Ductless Heat Pumps

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www.nwBuildings.org/dhp.aspx
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Outline

• Heat Pump Basics
• Ductless Heat Pumps
  • Efficiency
  • Advantages
  • Commercial installations
• Planning (applications, codes)
• Purchasing (sizing, styles)
• Installation (locating, condensate, power)
• Commissioning
• Maintenance
What is a Heat Pump?
Heat Pump Components

- Evaporator
- Compressor
- Expansion Valve
- Condenser
What’s a Split System?

• An HVAC system with components located both inside and outside
  Compressor/Condenser – outside
  Air handler - inside

• Mini Split
• Multi-Zone (Multi-Split)
Multi-Split System

• Suitable for multiple zones with varying loads
• One outdoor unit, several indoor units, one controller
OK, What’s a Ductless Heat Pump?

- 30-year history
- Many manufacturers *
- Split system
- Air Source heat pump
- No ducts
- Efficient

* [www.nwBuildings.org/dhp.aspx](http://www.nwBuildings.org/dhp.aspx)
How Efficient?

- **Seasonal Energy Efficiency Ratio**
  
  # of BTU of cooling from one watt of energy
  
  \[ \text{SEER} = 20+ \]
  
- **Heating Season Performance Factor**
  
  # of BTU of heating from one watt of energy
  
  \[ \text{HSPF} = 9+ \]
How Efficient

• What does it save over electric resistance?
• HSPF-COP
• $1 worth of heat from an electric resistance heat = $3 worth of heat from a DHP
The Air Conditioning, Heating and Refrigeration Institute is a trade association that produces the

AHRI Certified Product Directory

http://www.ahridirectory.org/ahridirectory/pages/vrfhp/VRFHP9-17-08.pdf
Advantages of Ductless Heat Pumps

- High efficiency
- Low cost heating and cooling
- Zonal system
- Improve occupant comfort
- Easy installation
- Eliminates ductwork
- Efficient at low outdoor temps
High Efficiency – Lower Cost

- Inverter technology
  - Allows variable speed operation
- High SEER and HSPF
  - SEER ratings of 20+
  - HSPF ratings of 9.0
Zonal Systems

• Only heat or cool areas in use-not the entire building
• Can result in increased occupant comfort
• Ducted systems waste 10% -30%+
Special Considerations in Commercial Installs

- Ventilation requirements
  15-20 cfm/person
  (ASHRAE 62.1 or IMC Chapter 11)
- Interactions with existing systems
  Simultaneous heating and cooling
- Power supply requirements
- Building control systems
- Amount of refrigerant allowed by IMC
Questions?

Next we’ll cover

- Planning (applications, codes, purpose)
- Purchasing (sizing, styles, shop)
- Installation (locating, condensate, power)
- Commissioning
- Maintenance
Think you are Ready?
Planning Questions

• Is my application a good one?
• Can I meet all required codes?
• Will it save money or improve comfort?
• Can the unit be installed where I want to install it?
Planning: Good Applications

• Add cooling to an existing zone
• Supplemental heating and cooling for an undersized zone
• Heat or cool a small area to allow shutting down a large system
• Computer room backup or cooling
Planning: Codes

- Commercial buildings must be ventilated during occupied hours *
- Check airside economizer requirements and exceptions
- Simultaneous heating & cooling prohibitions
- Pressure testing of refrigerant lines

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Planning: Save Money?

- Offset more expensive heating and/or cooling with higher efficiency equipment
- Extend the life and reduce maintenance of existing equipment
- Zonal heating
- Calculate fuel costs to be sure*
- Value of improved comfort

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Planning: Where NOT to Install

• If your central system has existing problems
Planning: Where NOT to Install

• In hospital treatment areas

• In areas with corrosives or dust in the air
Now You are Ready? Before You Buy

- What size heat pump do I need?
  - Providing heating or cooling or both?
  - Determine the number of zones
  - Calculate heating / cooling loads*
- Voltage requirements
- Comparison shop
- Check for rebates or incentives

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Sizing Considerations

- Determine the load *
  - Supplemental heating or cooling
  - DHP for entire load?
- Where does ventilation air come from?
  - Does the DHP have to heat or cool outside air? *

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Choose an Indoor Unit

- Wall mounted
- Ceiling hung
Choose an Indoor Unit

- In-Ceiling Unit
- Concealed duct (ducted ductless)
Installing Ductless Heat Pumps

- Plan the installation
- Install outdoor unit
- Power supply
- Install indoor unit(s)
- Connect refrigerant and power lines
- Run condensate drain
- Commission the unit

* www.nwBuildings.org/dhp.aspx
How Easy?
Installing the Outdoor Unit

- Provide secure mounting
- Check clearances
- Determine line set length and height restrictions
- Locating on building
- Seal wall penetrations
Locating the Outdoor Unit(s)

Outdoor units may be placed on ground or attached to the building
Power Supply

- 208v-230v from electrical panel to outdoor unit
- Provide electrical disconnect
- Provide separate breaker for DHP
Line Sets & Power Connections

- 230 power from panel
- Power to indoor units
- Refrigerant lines
  - 2 indoor units installed
Locating the Indoor Unit(s)

- Noise levels
- Air circulation
- Line set location
- Condensate drain
- Power
Locate the Indoor Unit

- Can installation clearances be met?
- If using a concealed duct unit
  - Check allowable duct lengths
  - Never install in unconditioned space
Removable filters for cleaning

Electrical connection
Condensate Line

• Route to storm drain or sanitary drain
OR
• Provide small condensate pump which may be included with some models
  • Pumps require power
• Trap may be necessary
Commissioning the Unit

- Refrigerant charge – R-410
- Recommended: have it done by contractor with the proper equipment
- EPA requires license to service system when refrigerant loss is a risk
Commissioning the Unit

• When ductless heat pump supplements existing HVAC system:
  Set and lock unit cooling and/or heating temperatures so the more efficient heat pump comes on first
Don’t Forget Maintenance

- Clean air filter(s) regularly
- Check outdoor coils for blockage annually
- Check the condensate drain and pan to make sure condensate can drain freely from the unit
- If using wireless controls, change batteries as needed
Summary

Ductless heat pumps are:

• Market ready
• Efficient
• Easy to Install
• Quiet
• Cost effective
• Available in various design options
• Good supplemental or primary heating or cooling system
More Information

The Northwest Building Efficiency Center has posted supplementary resources related to ductless heat pump technology at:

www.nwBuildings.org/dhp.aspx

Contact Us: Info@nwBuildings.org