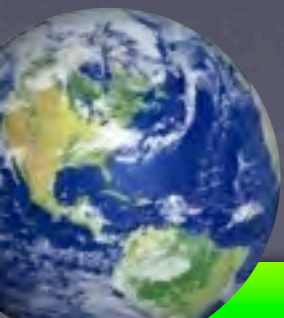


# Q. Since Ducted & Ductless Mini-split Heat Pumps Can Be:

Cheaper to purchase,  
Cheaper to operate,  
Quieter,  
More comfortable ...

**Why aren't they  
used more  
in America?**



# Confessions Of A Home Performance Zealot, Pioneer, Artist, & Evangelist

“Dave, your presentation sounds like  
a sales pitch for Mini-splits...”

**Well, yes!**

Somebody’s gotta do it. The HVAC  
and Home Performance industries  
aren’t...\*

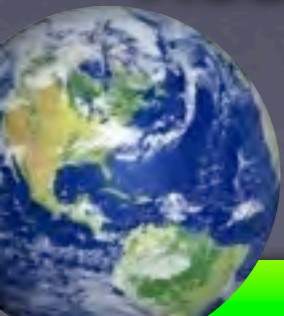
If you’re passionate about it...  
It’s not work.

Neither Steve Jobs nor Dave  
Robinson go, (went) to work each  
day for (just) the money.



My 2 HP Passions  
**Renovating Foreclosures**  
**Ducted Mini-Splits**

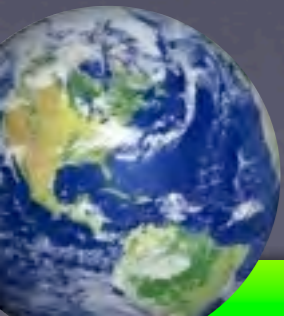
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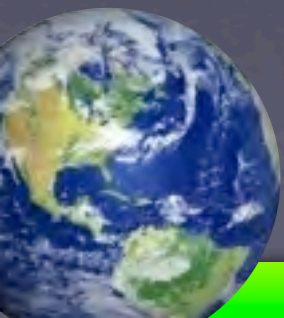
Both Trane and Carrier have sent me on “Incentive Dealer Trips” to exotic locations all over the world.

But I’ve never earned an incentive point for selling Mini-splits.



# At ACI '09 There Was A Big Focus On Mini-splits

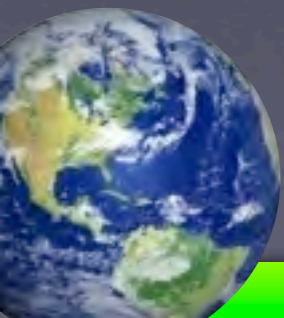
Charles and Dave discussed it in the airport on the way home. When the wheels touched down in Fresno, I stopped production of the conventional system and arranged to meet Gary on the job the next day. We designed a hybrid mini split system with ductwork that we **now use on all of our projects.**



Q. Since Ducted & Ductless  
Mini-split Heat Pumps Can Be:

Cheaper to purchase,  
Cheaper to operate,  
Quieter,  
More comfortable ...

Why Aren't They  
Used More  
In America?

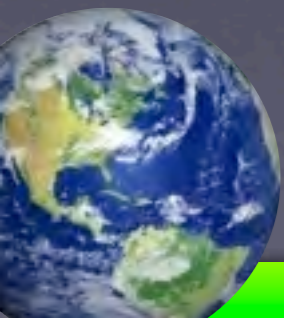


# Great Concept - Equipment - System

**The System  
Is Always The  
Solution!**

It's never a  
silver bullet ...

It's always a  
thousand silver BB's



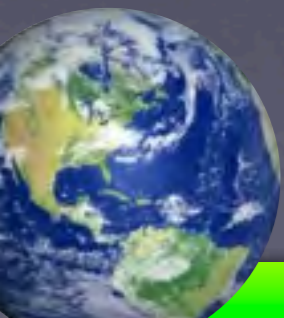
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# To Be A **Great System**, These Units Also Need:

1. Very tight building envelope
  2. Good Insulation, correctly installed.
2. Minimize East & West Sun Blast (shading and/or lower SHGC) (for cooling)
3. Minimum ductwork
4. Ducts in Envelope
5. Minimum Static Pressure
6. Correct Charging
7. Commissioning



## Hot Rodding Mini-splits



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# Get The Latest Technology

**Not Just Any Old Mini-split**

Manufacturers are dumping old units at deep discounts)

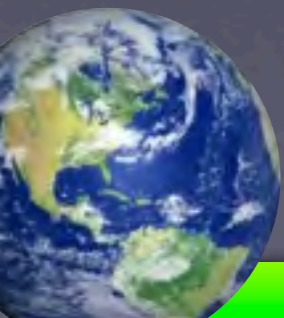
## **Inverter Technology**

Converts AC to DC power  
= Variable Speed

SEER Ratings from 11 to 26  
Choose Wisely



SEER to Utility Bill is Linear  
A 26 SEER unit will consume 50%  
of the Electricity of a 13 SEER model





# Are Delivery Systems A Necessary Evil?

All ductwork systems reduce efficiency at least some...

So, as far as ducts are concerned...

**The Less,  
The Better**

(None is good)

**(Ductless)**



# Ducts

It's All About **Static Pressure**

Keep it **LOW** by keeping ducts

1. As Short As Possible
2. As Straight As Possible
3. As Smooth As Possible

Use Low Static Registers.  
(Curved Fin, Large Opening  
Remove Dampers?)



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# Static Pressure

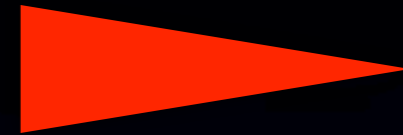
US manufacturer's require .5 - 1.70 inches of water column.

Many systems test at .7 - 1.7 (doomed for failure)

Fujitsu recommends .28 inches

Our systems shown here test at .18 to .24 inches

1.70



.70



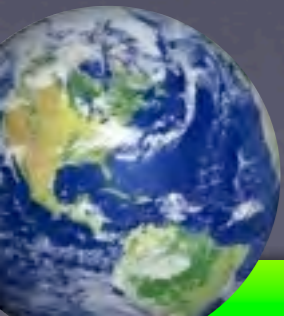
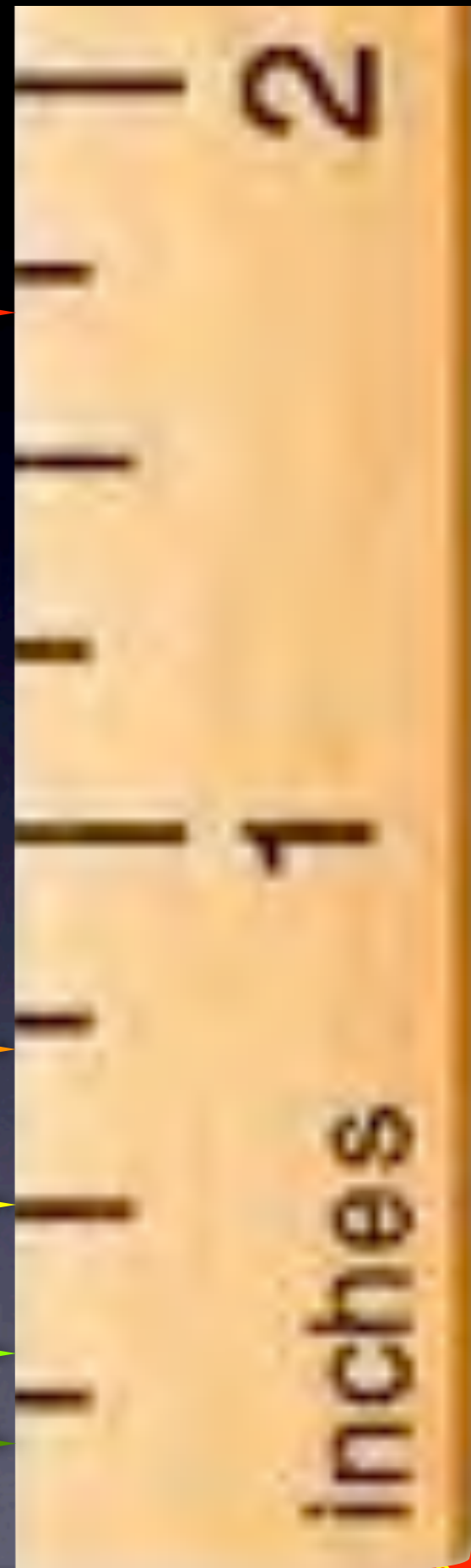
.50



.28



.22

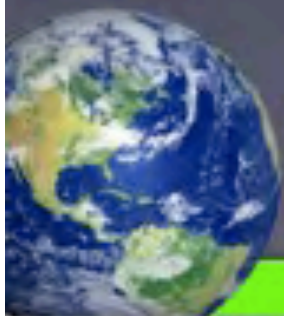


# The Concealed Unit = Key To Acceptance In **US Market**

The small ducts feed the  
bedrooms and bathrooms

A lowered ceiling will be  
installed when the ductwork  
is complete

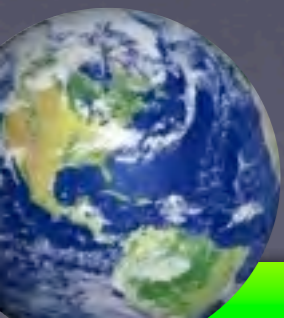
All the ductwork is within the  
building envelope and  
covered by R-55 insulation  
= No duct loss!



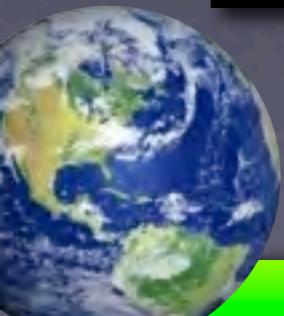
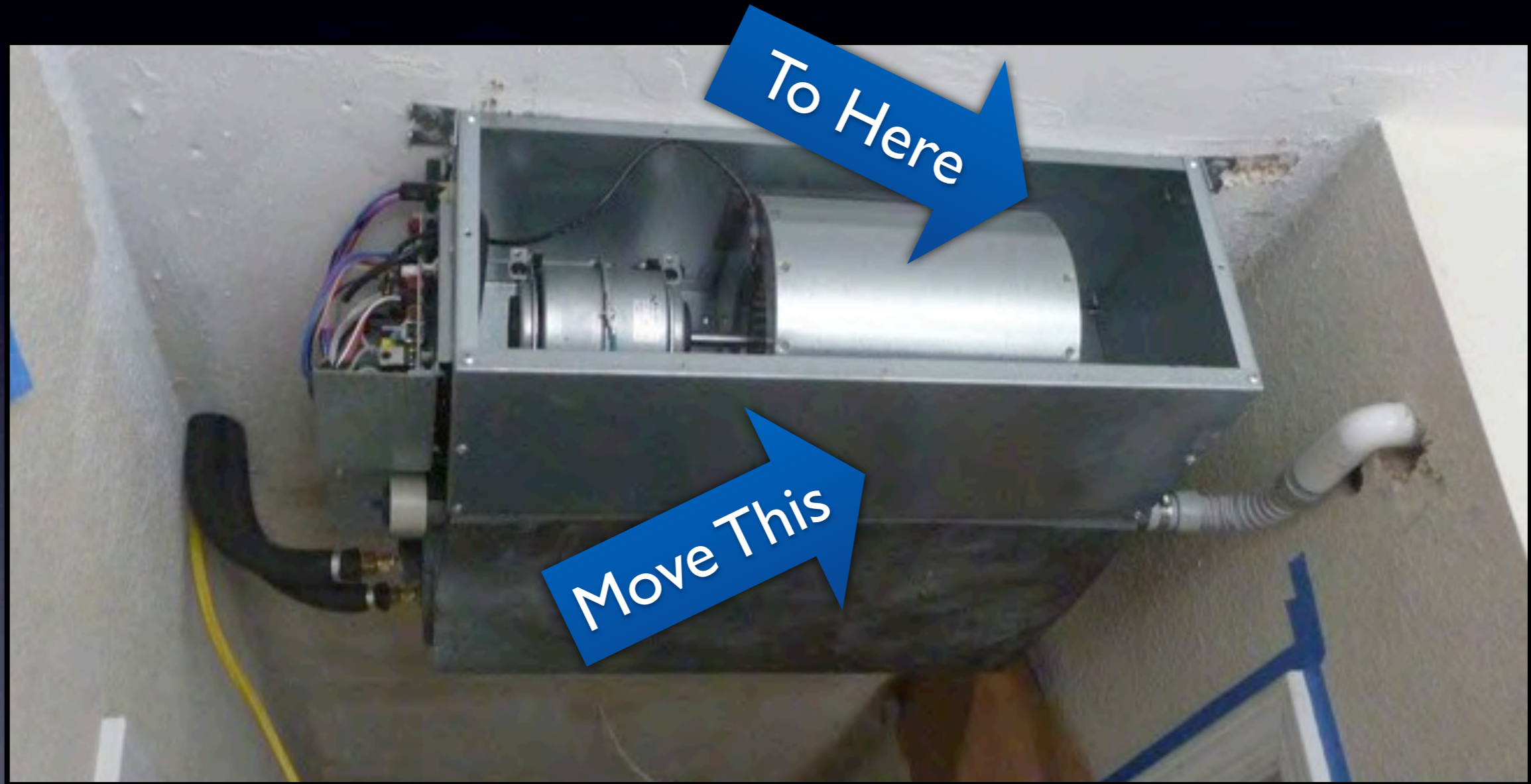
# Indoor Unit, Custom Transition & First Branch Duct



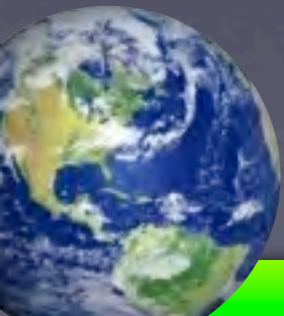
Looking Up At Hallway Ceiling



# Concealed Unit With Side Return, (Will be modified to bottom return)



# The Former Side Draft Is Now An Up Flow



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# Indoor Units Create Condensate

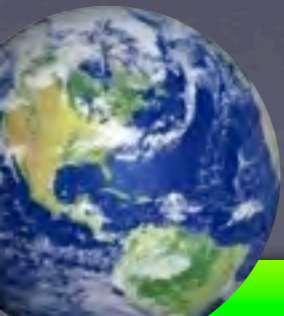
**Run a drain,\*  
Not a pump  
(they fail)**

Make all systems as bullet  
proof and idiot proof as  
possible

(Easier to do in a foreclosure  
that you own than a  
customer's home)



\*Connect to drain in basement or crawl or run to outside





# Lowered Ceiling Framing



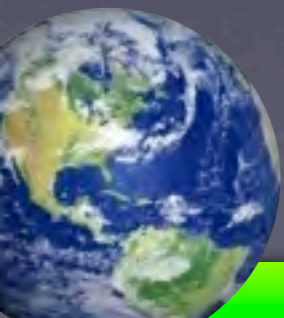
Note distance remaining above doors. This “lowered ceiling” has not been objectionable, or even mentioned by our buyers and renters.





Smooth “Hard Pipe” and gentle square to round transitions minimize friction loss and deliver maximum air to the rooms.

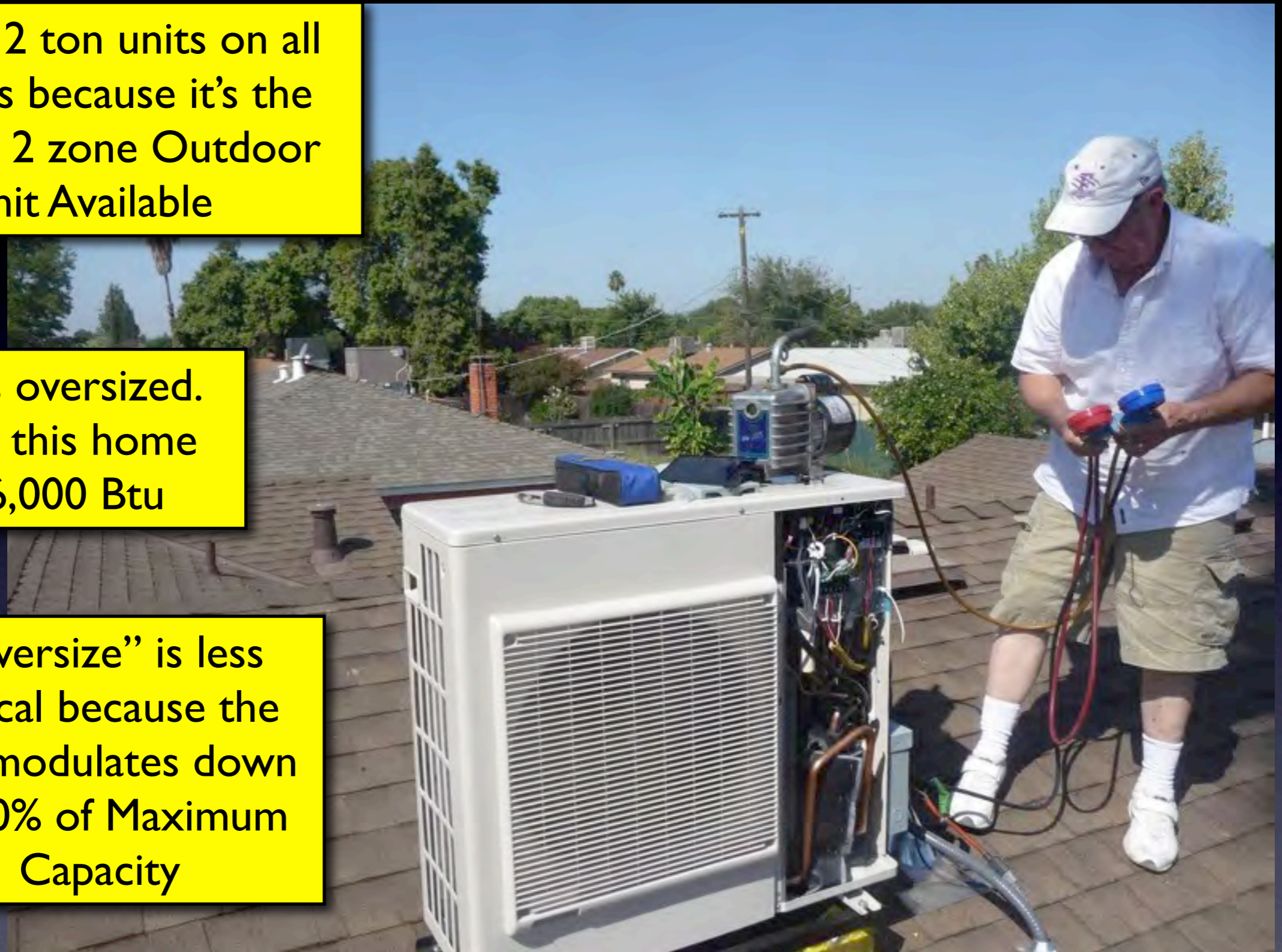
This was our main concern but these short, smooth ducts were our solution.



We use 2 ton units on all our jobs because it's the smallest 2 zone Outdoor Unit Available

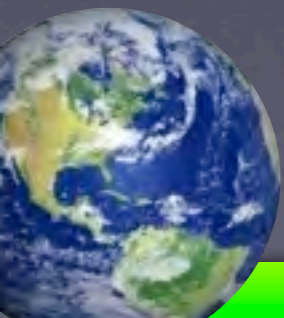
2 Tons is oversized. Load on this home was 16,000 Btu

“Oversize” is less critical because the unit modulates down to 40% of Maximum Capacity



Checking The Charge On 2 Ton Unit

**Note 3 and 4 ton units on neighbor's homes.**



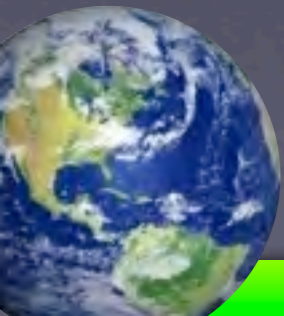
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# Review The Benefits:

1. Superior “Inverter”  
Technology converts AC power  
to DC allowing higher efficiency.
2. Ducted & Non ducted  
Systems for all applications.
3. Heating, Cooling AND (soon)  
Water Heating from 1 unit!
4. Less expensive to install\*
5. Less expensive to operate\*
6. Quiet\*



\* # 4, 5, & 6 require proper selection, design, & installation by a trained contractor

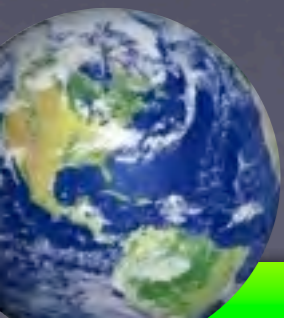
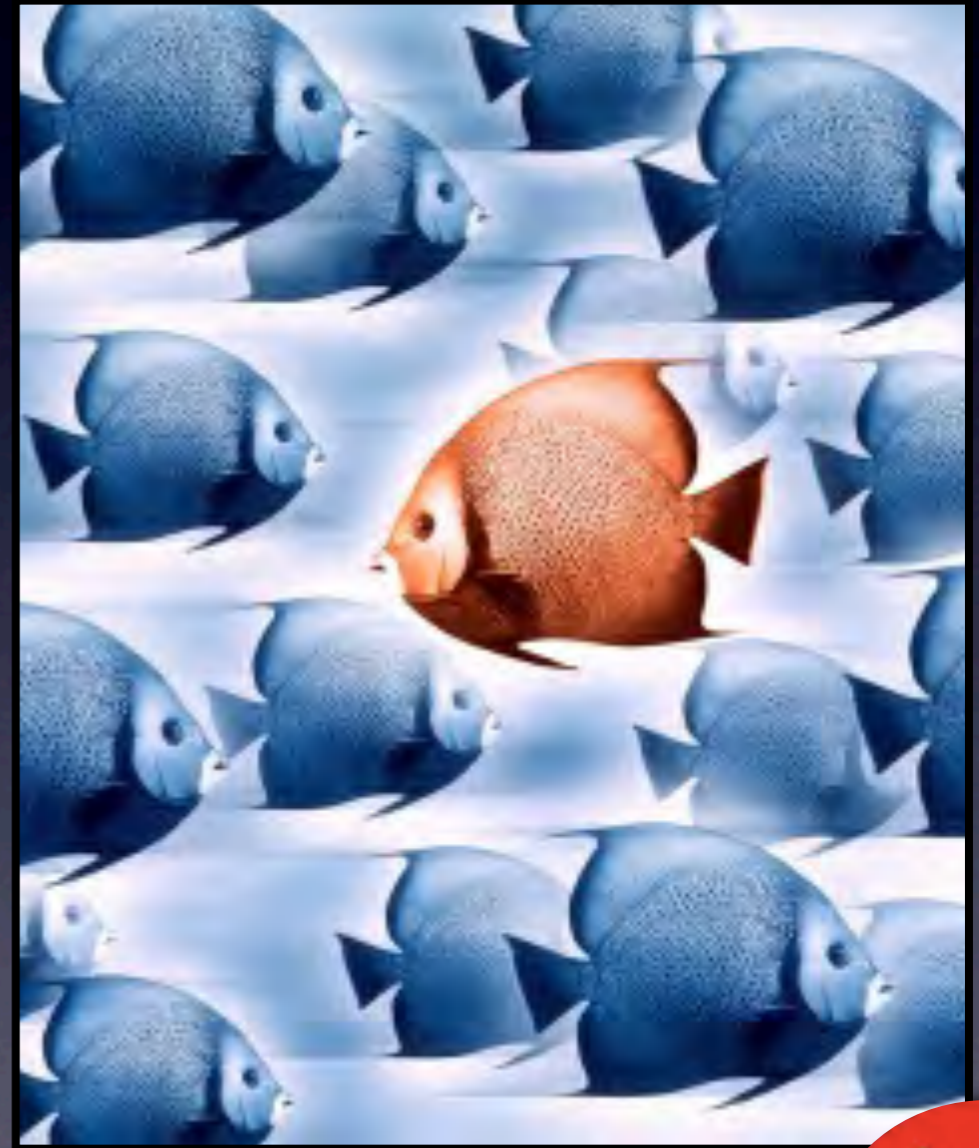


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# Why “It Wont Work Here” & How To Make It Work Anyway

## The Common Reasons Against Mini-split Technology:

1. It's loud
2. The wall units are ugly & my clients wont buy them.
3. It only works in spot locations like room additions
4. It's too expensive.
5. Must have forced air to each room.

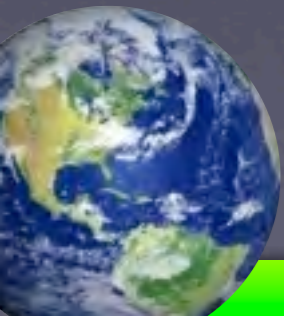


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# It's Loud

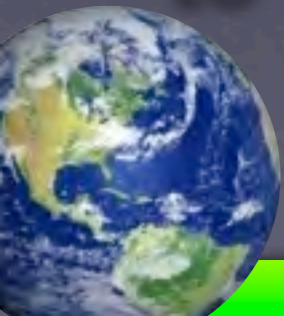
My friend Pete has spend 3 decades as a recording engineer and wanted something REALLY quiet for his home. He showed up with his dB meter to check the decibels on 3405 N Miami...The result? Pete's buying a Mini Split.

**It's not loud if it it's installed correctly**



# It's Ugly...

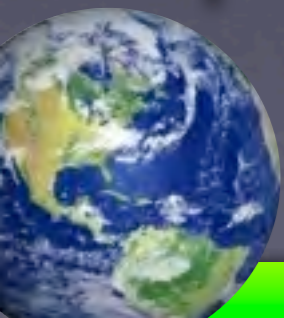
Beauty is in the eye of the beholder. It's true that Americans can tend to be snobbish and trendy. We say matter of factly that **“that thing on the wall”** is a new high tech unit that is used in Paris and London (I have photos from both cities) and was only now making it to our town and was going to save them money.... The buyers love it. And continue to love it and brag about it after they moved in.



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# It Only Works For Room Additions

This never was true. But if it was sort of true in the last century... It is certainly no longer true. The ducted units easily bring Mini Split Technology to the American Consumer and the American Buyer. **The American HVAC Contractor?** Well, that's a "Wait and See" Typically a pretty tough crowd when it comes to change....



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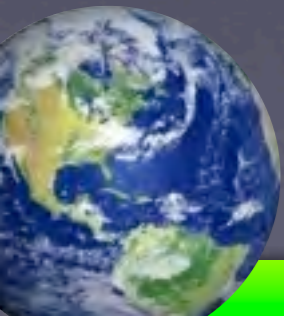


# Cost

Some think that the cost is greater than conventional HVAC. It can be if comparing a Mini-split with 4 inside units to an American central system. Our experience is that a two zoned Mini-split System, with or without ducts, costs \$500, - \$1,000 LESS than new central system for the same house (13 SEER, 80% equipment) High Efficiency Central Systems would cost \$2 - 4,000 MORE than the high efficiency Mini-split.

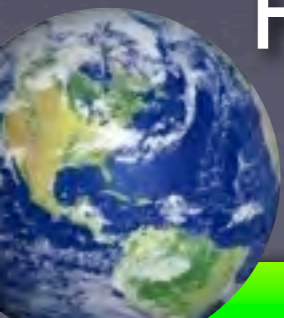


The \$1,500 tax credit plus any rebates make this system \$2,000 to \$3,500 cheaper than the typical central system, which gets no tax credit or rebate.



# Need FORCED Air In Every Room

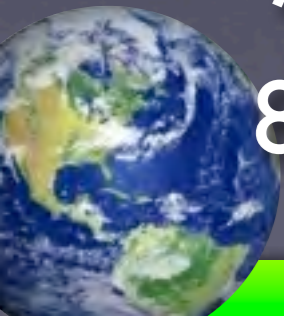
This objection may have had merit last century. With the ducted Mini-splits now available, the only reason no to use them is that your HVAC contractor is unfamiliar with them and his distributor doesn't offer incentive trips for selling them. Our rooms all have forced air @ 700 fpm with our ducted Mini-split systems. Introduce your HVAC sub to the future or replace him



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# Selling Points For Mini-splits

1. High SEER: 16 to 26. No duct loss with typical ductless units
3. No duct loss with duct systems in the building envelope
4. Little duct loss with small ducted systems properly installed
5. Quiet
6. Zoned systems for maximum efficiency
7. All electric, no gas leaks
8. Less expensive to install

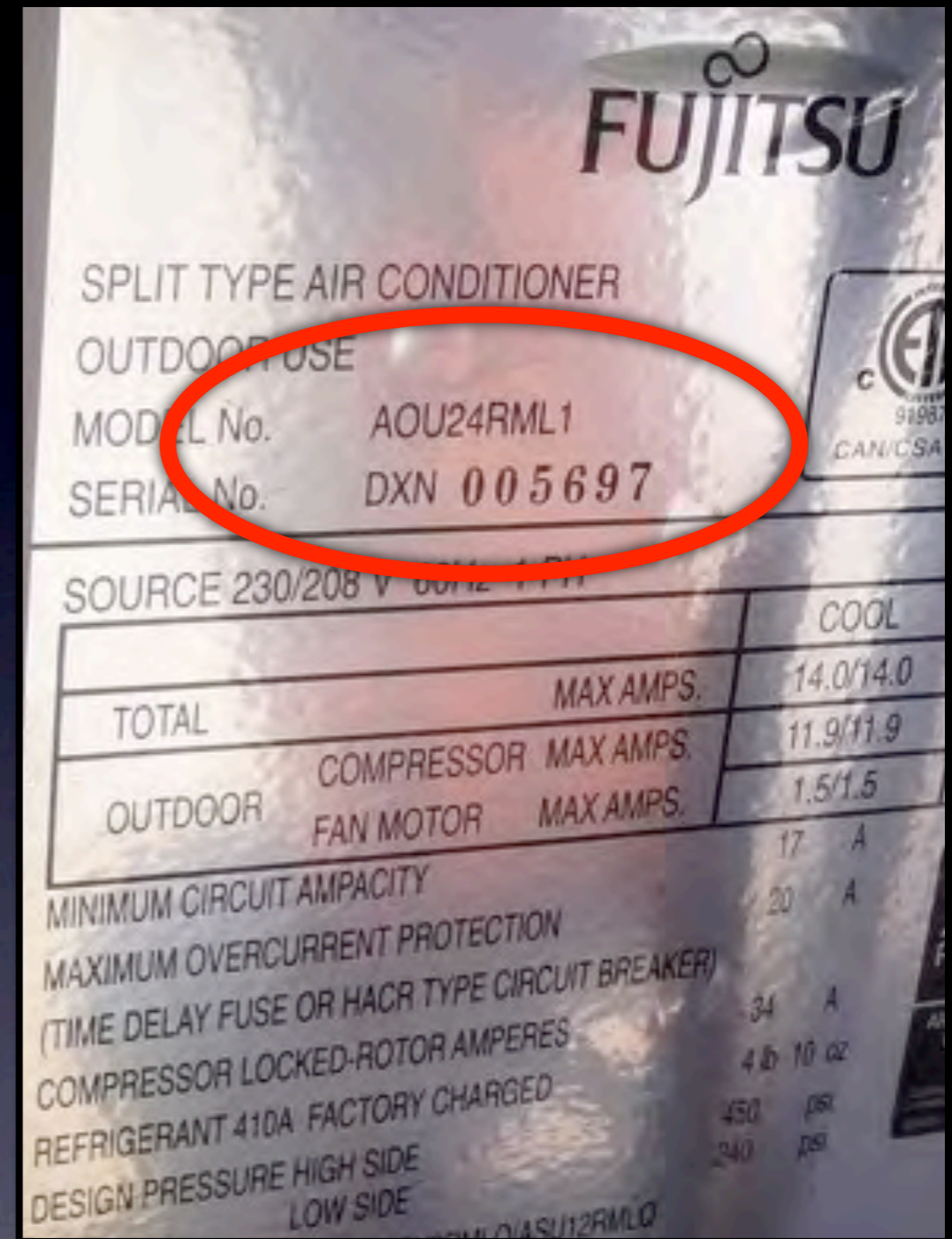


# Units & Sources

One world wide Brand that I use on GreenEarthEquities jobs is Fujitsu Halcyon. Other brands may be equally good.

The national supplier that I purchase thru is Johnstone Supply

Factory trained installers are essential. Charging these units is different than for American central systems



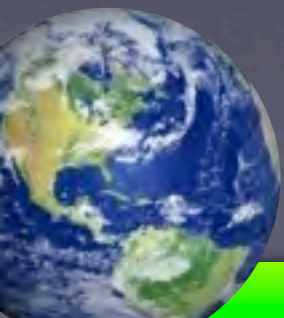
# Details For Ducted Systems

1. Consider placing the ducts inside the building envelope in a lowered hallway plenum. This retains the “Zero Duct Loss”
2. Use of hard pipe will minimize static loss. The factory cautions against high static.
3. Keep ducts as short as possible, with few gentle bends, no sharp turns



This Concealed Unit and Duct system was covered by a lowered ceiling.

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# Roof Mounting Is Preferred

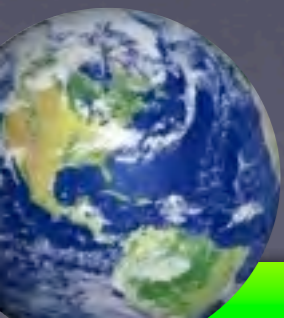
1. Less noise

2. Harder to steal or vandalize

3. Harder for kids to  
poke sticks in

4. Rocks thrown by lawnmowers

5. This is typical in my town. In  
areas where this looks strange, a  
surround can be built.

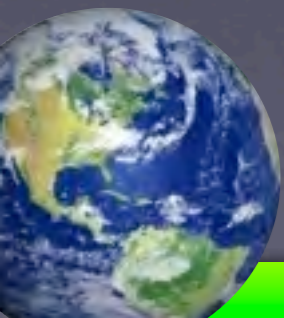


# Roof Mounting Is Safer

What do you think  
the efficiency rating of  
this typical ground  
mounted coil is?

Kids?  
Dogs?

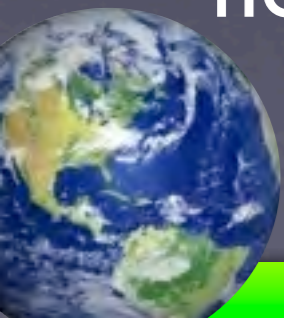
Doesn't matter, this is  
not an uncommon  
sight.



# Mini-split Commissioning, Air Velocity

The moving dampers easily throw the air 18 feet across the space.

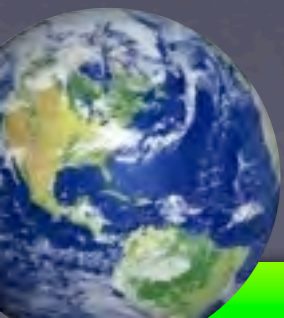
This is a good application for open space floor plans.





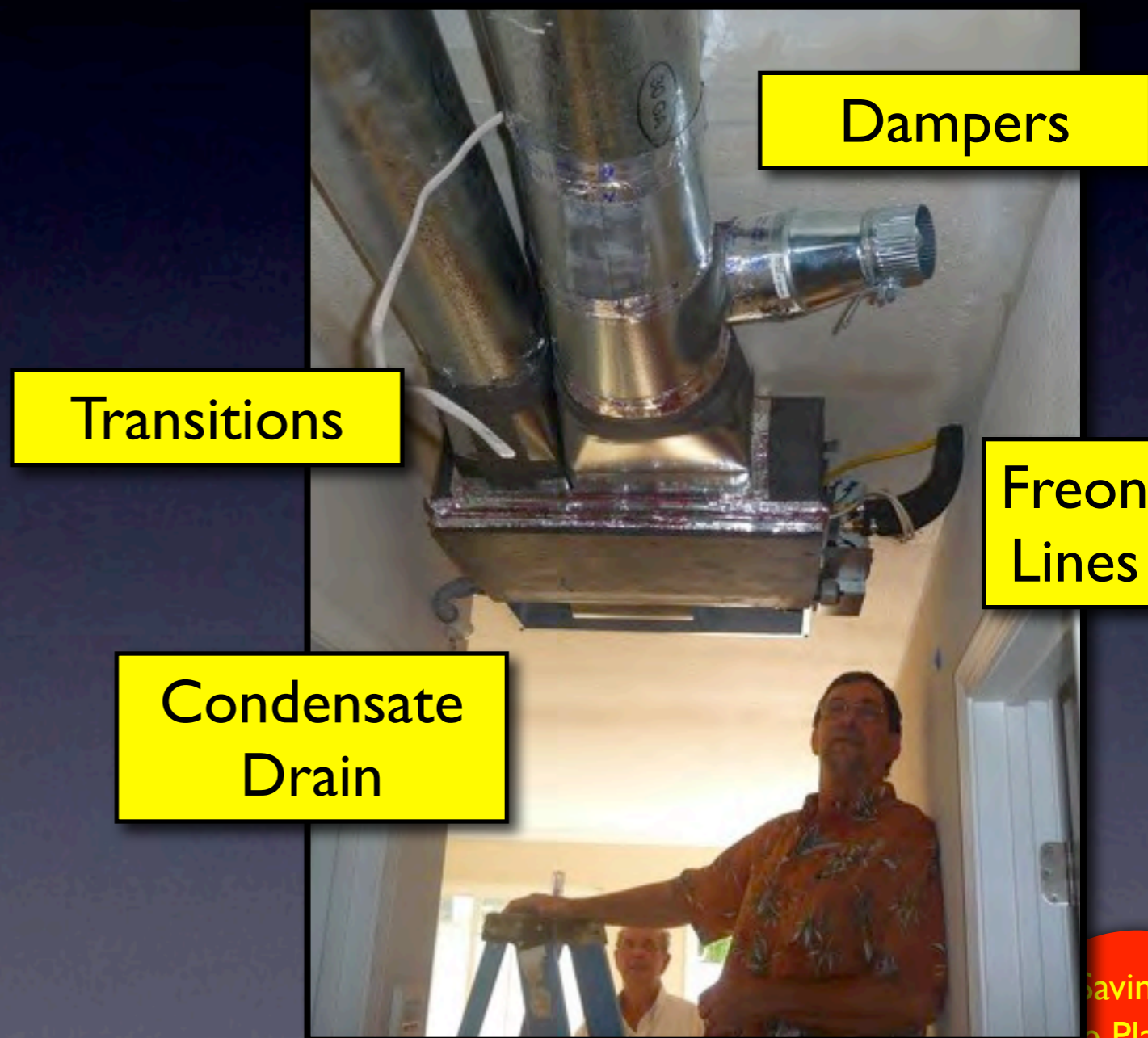
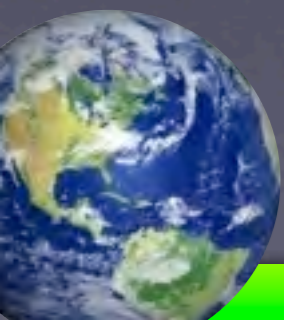
# Confirming Velocity and Adjusting Dampers.

In this application, the dampers should be adjusted for balance and locked in place before the ceiling is installed.




# Hard Pipe With Smooth Transitions


Smooth square to round transitions and straight runs create the least static pressure and make this system work better than anyone expected. It's old school work, and many HVAC installers don't have the knowledge or tools to do it. It pays to ask



# Ducts Work In Attics, Just Not As Well



Factory supplied transition. We wont be using it in the future.



This Custom transition divides the air for each side of the hall.



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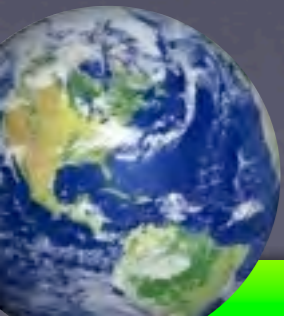
# One Way To Mount Mini-split Concealed Units.

Two  
Concealed  
Units Sharing  
a large 20" x  
30" Filter  
Return Box

Not Factory or ACCA or  
ASHRAE recommended ...  
It just works.

Ducts to  
Living Area go  
this way

Ducts to  
Bedrooms go  
this way



# Looking Up At 2 Concealed Units Sharing a 20x30 Filter Grille & Access

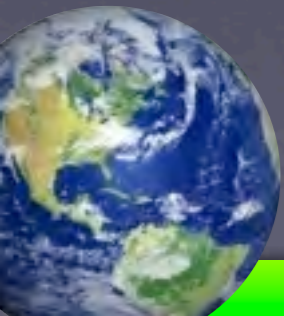
To help lower  
the static  
pressure, we  
discard the  
Factory  
included filter  
and replace it  
with this much  
larger 20x30  
filter



Super Easy  
Filter Change

# Mini-split Configuration Options

1. Single outside unit,  
Single inside unit
2. Single outside unit,  
Multiple inside units per room  
(recommended by manufacturers  
but tends to get pricey)
3. Single outside unit,  
Concealed indoor unit(s) with  
small duct system
4. Combinations



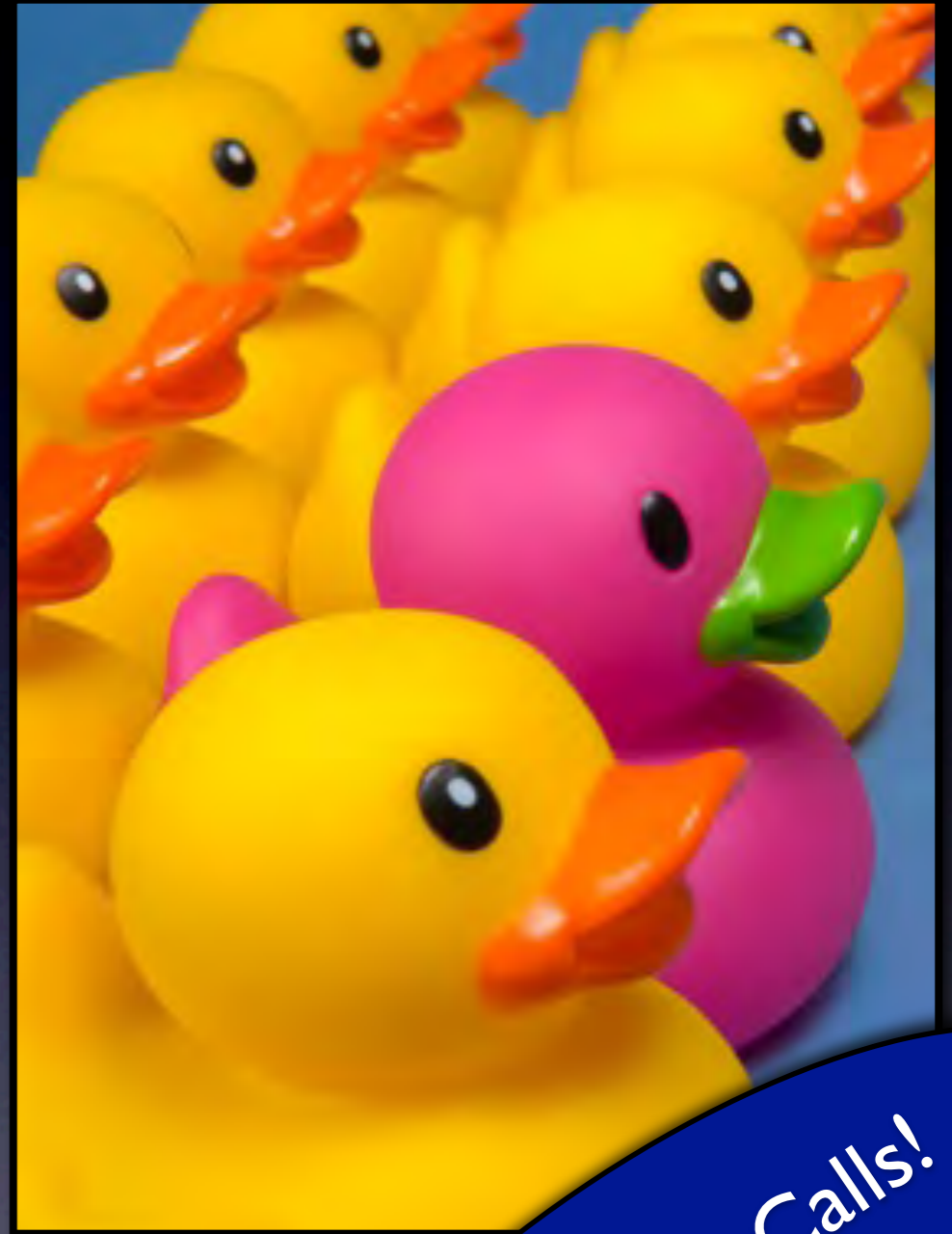
# Our Favorite, So Far

## “Hybrid” Ducted & Ductless

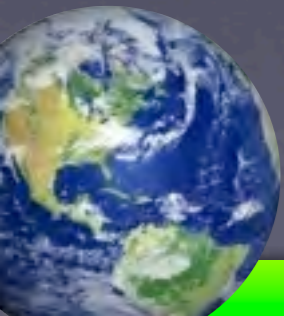
Outside unit serves two  
indoor zones

Living area is ductless

Bedrooms and baths are  
served by small duct system  
inside building envelope



No Service Calls!  
No Complaints



# Details On Test Home #1

1,200 sq ft 3 bed, 2 bath  
Attic R-55

Leakage: .5 cfm / sq ft floor

Vent: Panasonic ERV 40 cfm

Walls: R-16 with 1" rigid

Windows: U 30

< 10 sq ft Western exposure

Fujitsu 2-ton Mini-split on roof

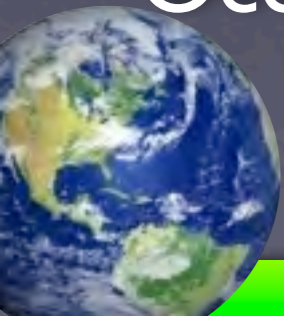
1 12,000 Btus wall mount

1 12,000 Btus concealed unit

Hard pipe in lowered hall

H2O & stove - Natural gas

Occupants = Couple + newborn  
(first home)



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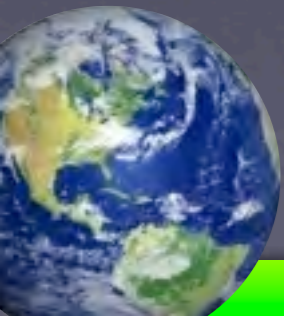


# Results: 13 Months Later

Bill Date	Elec Use	Elec \$	Gas Therm	Gas \$	Total \$
Feb 4, 2011	590	\$72.34	23.0	\$24.91	\$97.25
Jan 5, 2011	583	\$69.66	18.0	\$19.14	\$88.80
Dec 7, 2010	563	\$66.99	23.0	\$23.45	\$90.44
Nov 4, 2010	328	\$39.03	14.0	\$15.79	\$54.82
Oct 6, 2010	481	\$57.24	12.0	\$13.82	\$71.06
Sep 5, 2010	480	\$57.12	10.0	\$11.67	\$68.79
Aug 5, 2010	458	\$54.50	9.0	\$9.90	\$64.40
Jul 7, 2010	375	\$44.63	10.0	\$10.65	\$55.28
Jun 6, 2010	284	\$33.79	14.0	\$14.48	\$48.27
May 6, 2010	297	\$24.76	16.0	\$14.08	\$38.84
Apr 7, 2010	347	\$28.93	21.0	\$17.41	\$46.34
Mar 7, 2010	388	\$32.34	20.0	\$17.41	\$49.75
Feb 4, 2010	283	\$23.59	18.0	\$15.31	\$38.90

Hot  
Fresno  
Summer

Note: This won't work without a good envelope



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# Comparing Two GEE Projects



Very Similar - Some Differences

1,200 sq ft 3 bed, 2 bath

Attic R-55

Leakage: 1 cfm / sq ft floor

Vent: bath fans only

Walls R-11, no rigid ins added

Windows: U 30

< 15 sq ft Western exposure

Rheem 2 ton package on roof

(13 SEER 80% furnace)

Flex R-8 ducts in attic, Manual D

H2O & stove: Natural gas

Occupants = Couple + Newborn

Month	MS HP Test 1	Contol
Oct	\$57.24	71.15
Sept	\$57.12	109.97
Aug	\$54.50	112.77
Jul	\$44.63	109.32
Jun	\$33.79	40.36
May	\$24.76	43.70
Total->	\$272.04	487.27

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# I Thought Gas Was The Cheapest?

## Heating Fuel Cost Calculator

Will you save money by switching to another fuel?

### Compare Fuel Costs: Interactive Calculator

Compare the cost of different fuels by selecting a fuel, entering your local price, and choosing a heater and distribution system.

[Show detailed instructions...](#)

Fuel:  at \$  per kilowatt-hour (**3,412 Btu** [edit](#))

Heater:  efficiency  % [learn more](#)

System:  efficiency  %

**Electricity: \$15.95 per million Btu**

[remove this fuel](#)

Fuel:  at \$  per  (**100,000 Btu** [edit](#))

Heater:  efficiency  %

System:  efficiency  %

**Natural Gas: \$19.03 per million Btu**

[remove this fuel](#)

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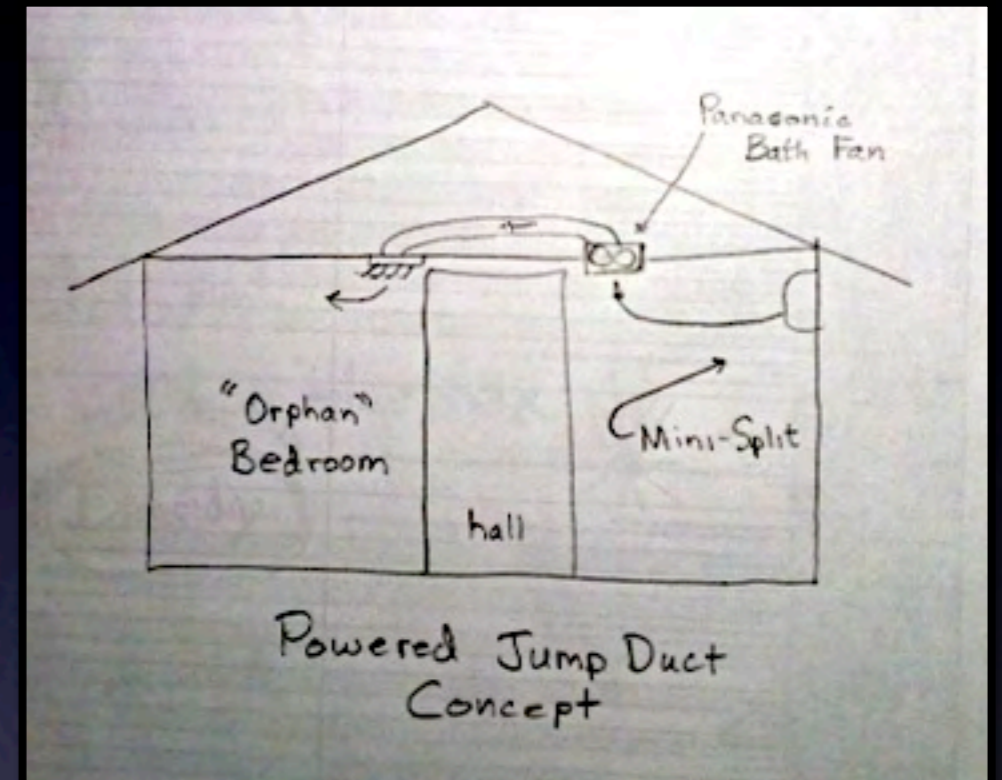
## Surprised?

Note: Specify  
Electric Only Heat  
for Utility Discount

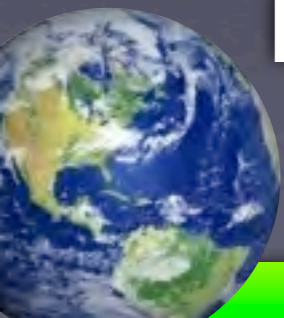
Living  
Planet  
House  
At A Time

# Powered Jump Ducts

1. Use the MOST efficient Mini-splits.  
(26 SEER, 9000 - 15,000 Btu's, Single wall-mount only)
2. Access distant rooms
3. Working well in 800 sf apartment in York, Nebraska
4. Installed between floors in 4500 sf home in Virginia  
Performance? ... Stay tuned



We need more data  
Anyone done this?  
Anyone planning to?





Marty, this could be bigger than the Flux Capacitor. Foreclosures, Renovated with Mini-splits and all the other stuff these guys are talking about! We really can save the planet!

Saving  
The Planet  
One House  
At A Time

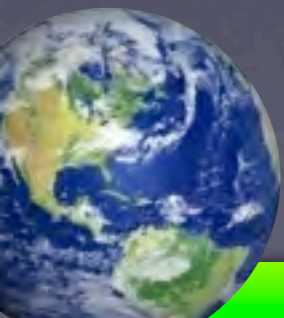
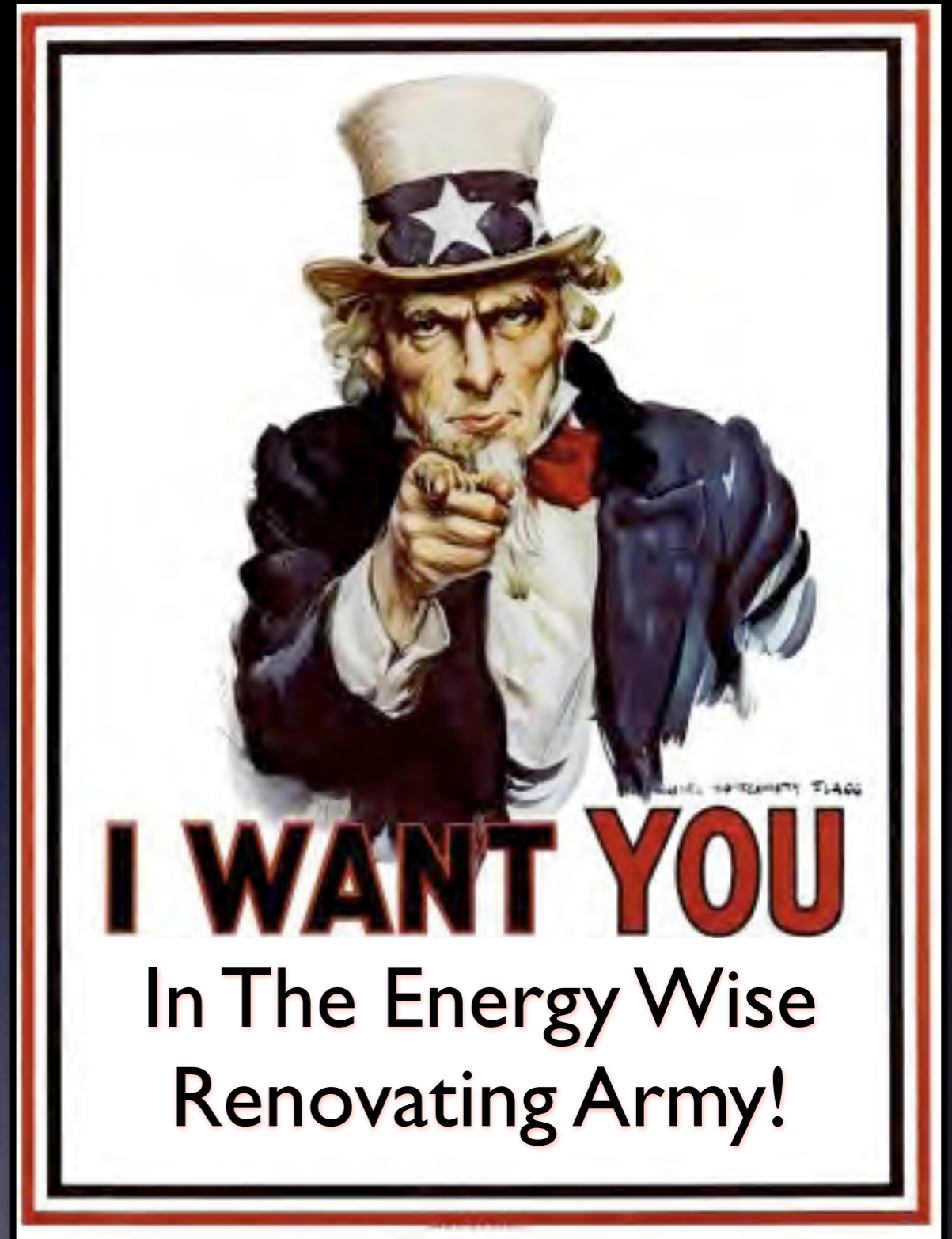
# Thank You!

If you missed  
a point or 2,  
all these slides  
and many more are at

[GreenEarthEquities.com](http://GreenEarthEquities.com)

Email me at:

[Dave@GreenEarthEquities.com](mailto:Dave@GreenEarthEquities.com)



# Questions ... Dave, Danny or Linda Audio or Text

