

Effective and Efficient Heating and Cooling

Rebuild Green Expo

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A new SEER 14 EER 12 AC
Is it an AC appropriate for Santa Rosa?



Dry Climate vs. Wet Climate

- Official Measures of Performance:
 - SEER
 - **EER**
- Necessary Measure of Performance for Santa Rosa:
 - **Sensible Efficiency**

What Does an Air Conditioner DO?

**Reduces the Temperature –
Sensible Capacity**

**Removes Moisture –
Latent Capacity**

How to get a Santa Rosa Appropriate Air Conditioner

1. Keep the coil indoor warmer so little moisture is gathered on the coil
 - This produces high sensible capacity and high system sensible efficiency.
 - You do it with high airflow (CFM per ton)
 - Which takes **SHORT DUCTS**
 - Which takes a good duct system and fan motor
2. Evaporate the moisture off the coil at the end of the cycle

Warmer Coil = Higher Sens. Efficiency

- Warmer Coil comes from one thing
MORE AIRFLOW
- More Airflow is measured in
CFM per TON
- CFM per Ton comes from two things
MORE CFM and
- **LESS TONS**

Historic AC and Heat Pump Sizing

- One ton per 400 Sq. Ft.
- Houses have changed

Back to More CFM

- More CFM comes from:
- LESS RESTRICTIVE DUCTS which are:
 - **SHORT DUCTS**
 - MINIMUM TURNS
 - PROPER DIAMETER

So What Makes a Santa Rosa Duct System?

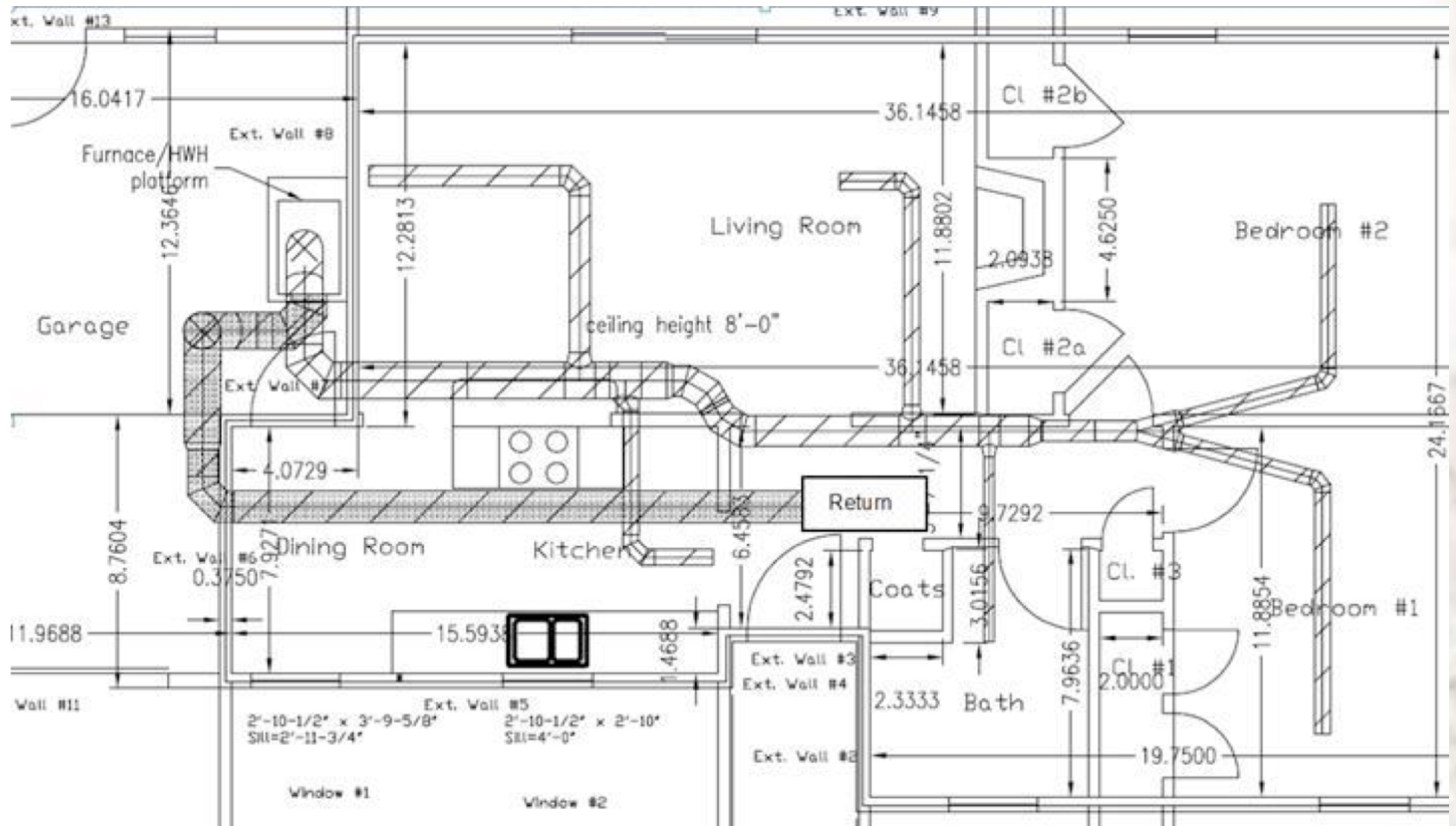
- **SHORT DUCTS**
 - Minimum Turns
 - Proper Diameter
 - Big Returns (include 2" or 4" filter)
- and**
- Well Insulated (R ?) or
 - Inside Conditioned Space

Case Study 1948 Stockton House

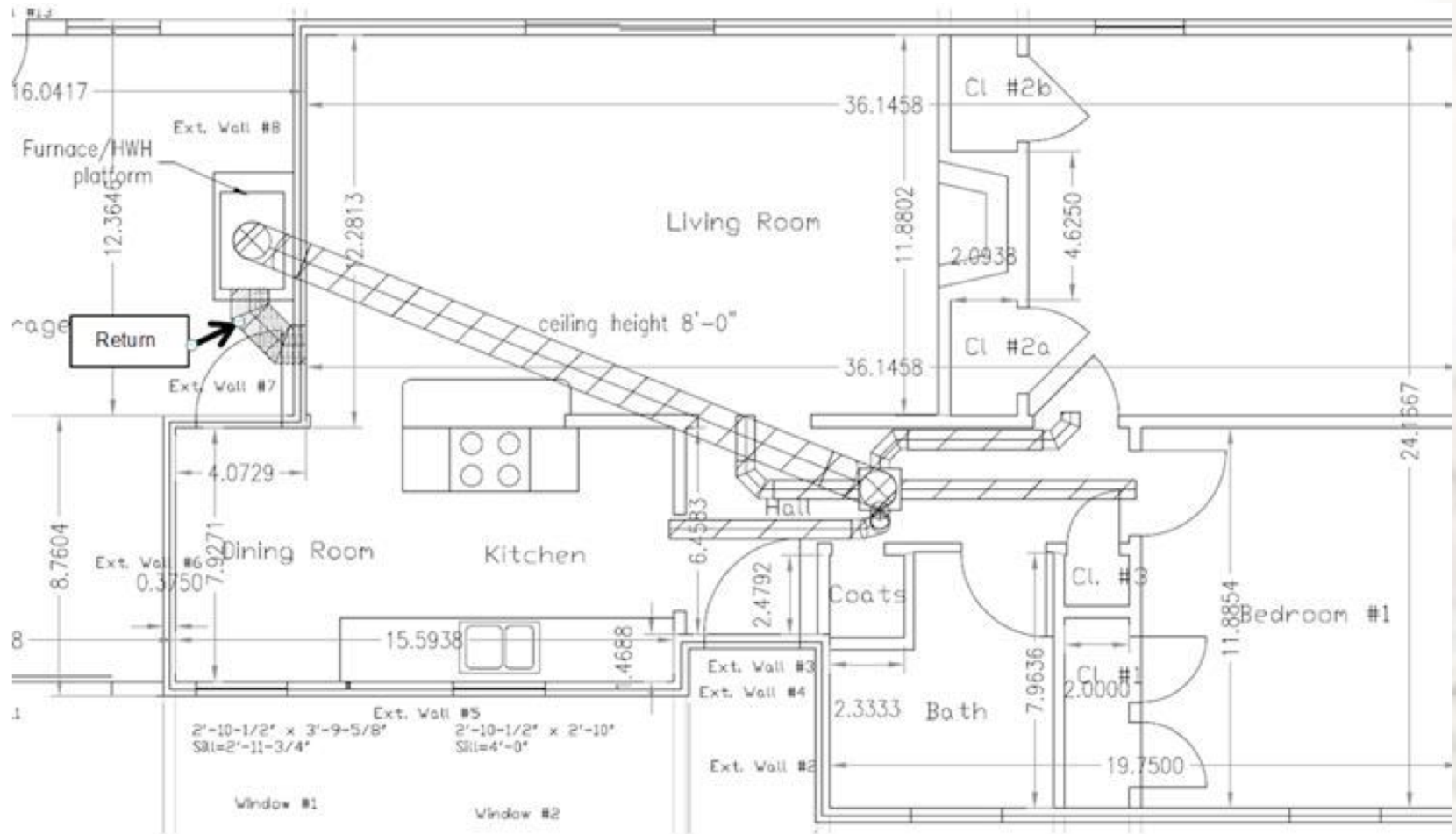
2x3 Walls



Start Here -- Ducts



Number 1 – Minimum Ducts



Buried Ducts



Some Numbers

- SHORT DUCTS insulated to attic R value
- Replacement ECM Motor
- Downsized FROM 2.5 to 1.25 Tons

- Went from 212 CFM/ton to 540 CFM/ton
- 0.12 Watts per CFM
- Went from 339 to 678 sq. ft. per ton

Why Are Ducts Number One?

- They generate LOSSES:
 - They are a really big heat exchanger
 - They are very effective at losing the capacity of your AC, HP or furnace through conduction and leakage

Minimize Ducts

- Short
- **Really Short**
- Insulated
- **Super Insulated**
- Tight
- **Leakless Tight**

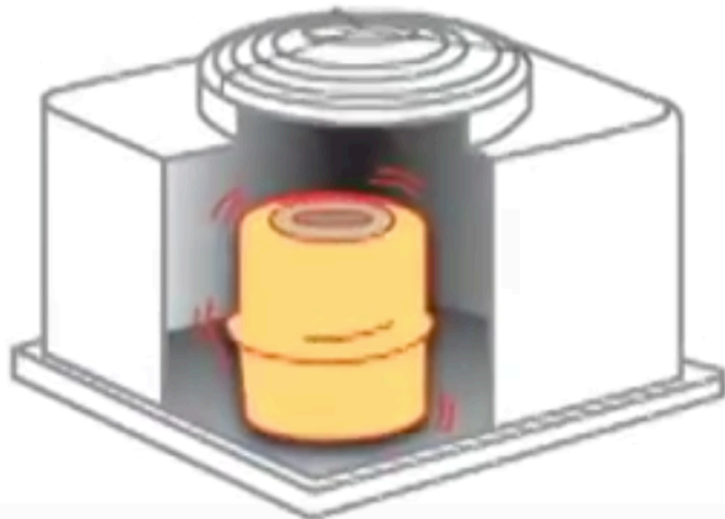
There are Two Ways to get a Dry Climate Air Conditioner

1. Keep the coil indoor warmer so little moisture is gathered on the coil
 - This produces high sensible capacity and (if done right) high system sensible efficiency.
 - You do it with high airflow (CFM per ton)
 - Which takes a good duct system
- 2. Evaporate the water off the coil at the end of the cycle**

Water Builds up on Coil During Compressor on

- In hot and dry climates, when the typical air conditioner turns off, it still has stored cooling (moisture) sitting in it. The stored cooling can be delivered to the home or business if the fan runs longer.

Compressor
shuts off...



(high energy use)

Indoor Fan

... keeps
running

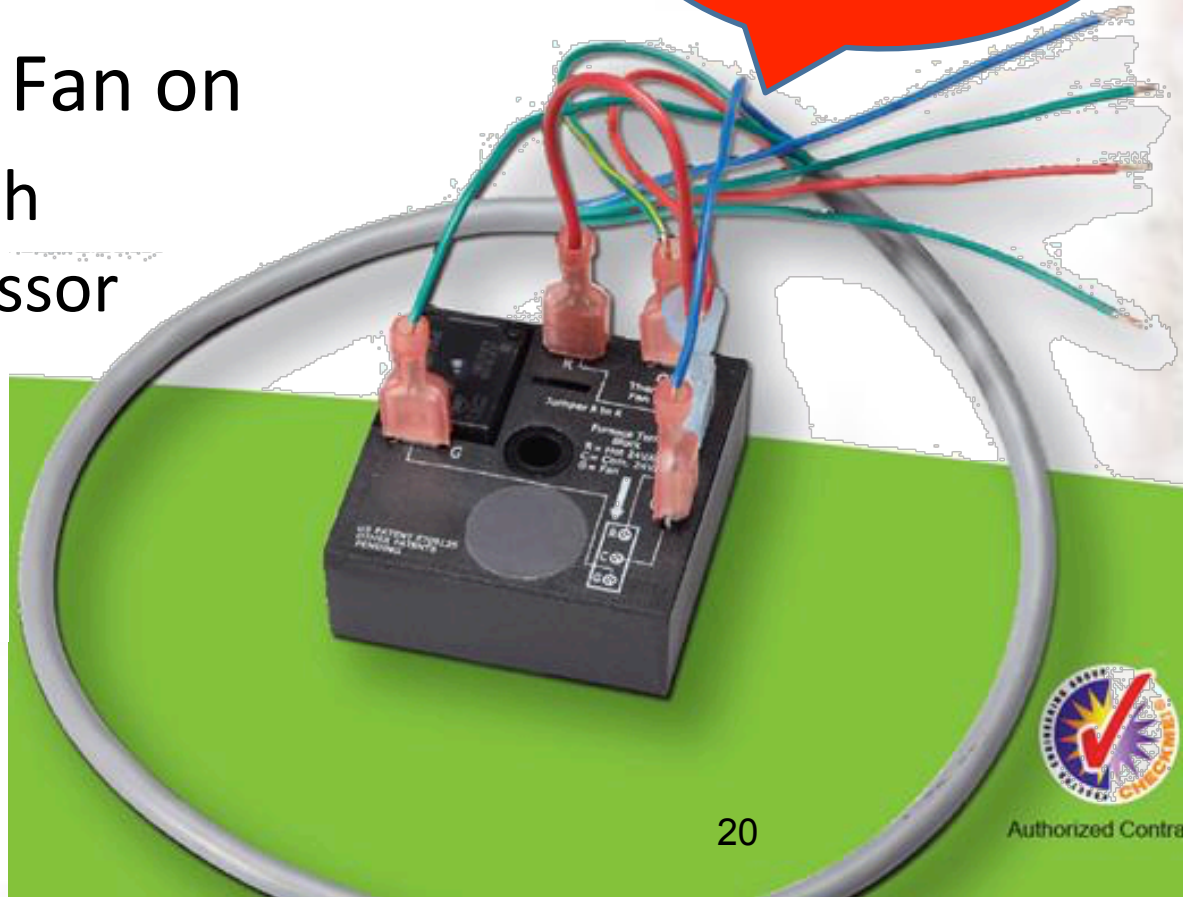


(low energy use)

Western Cooling Control™

- Compressor on Fan on
 - On time logged
- Compressor off Fan on
 - Time varies with logged compressor time
 - Evaporates off the coil = Cool air

Over 100,000
successfully
installed



Authorized Contractor

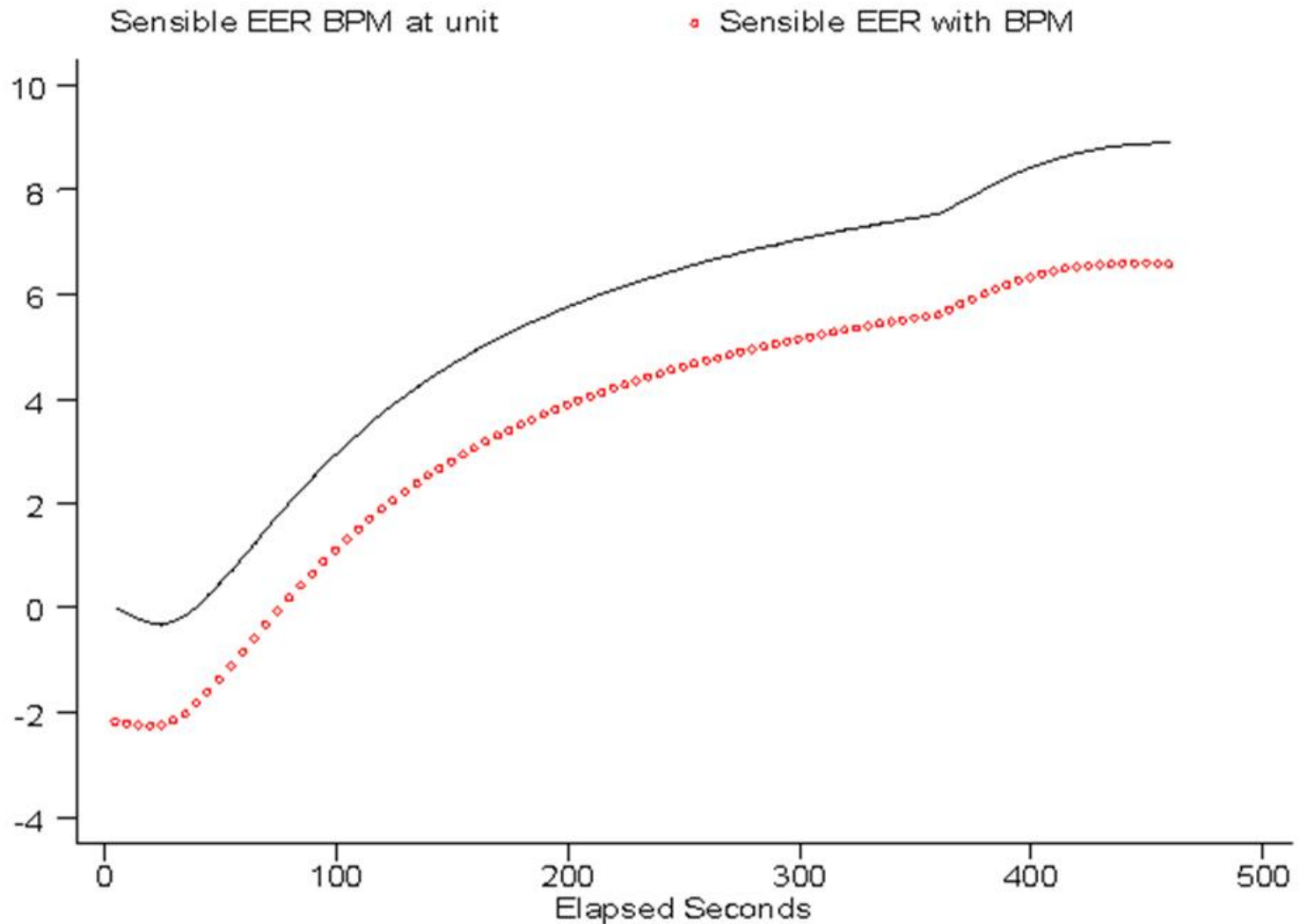
Good Design vs. Barely Enough

- 600 to 800 CFM/ton vs. 350 CFM/ton
- 0.15 to 0.26 Watts/CFM vs. 0.45 Watts/CFM
- 600 to 1000 sq. ft. / ton vs. ???
- Unmeasurable to 2% Duct Leakage vs. 5% Lkg.
- 4" Deep Filter Box vs. 2" Deep
- R-38 Duct Insulation vs. R-8 Duct Insulation
- Variable Fan-off Time Delay vs. 60 to 90 sec.
- Heat Pump HSPF 9.5 vs. 8.2
- EER 12.5 vs. SEER 14
- Refrigerant Charge Correct
- Filter Location Label

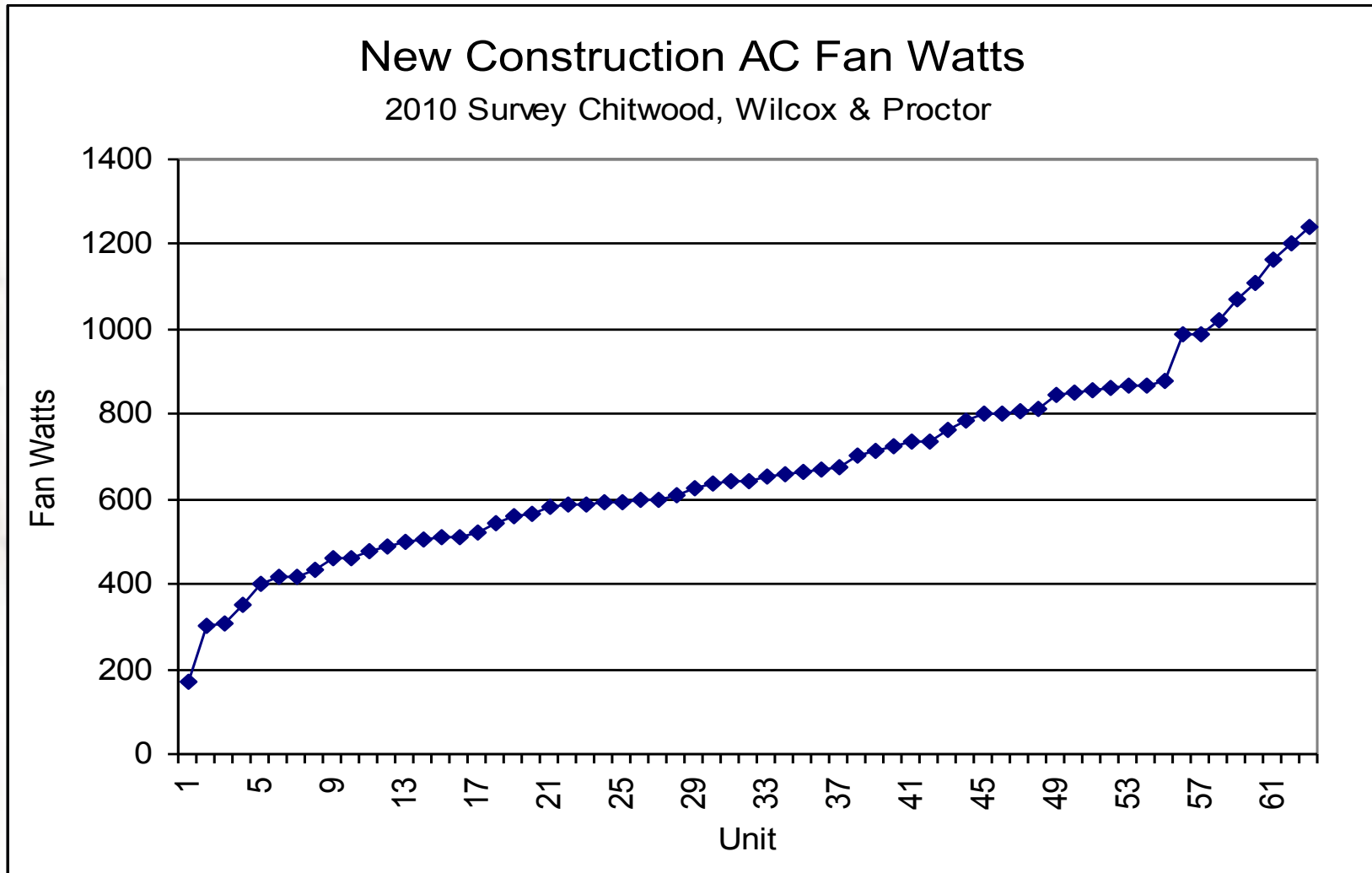
Other Topics

- Furnaces
- Two Speed
- Variable Speed
- Zoning
- Whole House Fans
- Attic Fans
- More Examples

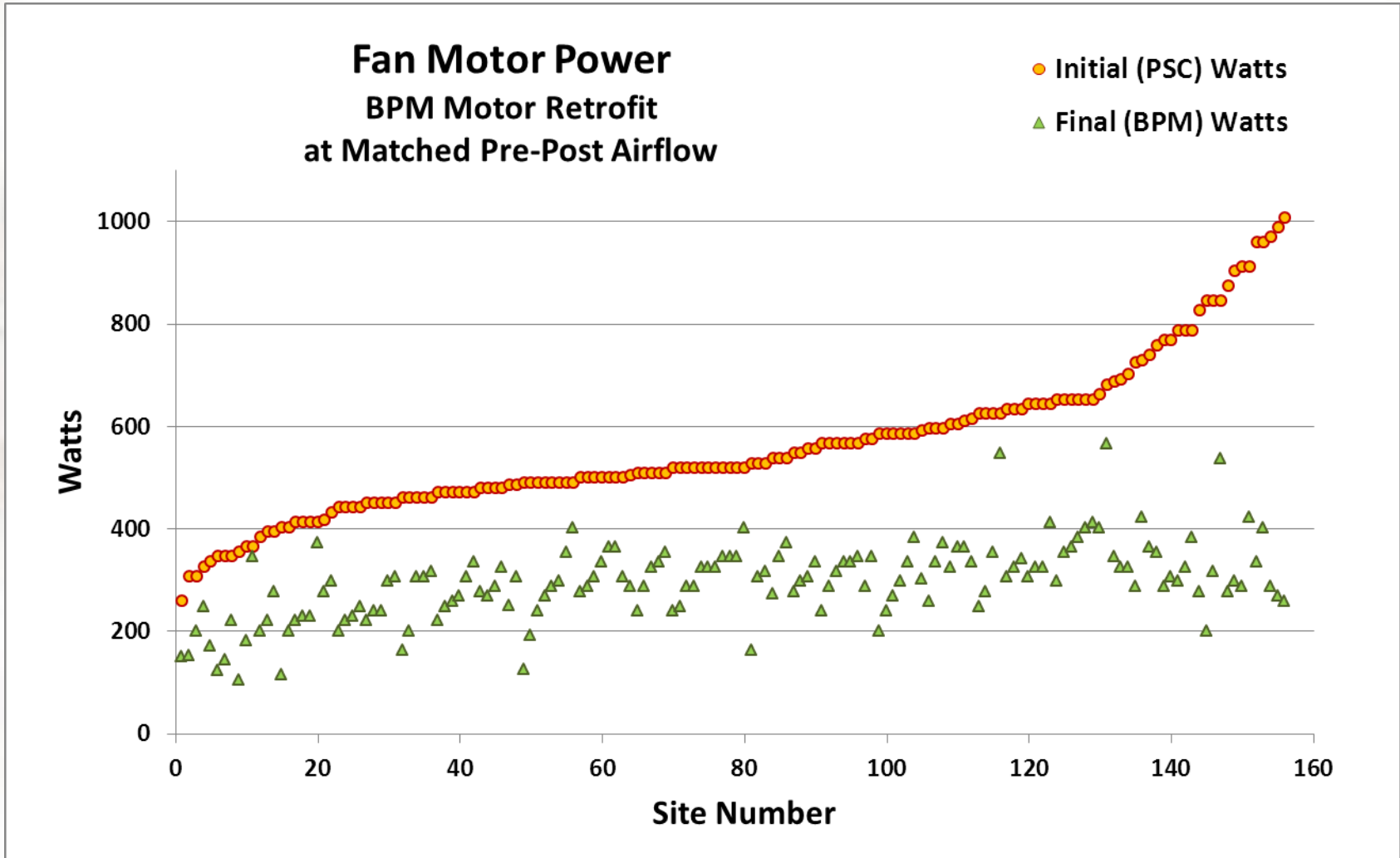
Efficiency with 20% Duct Loss



Furnace Fan Watt Draw



Fan Watts at Same Cooling CFM



Average Reduction 47%

