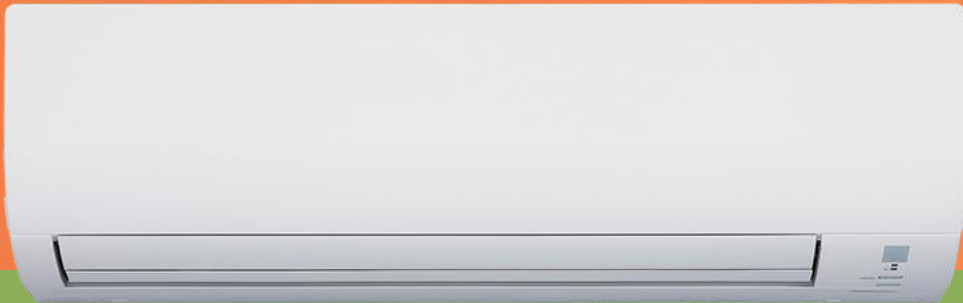
PRESENTER:

Jonathan Moscatello

- Consultant for Utilities and HVAC Supply Chain
- 17 years HVAC Experience
- 13 years selling ductless
- 9 years as owner of a "Ductless Only" contracting company

AGENDA

1. Why Heat Pumps, Why Now
2. Cold Climate Definitions
3. Installation & Design Best Practices
4. Question & Answer

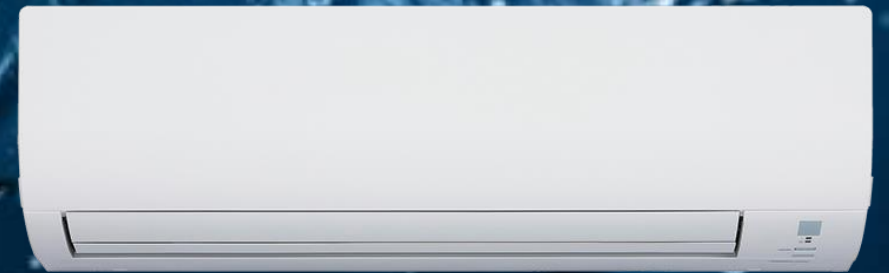


IN NORTHWEST COLDER CLIMATES:

- Heat pump adoption lags
- Installers have indicated lower confidence in ductless applications

However, modern heat pump technologies can change this paradigm.

In
C  **OLDER**
Climates



IMPROVED LOW AMBIENT HEAT GATHERING CAPABILITIES

Thanks to a computer controlled refrigerant system that optimizes the expansion valve, compressor speed and fan speeds.



MANY SYSTEMS OFFER:

- Up to 100% heating capacity at 5 ° F
- Efficient operation as low as -20 ° F

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A VARIETY OF OTHER PRODUCT FEATURES IMPROVE COLD CLIMATE OPERATIONS:

- Demand-based defrost operations (sensors dictate defrost only when needed)
- Improved drain pans (more holes) to allow for better defrost removal
- Drain pan heaters (sometimes included, otherwise optional)
- Optional wind baffles



HIGHER DISCHARGE AIR TEMPERATURES

Indoors



A variety of technologies ensure occupant comfort through **HIGH discharge** air temperatures

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STEP 1 Install ductless unit in living room.

STEP 2 Keep electric resistance heat in place with temperature setback.

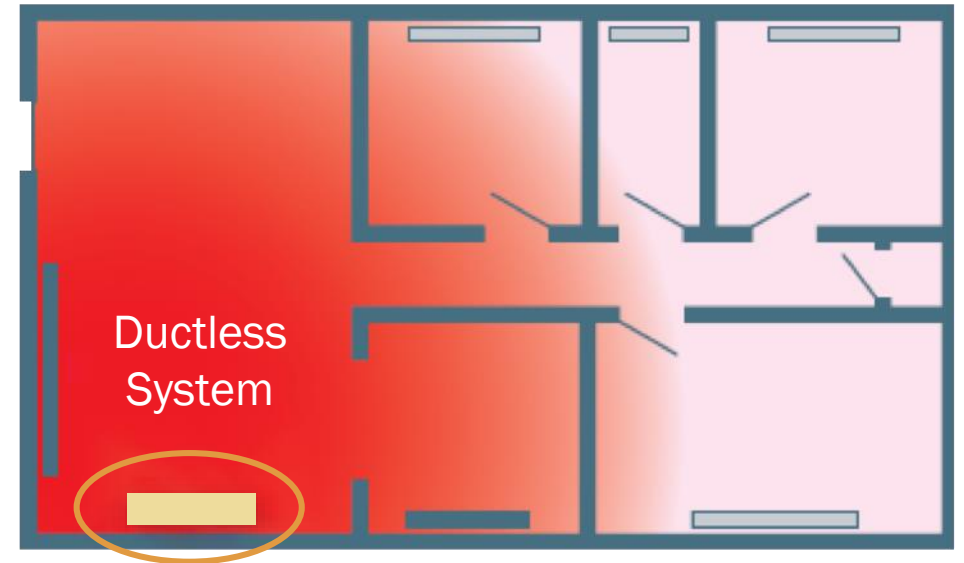
STEP 3 Educate homeowner to use back-up heat only when they experience the need for supplemental heat.

RESULTS:

- A single zone ductless system in the main living area can save up to 50% of home's heating bill.
- 91% of customers "very" or "extremely" satisfied.

DISPLACEMENT APPROACH

Low cost way to install *DUCTLESS*



DISPLACEMENT SOLUTION:

Single-head ductless system in primary living area; baseboards remain in place as back-up.

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What is **COLD CLIMATE?**

In the Northwest, the areas east of the Cascade Mountains in Washington and Oregon, most of Idaho, and all of Montana — are cold climates.

ANOTHER HELPFUL DESCRIPTION IS:

1. Areas where winter design temperatures are below 15 °F
2. Where historical data shows winter temperatures regularly fall to 5 °F or lower.



What is a **COLD CLIMATE DHP?**

NW Utility Definition:

1. Rated HSPF ≥ 10.0
2. COP @ 5 °F >1.75 at maximum capacity
3. Maintain 80% of rated capacity at 5 °F
4. Drain pan heaters, if present, operate only during defrost cycle.

Pro Tip:
Use the NEEP heat pump list to check
if your DHP is cold climate rated:
<https://ashp.neep.org/>



9 RECOMMENDED "COLD-CLIMATE" INSTALLATION PRACTICES



RECOMMENDED INSTALLATION PRACTICES

in colder temps

1



AVOID INSTALLING OUTDOOR UNITS ON WALKWAYS AND PATIOS

Defrost cycle melt water can re-freeze on ground surfaces and create a dangerous slip hazard.

If you cannot locate the outdoor unit to a flower bed or other helpful area, a drain pan heater and heat tape can allow for the melt water to be drained away.

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RECOMMENDED INSTALLATION PRACTICES

in colder temps

2

DO NOT INSTALL OUTDOOR UNITS UNDER A ROOF'S DRIPLINES

Rain, ice fall and snow melt from roof overhangs and driplines can re-freeze on the compressor's coil surface and overwhelm the unit's defrost cycle.

When needed, outdoor units should be installed with drip caps or shields.



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RECOMMENDED INSTALLATION PRACTICES

in colder temps

3

DO NOT INSTALL OUTDOOR UNITS FACING THE DOMINANT WIND

If the outdoor unit is facing into dominant wind direction, this could cause counter-rotation of the outdoor fan and lead to failure of the fan motor, fan circuit board, or both.

- **TIP 1:** If you cannot avoid the dominant wind direction, install an optional wind baffle offered by the manufacturer.
- **TIP 2:** Avoid placing units where drifting snow may accumulate.

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RECOMMENDED INSTALLATION PRACTICES

in colder temps

4

LOCATE OUTDOOR UNITS WHERE NOISE WILL NOT DISTURB OCCUPANTS

In colder climates, defrost cycle and full power operations occur frequently and run at higher decibels than typical operations. In homes with little or no insulation or single pane windows full power noise may bother occupants.



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RECOMMENDED INSTALLATION PRACTICES

in colder temps

5



INSTALL OUTDOOR UNITS ABOVE AVERAGE SNOWFALL DEPTHS

Outdoor units need free-flowing air at all times. Install using wall brackets or an equipment platform that will raise the outdoor unit above average snow levels.

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- **TIP 1:** Remind the homeowner to regularly clear snow away from their outdoor unit, and to keep an eye on the unit during extreme weather.
- **TIP 2:** Install vibration absorbers when mounting the unit using wall brackets. Use double-ended vibration absorbers to reduce noise from transmitting through the wall.
- **TIP 3:** If ground clearance allows, use brackets designed to attach to the foundation wall.



Brackets that Attach to Foundation

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RECOMMENDED INSTALLATION PRACTICES

in colder temps

6

AVOID ANY KINKS OR PARTIAL KINKS IN THE LINESET

Even a partial kink can result in reduced capacity in low temperatures and may result in a callback. This can be a very difficult problem to solve. Adding more refrigerant will only exacerbate the problem. Locating a kink requires removing the lineset cover, feeling along the lineset to locate hot spots, and potentially replacing the entire lineset.

Okay

Partially Kinked (bad)

Kinked (bad)



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RECOMMENDED INSTALLATION PRACTICES

in colder temps

7



ENSURE OUTDOOR UNITS STAY LEVEL

The outdoor unit must be level (front-to-back and side-to-side) and remain so for its useful life. This is important for allowing the defrost cycle to work properly and to prevent ice buildup in the outdoor unit.

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Ensure Outdoor Unit Stays Level

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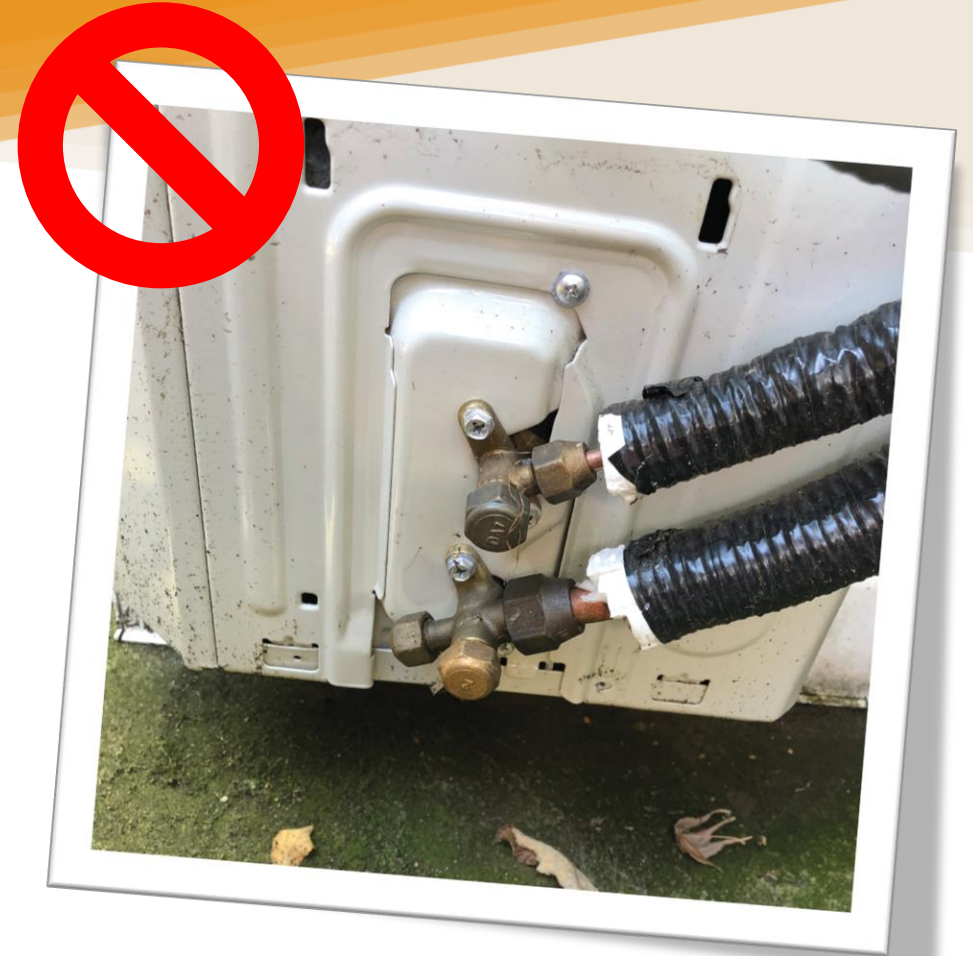
TIP: For ground pad-secured units with snow-level risers, create a strong, long-lasting foundation by removing grass, topsoil and mulch and getting down to base soil. Then build back up using dry cement or 1/4" minus gravel before adding a ground pad or stand to prevent saturated soils from shifting.

RECOMMENDED INSTALLATION PRACTICES

in colder temps

8

**ENSURE INSULATION COVERS
THE ENTIRE LINESET
INCLUDING FLARE FITTINGS**



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TIP:

Make sure insulation covers the flare nuts, as well as the entire lineset length. This ensures liquid or frost will not develop under the flare nut and cause cracks. Full insulation coverage also retains heat and improves system efficiency.



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Covering Everything

RECOMMENDED INSTALLATION PRACTICES

in colder temps

9



AIR SEAL AND INSULATE THE WALL PENETRATIONS

Unsealed holes cause internal temp sensor errors which can lead to serious performance issues. Effects also exacerbate when under low temperature conditions.

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Seal the Holes

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TIP:

This is a common installation oversight. Add it to your installation checklist.

SUMMARY

of “cold-climate” install tips:



1. Avoid installing outdoor units on walkways and patios
2. Do not install outdoor units under a roof's driplines
3. Don't install outdoor units facing into the wind
4. Locate outdoor units where noise will not disturb occupants
5. Install outdoor units above average snowfall depths
6. Avoid any kinks or partial kinks in the lineset
7. Ensure outdoor units stay level
8. Ensure insulation covers the entire lineset including flare fittings
9. Air-seal and insulate the wall penetrations

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Create your own

INSTALLER CHECKLIST

Include any and all items that help produce:

- ✓ High Performing,
- ✓ Long Lasting &
- ✓ Energy Saving

Installations!

- Making quality flare fittings
- Sealing the building penetration
- Securing the outdoor unit and keeping it level
- Handling and protecting linesets
- Locating the outdoor unit

Customer: _____
Equipment: _____
Serial # (Outdoor): _____
Serial # (Indoor): _____
Line Set Length: _____
Refrigerant Added: _____

DHP CCCC Checklist	Tech Initials
1. Construct flares according to the Japanese Industrial Standards and manufacturer's specification. This includes sizing the flares, using synthetic compressor oil on the face of the flare, and tightening the flare nuts to the specified torque.	
2. Conduct 10 minute Nitrogen pressure test (>400 PSI) and check for leaks at flares and service valves openings using HVAC bubble solution. Wipe off bubble solution when done with test.	
3. Vacuum line sets using compound gauge or vacuum gauge to <500 microns: <ul style="list-style-type: none">• 9K/12K <25ft = 20 minutes• 9K/12K >25ft = 30 minutes• 18K/24K <25ft = 30 minutes• 18K/24K >25ft = 45 minutes• Multi-Zones = 45 minutes (2-zones); 1 hour (3-zones+)• Add 15-30 minutes in wet humid conditions or if line sets are not shiny and new	
4. Conduct Rise test for 10 minutes and ensure the vacuum reading on the compound gauge is 100% stable. If using a digital vacuum gauge, rise should not exceed 1,000 microns in 10 mins.	
5. Open service valves (fully), remove hose and adapter if used, and leak check the Schrader valve with bubble solution. Tighten or replace Schrader valve if leaking.	
6. Confirm electrical connections are solid and correct (wire order). Confirm wiring order by zone on multi-zone systems. Confirm correct MOCP (breaker and/or fuses) and energize system.	Readings:
7. Start system and operate on maximum cooling or maximum heating for 20 minutes. Use the test operation (forced cooling) if ambient or room temperatures make it necessary.	
8. Confirm controller operation and indoor unit responses (vanes, louvers, and fans). For multi-zone systems, each indoor unit must be commissioned separately and then together (all running).	
9. Measure the inlet/room temperature and the outlet/coil temperature of indoor unit.	Readings:
10. Measure the inlet/ambient temperature and outlet/coil temperature of the outdoor unit.	Readings:
11. Confirm indoor and outdoor units are stable and level.	
12. Confirm line set insulation is completely insulated and protected from UV (i.e., in line set cover or taped).	
13. Pour 1 quart of water on indoor unit coil to confirm condensate drains properly to an acceptable drain or to a suitable location outside of the building foundation.	
Technician Signature: Additional Notes:	Date:

INSTALLER'S GUIDE

DUCTLESS HEATING & COOLING SYSTEMS

BEST PRACTICES FOR INSTALLING DUCTLESS HEATING AND COOLING SYSTEMS

Quality service and installations generate referrals, increase sales and improve customer satisfaction. Make sure your customers get the most from their ductless system by following installation best practices and educating homeowners. This guide does not replace manufacturer's specifications. Follow manufacturer's installation instructions and building code requirements.

BEFORE YOU BEGIN

- Review the existing heating and cooling system location and layout with your customers. Consider occupancy, usage and climate when integrating the ductless system as the primary heating and cooling system in the home.
- If there is an electric furnace, determine if it is the best backup heat source or if other backup options are more appropriate.
- Review utility rebates and tax credits. Consult GoingDuctless.com for up-to-date information.
- Install system on a dedicated electrical circuit.
- Gauges are not needed to verify refrigerant levels; if adjustments are necessary, use a scale when adding/removing refrigerant
- Consult the manufacturer's installation manual to verify refrigerant protocols

LINE SET INSULATION AND PROTECTION

- Insulation must cover entire line set length to avoid condensation and decreased efficiency
- Protect the outdoor line set from insulation damage with rigid line hide and building code-approved line set protection
- An insulative sealant must seal penetrations through the shell of the home; return any insulation disturbed by installed line set to original (or better) condition

OUTDOOR UNIT (COMPRESSOR)

- Set the unit on a stable, level surface
- Use adjustable risers to prevent debris and snow buildup and allow better drainage
- Secure outdoor units to the pad, risers and/or resting surface using bolts and/or adhesive

REFRIGERANT TUBING

- Create new flares using appropriate R410A flaring tool and measurement gauge; DO NOT USE manufacturer-provided tubing flares and fittings
- Apply refrigerant oil to the end of each flare
- Connect tubing with R410A nuts (supplied with your outdoor unit) and tighten to manufacturer's specifications

REFRIGERANT CHARGE

- Adjust refrigerant charge ONLY IF NECESSARY; most installations do not require adjustment

CONDENSATE DRAIN

- Must slope downhill; can be routed with line set and run to a suitable termination point, away from crawl spaces and walkways

COLD CLIMATE RECOMMENDATIONS

- Avoid installing outdoor unit along pathways; freezing discharge can pose a slip hazard
- Use a pan heater to prevent defrost discharge from freezing inside the compressor
- Use wall-mount brackets to maximize clearance under the outdoor unit for easy drainage and reduced snow and ice buildup

REQUIRED TOOLS



INSTALLER GUIDE DUCTLESS HEAT PUMPS FOR COLD CLIMATES

DUCTLESS HEATING & COOLING SYSTEMS

Do you know some ductless heat pumps are designed to operate in cold climates? When properly applied and installed, research has shown these ductless heat pumps work well for heating homes and for saving energy. Due to the more demanding conditions in which they operate, installation mistakes, shortcuts and oversights can dramatically impact how well these machines perform. This document builds on the Best Practices for Installing Ductless Heating and Cooling Systems to include practices essential to successful installation and performance of these ductless heat pumps in cold climates.

WHAT IS A COLD CLIMATE?

Areas where winter nighttime temperatures commonly drop below 20° F, and where historical data shows winter temperatures regularly fall to 5° F or lower, are considered cold climates. In the Northwest, this usually includes high elevations, areas on the east side of the Cascade Mountains, and much of Montana and Idaho.

Northwest Cold Climate Ductless Heat Pump Specifications*:

- | | | |
|--|---|---|
| 1. Compressor must be variable capacity (inverter type) | 3. The AHRI matched system must be rated at or above 10.0 HSPF | 5. Must deliver at least 80% of rated heating capacity at 5°F |
| 2. Indoor and outdoor units must be part of an AHRI matched system | 4. The AHRI matched system must have a Coefficient of Performance (COP) at or above 1.75 at 5°F | 6. If a drain pan heater is present, it may only run as part of the defrost cycle |

* Northeast Energy Efficiency Partnerships maintains a list of cold climate rated air source heat pumps at <https://ashp.neep.org/#/>. To determine if a system meets the Northwest specification, review a listed unit's HSPF and ensure it meets 80% rated capacity at 5°F.

LOCATION OF THE OUTDOOR UNIT IMPACTS PERFORMANCE

<p>1</p>	<p>2</p>	<p>3</p>
<p>1. Avoid installing outdoor units on walkways and patios Defrost cycle melt water can re-freeze on ground surfaces and create a dangerous slip hazard.</p>	<p>2. Do not install outdoor units under a roof's driplines Rain, ice fall and snow melt from roof overhangs and driplines can re-freeze on the compressor's coil surface and overwhelm the unit's defrost cycle. When needed, outdoor units should be installed with drip caps or shields.</p>	<p>3. Don't install outdoor units facing into the wind If the outdoor unit is facing into dominant wind direction, this could cause counter-rotation of the outdoor fan and lead to failure of the fan motor, fan circuit board, or both.</p>

Tip: If you cannot avoid the dominant wind direction, install an optional wind baffle offered by the manufacturer.

**Thank
you**

For other great contractor resources and information,
check out: www.goingductless.com

Additional Resources:
[DHP Installation Best Practices](#)
[Cold Climate Installation Best Practices](#)

BetterBuilt^{NW}

www.HVAC.BetterBuiltNW.com

HVAC
SIZING TOOL

www.HVACsizingtool.com

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