



# Net Zero-Passive Solar

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Products and Design Suggestions

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Winner

- ◆ [http://www.youtube.com/watch?  
feature=player\\_detailpage&v=0rPMztLx  
Jzg](http://www.youtube.com/watch?feature=player_detailpage&v=0rPMztLxJzg)

# Design Considerations- Ducted or Non-Ducted

## Benefits of Ducted

- ◆ 1) Air distributed more effectively
- ◆ 2) Not visible to consumer except for grills/registers.
- ◆ 3) Dehumidifier may be easily added

## Benefits of Non-Ducted

- ◆ 1) Zoning for energy efficiency- easy to do
- ◆ 2) Each Zone has own temperature setting-efficient
- ◆ 3) No energy loss due to ductwork
- ◆ 4) Washable Air filtration- built in by Mitsubishi

## Negatives of Ducted

- 1) Air and power losses due to ductwork and the inherent design.
- 2) Initial cost more
- 3) Indoor Air Quality may be impacted.

## Negatives of Non-Ducted

- ◆ 1) Airflow focused on one or two rooms
- ◆ 2) May need additional air circulation fans or thru the wall power vents

# Ductwork Design

## Why are Ducts Important?

- ◆ Duct Design is the most Critical Consideration for the engineer
- ◆ The equipment characteristics are fixed. Ductwork can be designed well- or poorly.
- ◆ Poor ductwork design means- reduced comfort and high energy costs.
- ◆ Air is heavy- moving thousands of cubic feet per hour takes ENERGY.

# Ductwork Design Components

- ◆ Ductwork
- ◆ Fittings
- ◆ Filters
- ◆ Registers/Grills- minimal impact
- ◆ Coils (not covered here)- mfg. selected



# Designing System

- ◆ Block load needed of complete envelope for cooling and heating season.
- ◆ Room by room load calculations and ventilation requirements- ACCA Manual J
- ◆ Equipment- selection based on loads
- ◆ Ductwork Design-ACCA Manual D

# AIR HANDLER EXTERNAL STATIC PRESSURE



Indoor Unit: SEZ-KD09NA4



Outdoor Unit: SUZ-KA09NA

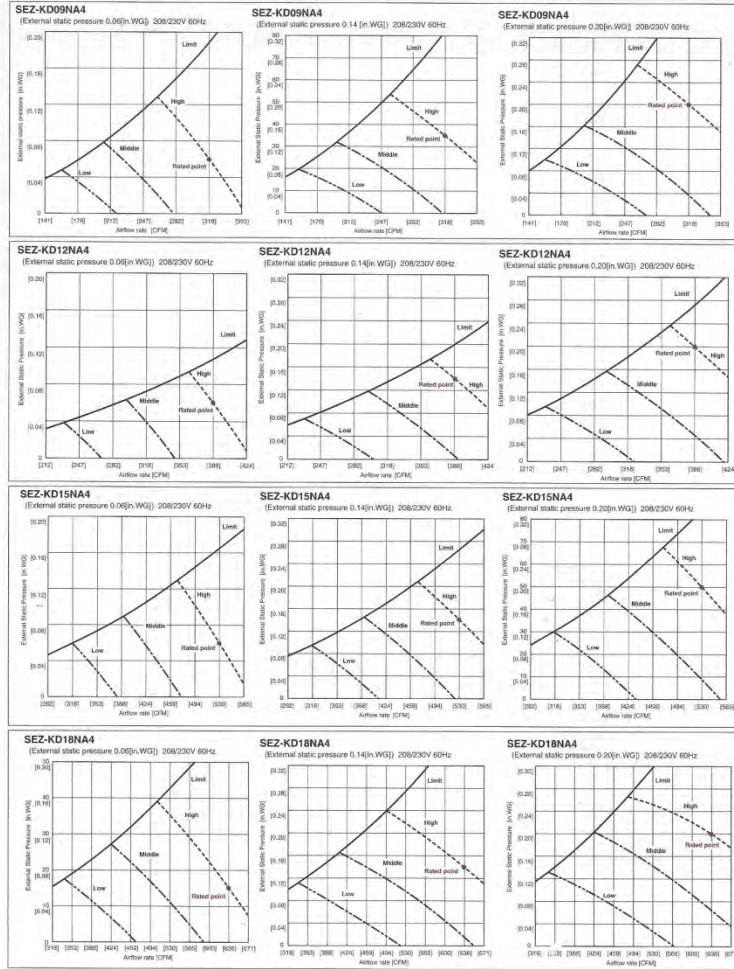
## **Voltage**

Indoor - Outdoor S1-S2 .....	AC 208 / 230V
Indoor - Outdoor S2-S3 .....	DC 12-24V

## **Indoor Unit**

MCA .....	1 A
Fan Type x Quantity .....	Sirocco Fan x 2
Fan Motor Type .....	Direct-driven DC Brushless Motor
Fan Motor Output .....	96 W
Fan Motor .....	0.51 F.L.A.
Airflow (Lo - Med - Hi) .....	194 - 247 - 317 Dry CFM
	174 - 222 - 285 Wet CFM
Air Filter .....	Polypropylene Honeycomb
External Static Pressure .....	0.02 - 0.06 - 0.14 - 0.20"WG
Sound Pressure Level (Lo - Med - Hi) .....	23 - 26 - 30 dB(A)

## SEZ Static Performance Curves



# Static Pressure

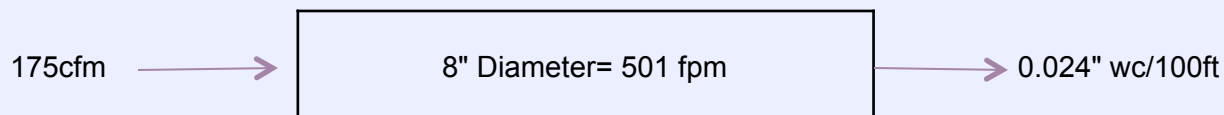
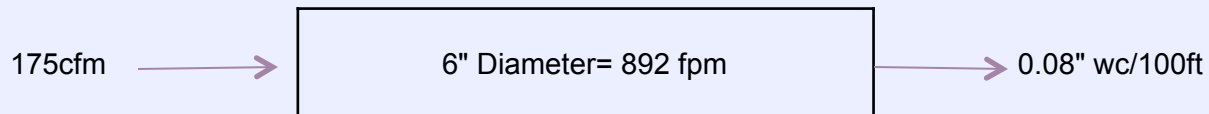
- ◆ The air handler fan must overcome the resistance of air moving in the ductwork.
- ◆ Lower resistance in the ductwork means less energy needed by the fan and system.
- ◆ Doubling the resistance in the ductwork

*Quadruples*

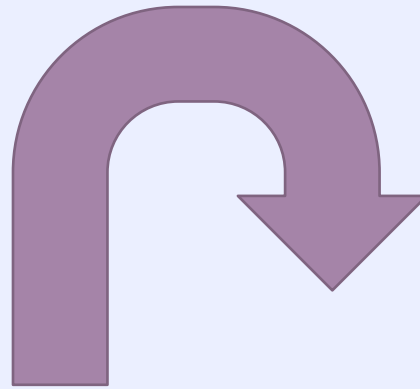
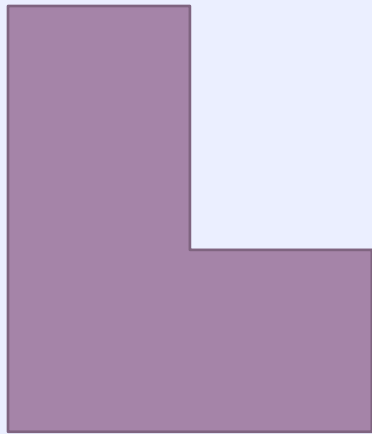
the energy required.

# How do we cut this resistance to the air flow?

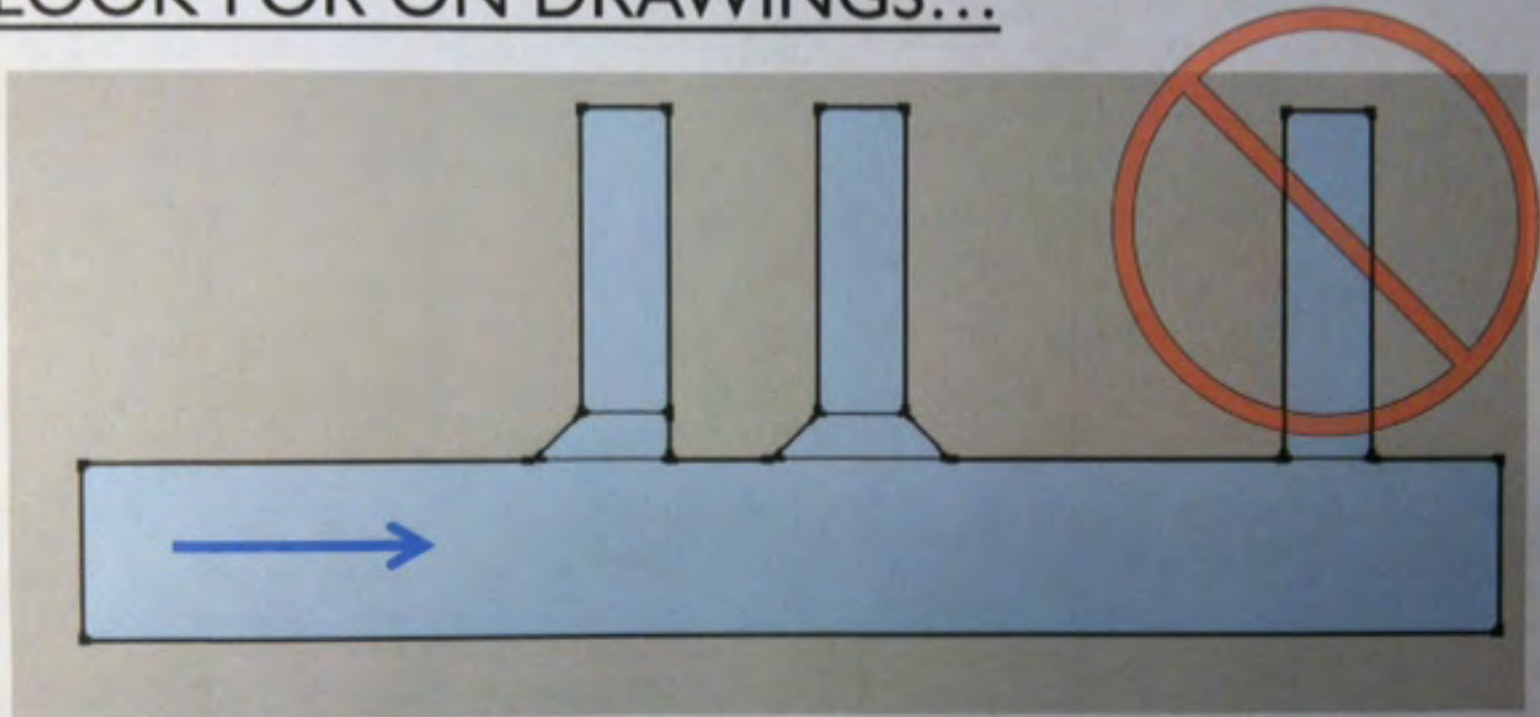
- ◆ 1) Larger ductwork and no FLEX DUCT!
- ◆ 2) Aerodynamic Fittings/design
- ◆ 3) Design using as little ductwork as possible



# Aerodynamic Fittings



KEY AERODYNAMIC FITTINGS TO  
LOOK FOR ON DRAWINGS...



TAPERED TAKEOFFS FROM TRUNKS

# Air Filtration

- ◆ Filter selection can have a major impact on airflow!
- ◆ The more particulate is captured the high restriction to the airflow- higher resistance to airflow, and more energy required.

## How to minimize Filter Energy Loss

- ◆ 1) Greater filter size- use a 20"x20" not 10"x10"
- ◆ 2) Increase the filter from 1" to 2"
- ◆ 3) And use a pleated filter



# Non- Ducted Air Handlers

- ◆ Are much more Energy Efficient
- ◆ No ductwork losses- saves energy
- ◆ Air flows directly from unit into the space- you can feel it!
- ◆ Washable air filter- built in. No waste to the the landfill
- ◆ Hyper Heat models offer extreme heating at 5F.

# MSZ-FH Hyper-Heat

## 09k- 12k- 15k soon 18k

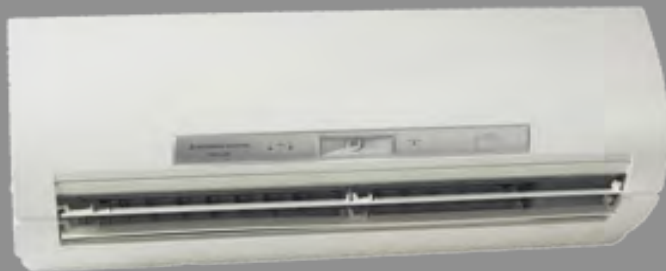


All MSZ/MUZ-FH systems

- ◆ High efficiency up to **30.5 SEER / 10.6 HSPF(09k)**
- ◆ Heating down to **-13°F- FULL to 5F**
- ◆ TRIPLE filtration
- ◆ iSee Sensor- 3 Dimensional



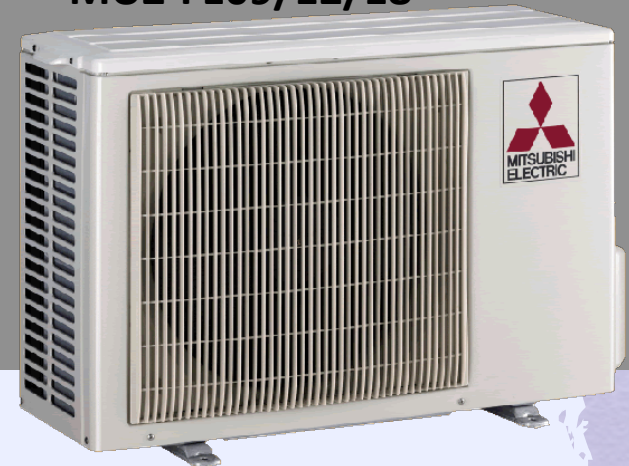
MHK1 Optional



MSZ-FE09/12/18



MUZ-FE09/12/18



# New FH Series for 2014!

## PRODUCT GUIDE MSZ

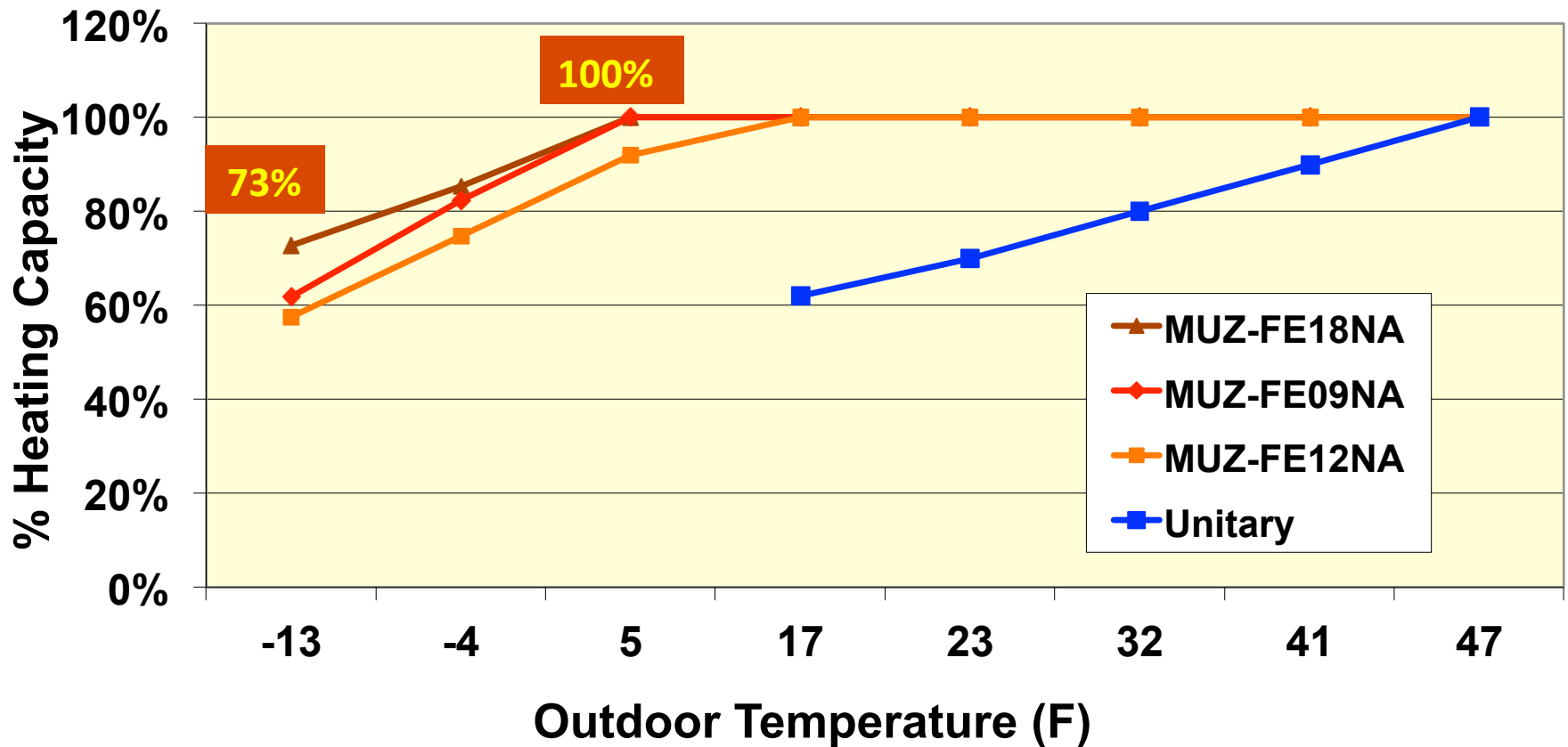
### MSZ-FH\*\*NA



Model Name	Indoor Unit		MSZ-FH09NA	MSZ-FH12NA	MSZ-FH15NA
	Outdoor Unit		MUZ-FH09NA	MUZ-FH12NA	MUZ-FH15NA
Cooling *1	Rated Capacity	Btu/h	9,000	12,000	15,000
	Capacity Range	Btu/h	2,800-9,000	2,800-12,000	6,450 - 19,000
	Rated Total Input	W	560	870	1,200
	Energy Efficiency	SEER	30.5	26.1	22.0
	Moisture Removal	Pints/h	0.6	1.9	4.0
	Sensible Heat Factor		0.920	0.830	0.700
Heating at 47° F *2	Rated Capacity	Btu/h	10,900	13,600	18,000
	Capacity Range	Btu/h	1,600 - 18,000	3,700 - 21,000	5,150 - 24,000
	Rated Total Input	W	710	950	1,300
	HSPF (IV)	Btu/hW	13.5	12.5	12.0
Heating at 17° F *3	Rated Capacity	Btu/h	6,700	8,000	11,000
	Rated Total Input	W	600	720	1,020
	Maximum Capacity	Btu/h	12,200	13,600	18,000
Heating at 5° F	Maximum Capacity	Btu/h	10,900	13,600	18,000

# Hyper-Heat INVERTER

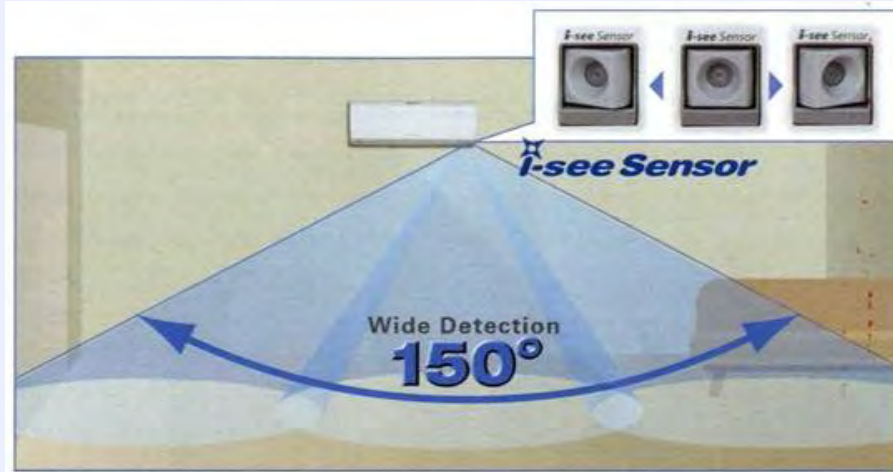
## MSZ/MUZ-FE H2i Heating Capacity at Low Temperatures



# MSZ-FE\*\*NA Systems

## MSZ/MUZ-FH09/12/15/18

### i-See Sensor



The **i-see sensor improves comfort in the room & efficiency** by sensing and controlling for the temperature felt by the room's occupants to help prevent over cooling or under heating



MSZ INDOOR



MITSUBISHI ELECTRIC

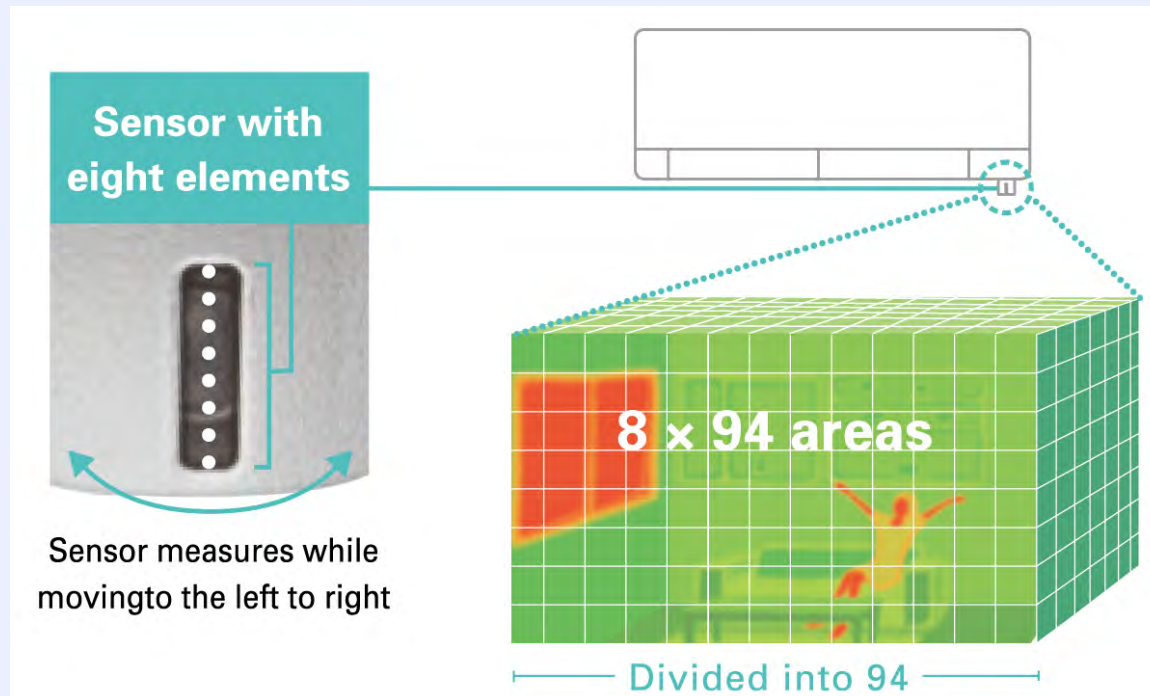


INVERTER

# New “i-See Sensor-3D”

## What is “i-See Sensor-3D”?

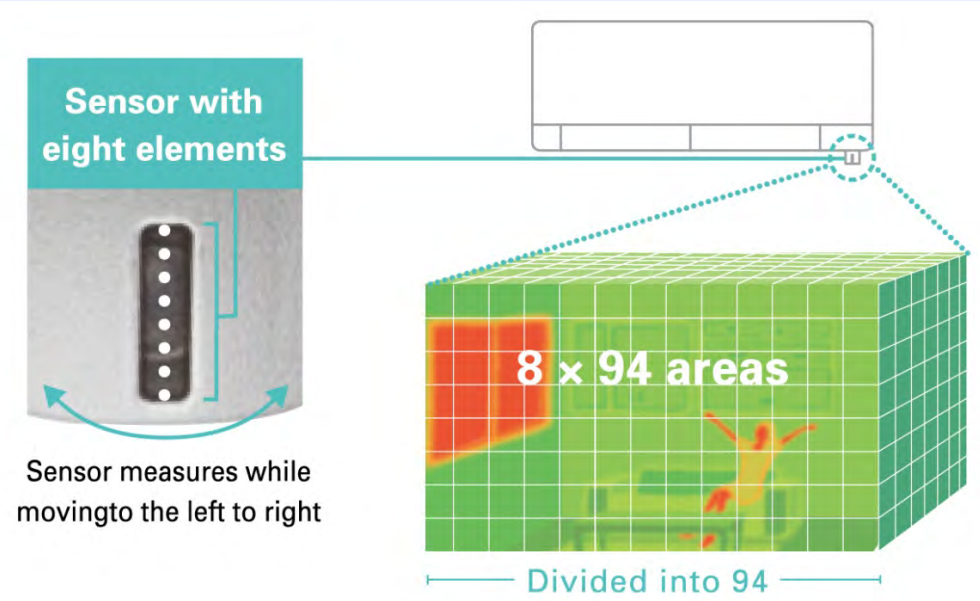
- Analyzes the room temperature in three dimensions.
- This function makes it possible to judge where people are in the room, then enables the variety of airflow.



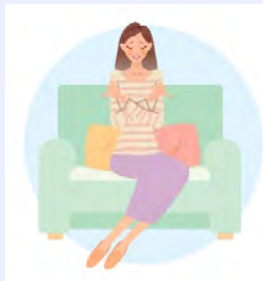
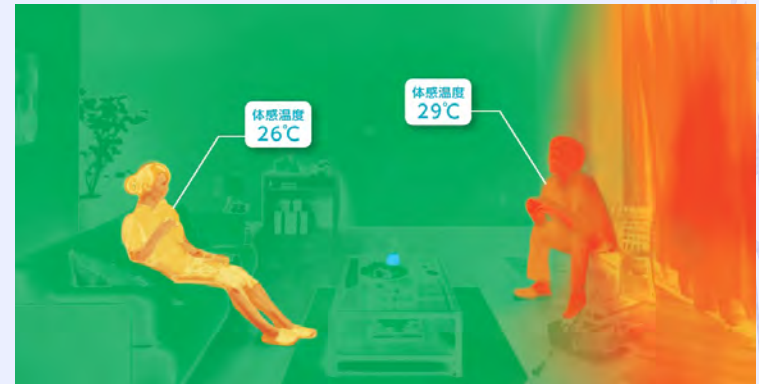
# MSZ-FH High Performance H2i Heat Pumps

No change

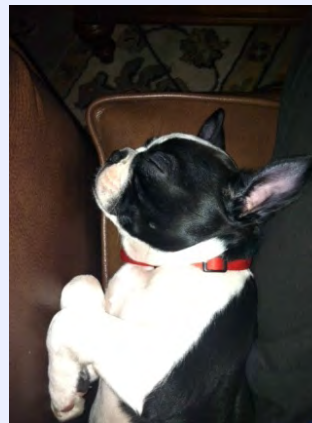
- ◆ i-see sensor 3D can detect temperature, size and shape



*Size Temperature shape*



Simple Motion  
Sensor detects only when people are moving, therefore if you sit on a sofa, it will miss you.



Simple Motion sensor will be responding to pets because it cannot distinguish by the different temperature.

**Only FH-series can detect human position and provide true conformability.**



# *Net-Zero and Passive House Designs*

- ◆ Buildings constructed are very well insulated, virtually air-tight that is heated by passive solar gain and by internal gains from people and equipment.

An Energy Recovery Ventilator(ERV) use is inherent in the design.

# Design Challenges to Consider

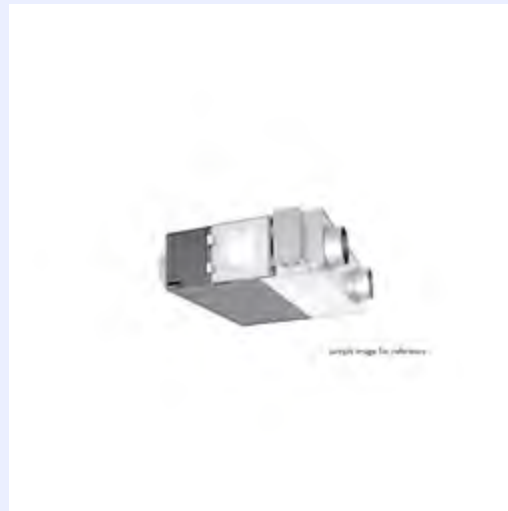
- ◆ Not enough heating and cooling needed- the house is TOO efficient!
- ◆ Limited Air Circulation- with a wall mounted air handler.
- ◆ Humidity Issues
- ◆ Fresh Air- IAQ

# Air Handler Sizes

- ◆ Sizes for Ducted and Non-Ducted start at 9,000 btus- or  $\frac{3}{4}$  ton.
- ◆ Mitsubishi Multizones- unique 6,000 btu wall mount.
- ◆ Sizes go up to 18,000 btu (  $1\frac{1}{2}$ ) tons for Hyper Heat wall mounted air handlers or the SEZ ducted unit.

# Energy Recovery Ventilators

- ◆ Simply running an exhaust fan not practical. Realistically ERV's can recover up to 75%(+/-) of the energy.
- ◆ Lossnay models can be easily ducted



# Dehumidification

Energy Star dehumidifiers may be required due to the tightness of the home.

## Aprilaire-SPECIFICATION SHEET DEHUMIDIFIER MODEL 1830

### PRODUCT SPECIFICATIONS

Capacity <sup>(1)</sup>	70 ppd
Energy factor <sup>(1)</sup>	1.91 L/KW-h
Airflow @ varying E.S.P. (external static pressure - dry coil)	
0.0" w.c.	160 CFM
0.2" w.c.	120 CFM
0.4" w.c.	70 CFM
Voltage, Phase, Frequency	120V, 1, 60 Hz
Current draw <sup>(1)</sup>	6.3 A
Noise	47 dBA ducted 51 dBA unducted
Dimensions (cabinet)	Width: 12.5" cabinet Height: 14.5" cabinet Length: 25" cabinet
Weight	67 lbs
Operating conditions	
Inlet air operating conditions	50°F - 104°F, 40°F dew point min.
Ambient/Ventilation	40°F - 140°F, 0% - 99% RH

<sup>(1)</sup> Rated Capacity, Energy Factor and Current Draw measured in accordance with AHAM DH-1 2008 at 80 F/60% RH inlet air at 0.0 ESP"

# Typical Ducted Dehumidifier



Questions

Thank you!