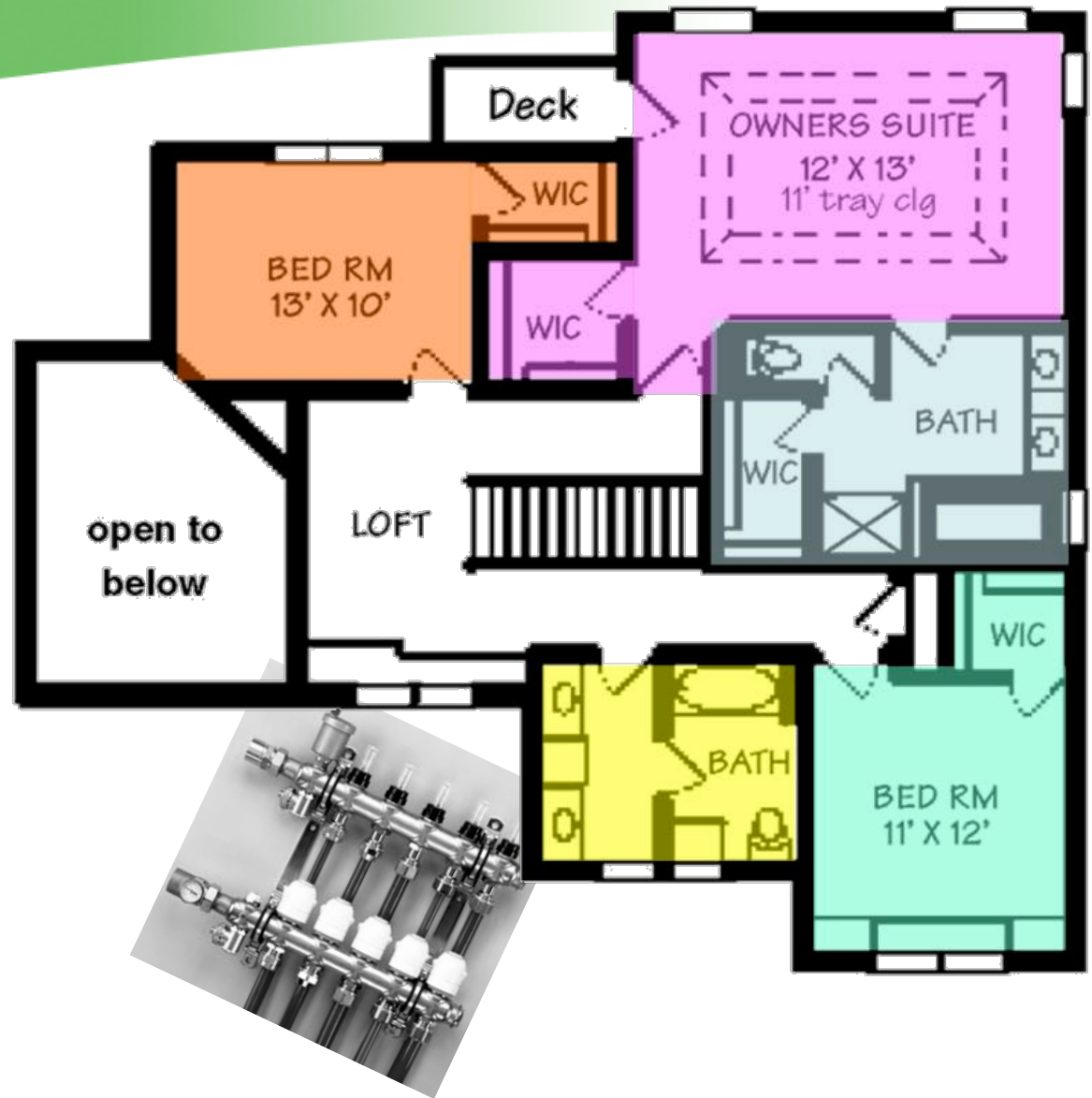


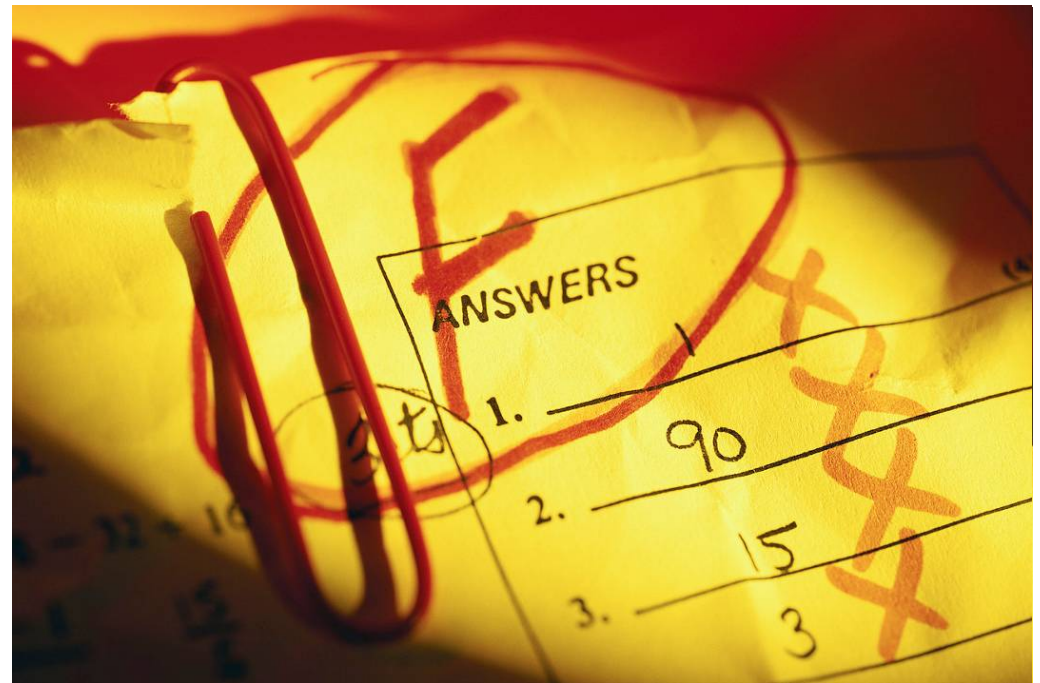
Zoning and Water Temperature Control



January 20, 2011

Industry Report Card

- What is satisfaction rate for RFH?
 - 40% satisfied
 - 42% say not bad, but hoped for better
 - 18% unsatisfied or don't know
- What's our grade?



Common Complaints

- Inconsistent room temps
- Some rooms too warm, some too cool
- “Goldilocks” Syndrome



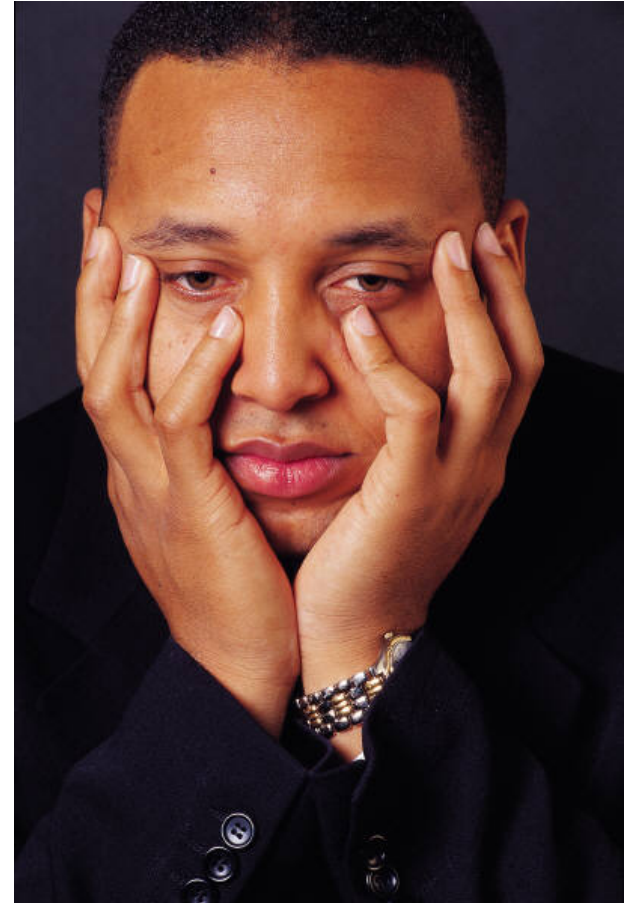
What Was Promised?

- Ultimate in comfort
- Total comfort in every room
- Ultimate in efficiency
- Premium system (premium price)



What Was Delivered?

- So-so comfort
- So-so performance (premium price)
- Did they get what they thought?
- Where did we go wrong?



So What Can We Do?

- Understand human physiology
 - 150,000 heat loss sensors
 - 16,000 heat gain sensors
- Average home has how many zones?
- The average Mini-Van?



Solution?

- Design for people!
- Aggressive zoning
- Appropriate # of SW_T's
- Smart application of outdoor reset
 - Enhance comfort
 - Reduce fuel usage



How Many Zones?

- 2556 SF, single floor



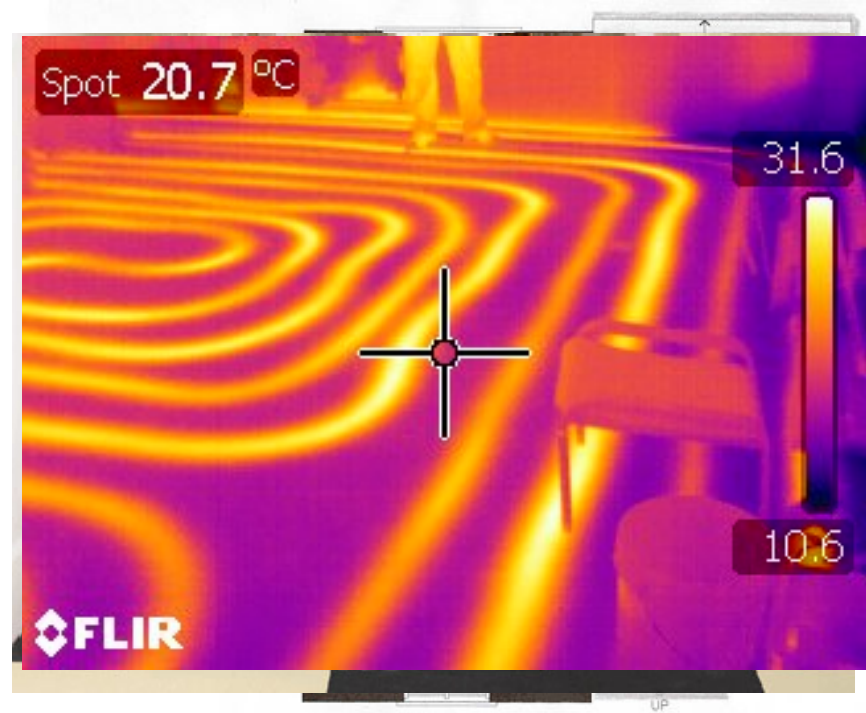
- **9 zones**
Laundry & Kid's Nook heated by leaders to Bedroom 3 & Bathroom



*Manifolds in:
 3 loop in
 Mechanical Room
 (Storage);
 6 loop in Pantry;
 3 loop in WIC*

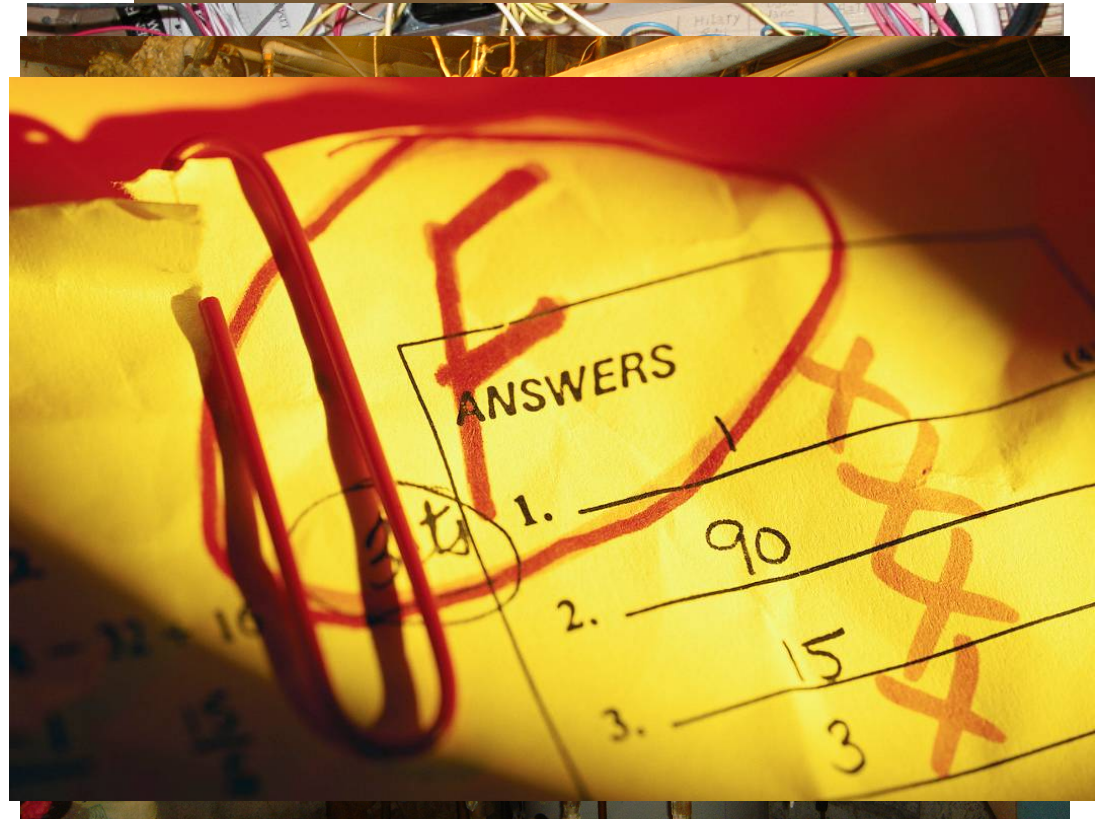
Zone “Conditions”

- Consistent use patterns
- Consistent floor R-values
- Consistent BTU/SF loads



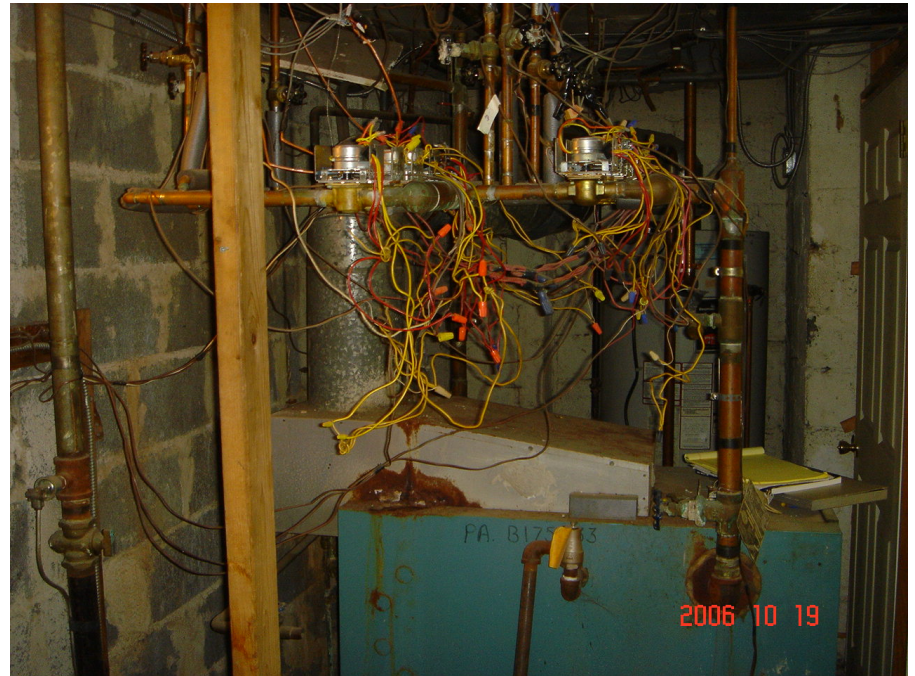
That's A LOT Of Zones!

- Too many?
- Too costly?
- Who the #@^&% is gonna wire the freakin' thing?
- Too much trouble?
- Remember...



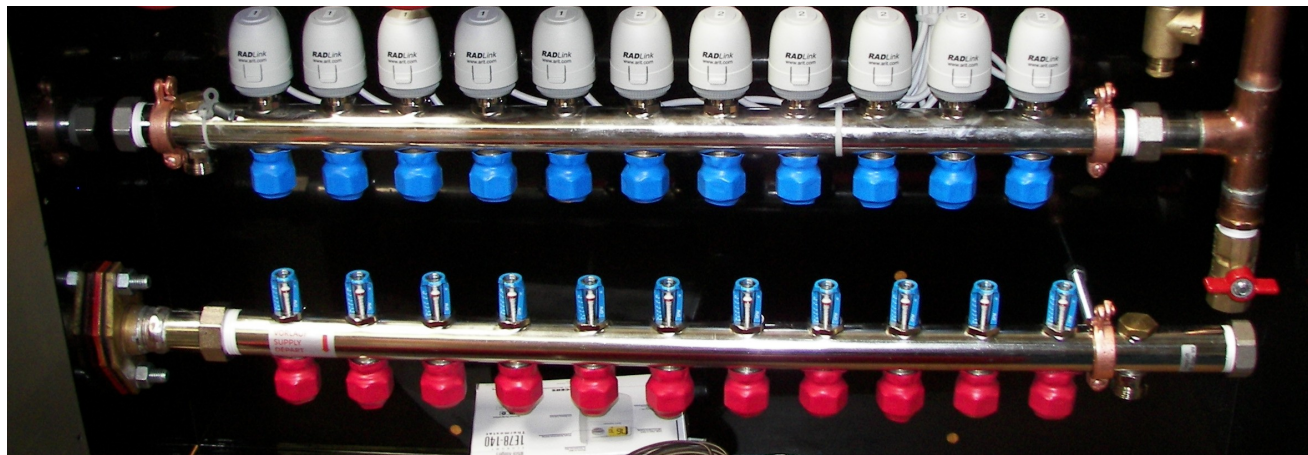
So How Do We Do It?

- Zone with circulators?
 - 9 circulators
 - Plus relays & manifolds
- Zone with zone valves
 - Fewer circulators
 - Still multiple manifolds



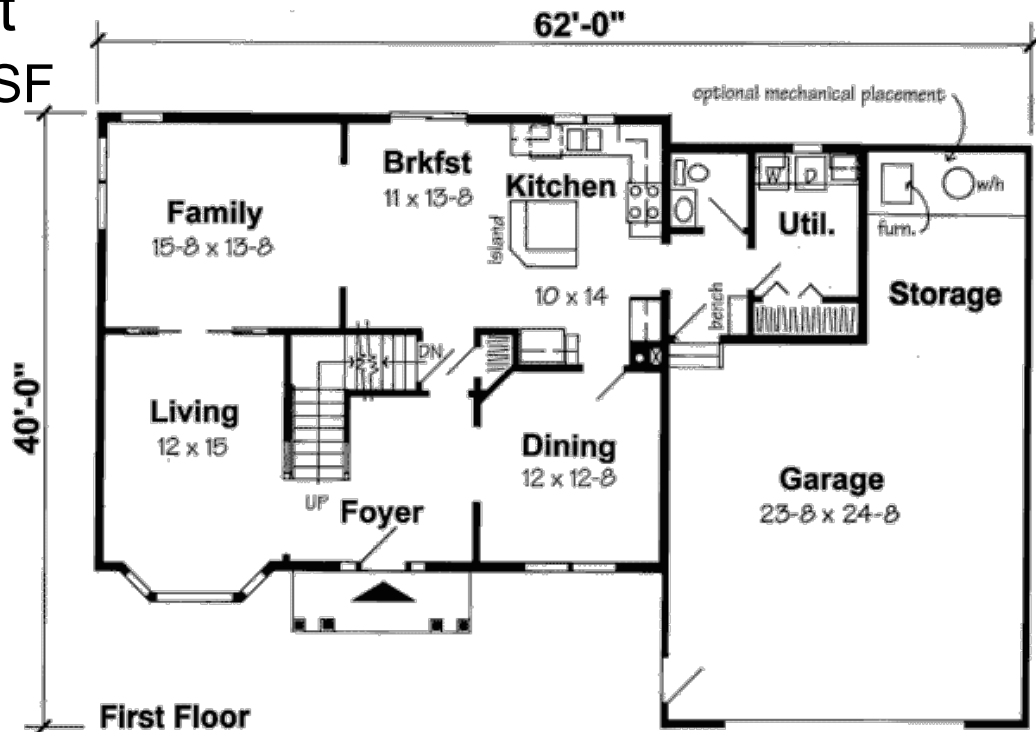
A Better Solution

- Manifolds & actuators
 - Central manifold locations
 - Easy piping/wiring



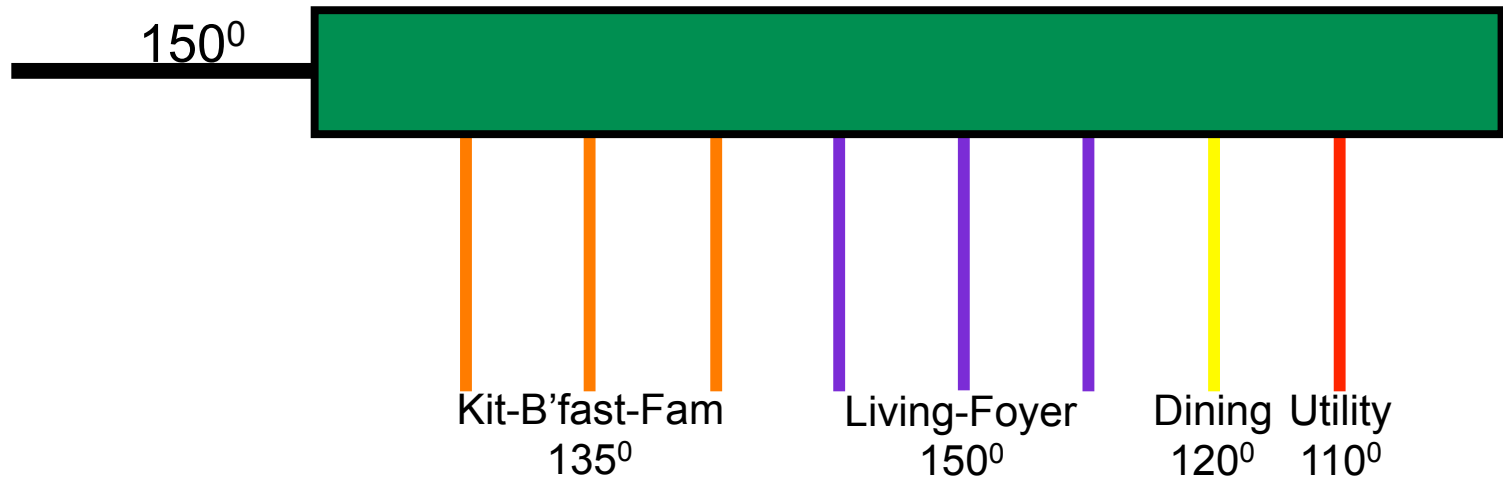
A Practical Problem

- Family-Kitchen-B'fast
 - Tile/HW, 19-22 BTU/SF
 - $SW_T - 135^{\circ}$
- Living-Foyer
 - Carpet, 26 BTU/SF
 - $SW_T - 150^{\circ}$
- Dining
 - HW, 16 BTU/SF
 - $SW_T - 120^{\circ}$
- Utility
 - Tile, 14 BTU/SF
 - $SW_T - 110^{\circ}$



A Practical Solution

- Single zone, 1 manifold



- Where are you going to put the thermostat?



Kit-B'fast-Fam
135°

Living-Foyer
150°

Dining Utility
120° 110°



150°



Kit-B'fast-Fam

135°



Living-Foyer

150°



Dining Utility

120°

110°





150°



Kit-B'fast-Fam

135°



Living-Foyer

150°



Dining Utility

120°

110°



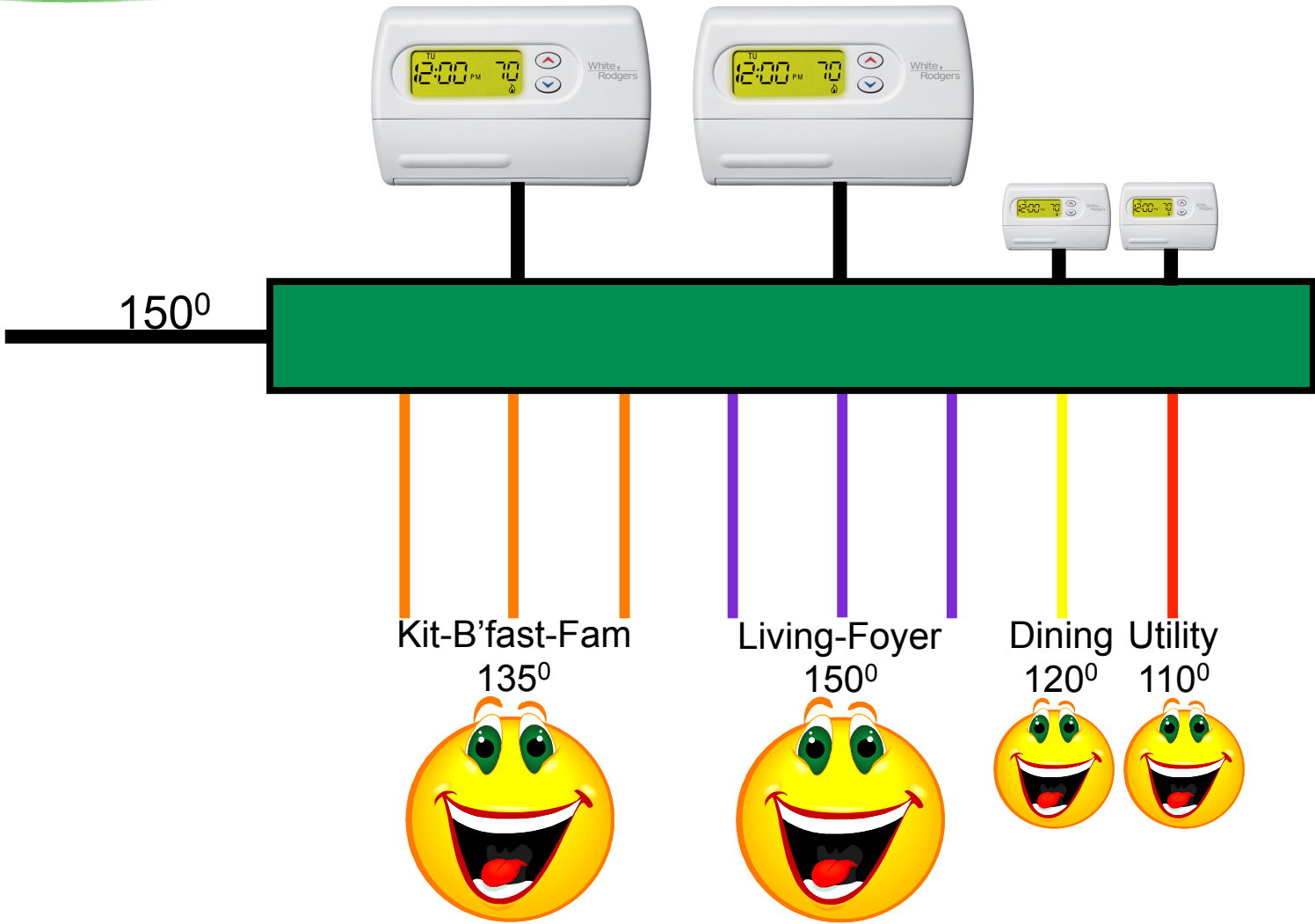
The Result...

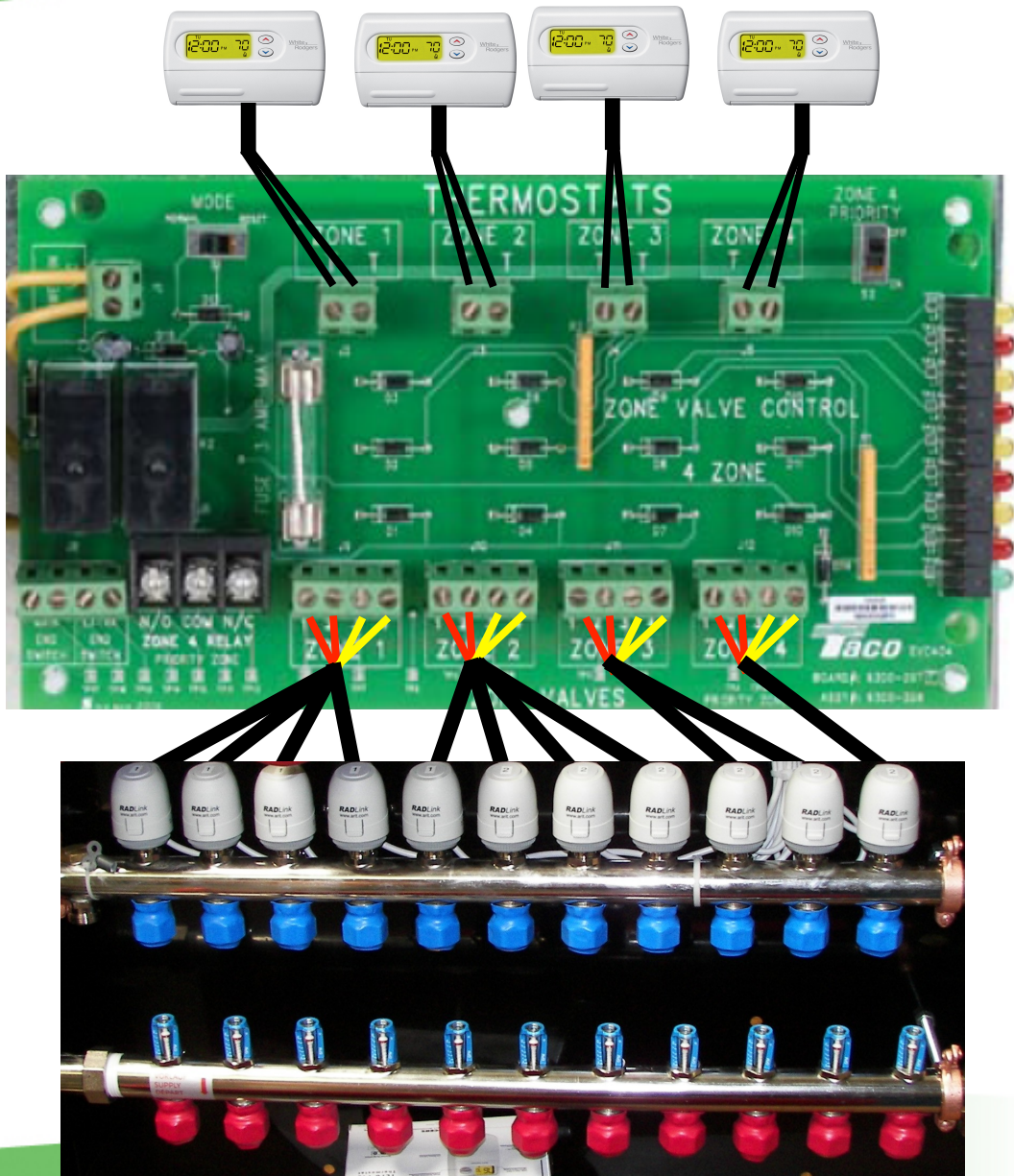


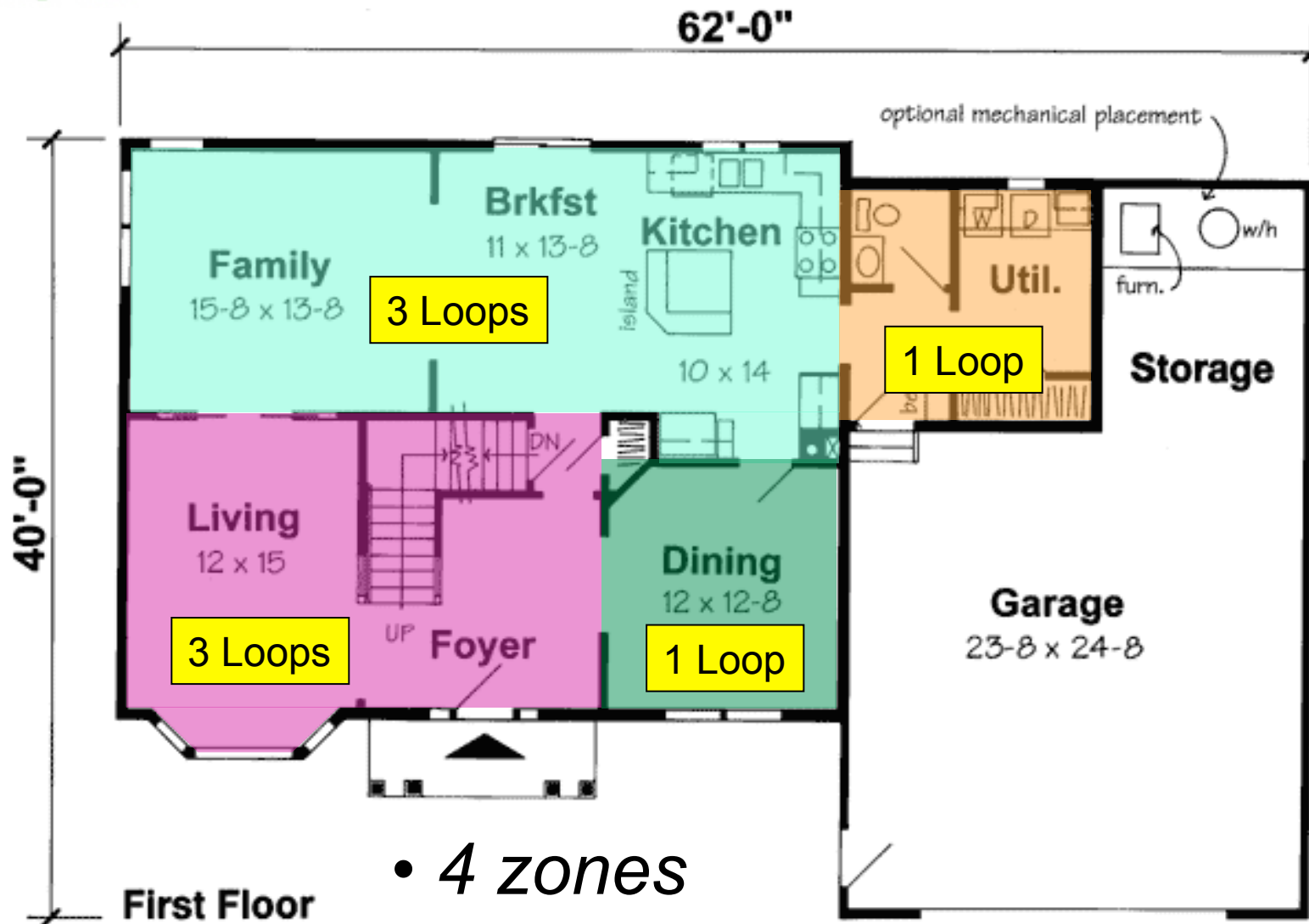
How Do We Fix It?

- Three or four tempering valves?
 - That'll work, but...
 - 3 or 4 manifolds, circulators, relays, piping, wiring, etc...
- Or...







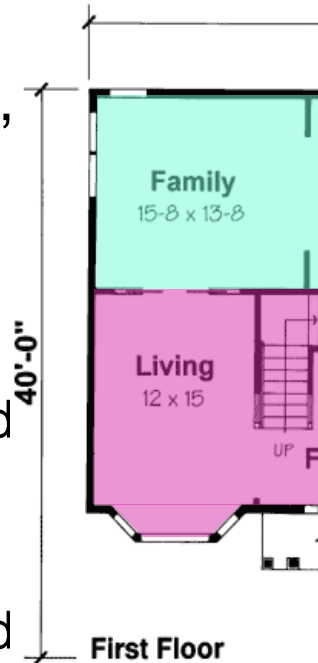


- 4 zones

8 loop manifold in hall closet

Tale Of The Tape

- One 8 loop manifold in hall closet
- 8 actuators, 4 zones
- Manifold: 2.4 GPM @ 6'
 - Supply with 3/4" copper
 - 60' x 1.5 = 90'
 - 90' x .04 = 3.6' head
 - 2.4 GPM @ 9.6' head
 - Or how about 5/8" PEX?
 - 60' PEX = 3.6' head
 - 2.4 GPM @ 9.6' head
- Same circulator, which is smarter?



5/8" RadiantPEX 100% Water—0% Glycol Head (Feet of Water) Per 100' of Pipe						
GPM	80°F	100°F	120°F	140°F	160°F	180°F
0.5	0.45	0.42	0.40	0.39	0.38	0.37
0.6	0.62	0.58	0.56	0.54	0.52	0.51
0.7	0.81	0.77	0.73	0.71	0.69	0.68
0.8	1.03	0.98	0.93	0.90	0.88	0.86
0.9	1.27	1.20	1.15	1.11	1.08	1.06
1.0	1.54	1.45	1.39	1.34	1.31	1.28
1.1	1.82	1.72	1.65	1.59	1.55	1.52
1.2	2.13	2.02	1.92	1.86	1.81	1.77
1.3	2.46	2.33	2.22	2.15	2.09	2.05
1.4	2.81	2.66	2.54	2.45	2.39	2.34
1.5	3.17	3.00	2.87	2.77	2.70	2.65
1.6	3.56	3.37	3.22	3.11	3.04	2.97
1.7	3.97	3.76	3.59	3.47	3.38	3.31
1.8	4.40	4.17	3.98	3.84	3.75	3.67
1.9	4.85	4.59	4.39	4.24	4.13	4.05
2.0	5.31	5.03	4.81	4.65	4.53	4.44
2.1	5.80	5.49	5.25	5.07	4.95	4.84
2.2	6.30	5.97	5.71	5.51	5.38	5.27
2.3	6.82	6.46	6.18	5.97	5.82	5.70
2.4	7.36	6.98	6.67	6.44	6.29	6.16
2.5	7.92	7.51	7.18	6.93	6.76	6.63
2.6	8.50	8.06	7.70	7.44	7.26	7.11
2.7	9.10	8.62	8.24	7.96	7.77	7.61
2.8	9.71	9.20	8.80	8.50	8.29	8.12
2.9	10.34	9.80	9.37	9.05	8.83	8.65
3.0	10.99	10.41	9.96	9.62	9.39	9.20

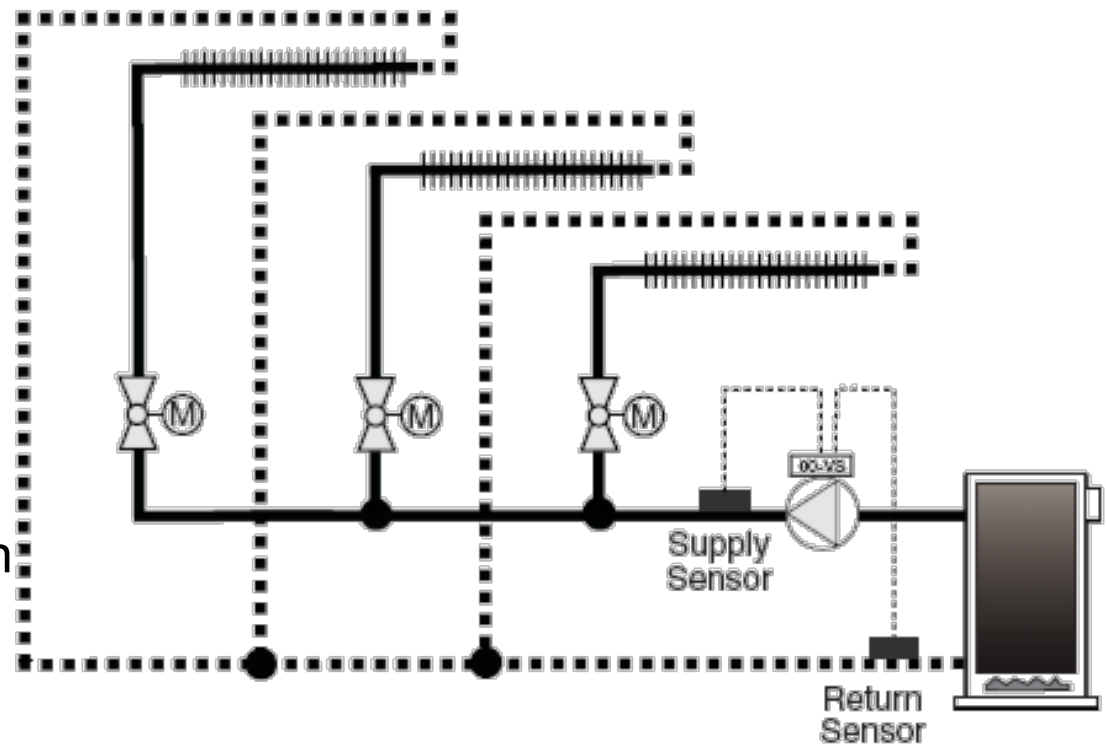
Wickid Smaht!

- Saves time, labor, \$\$\$
- Use up leftover PEX
- Uses same circulator (in this example!)
- Faster, less costly install
- Provide zone control needed
- Value-laden offering



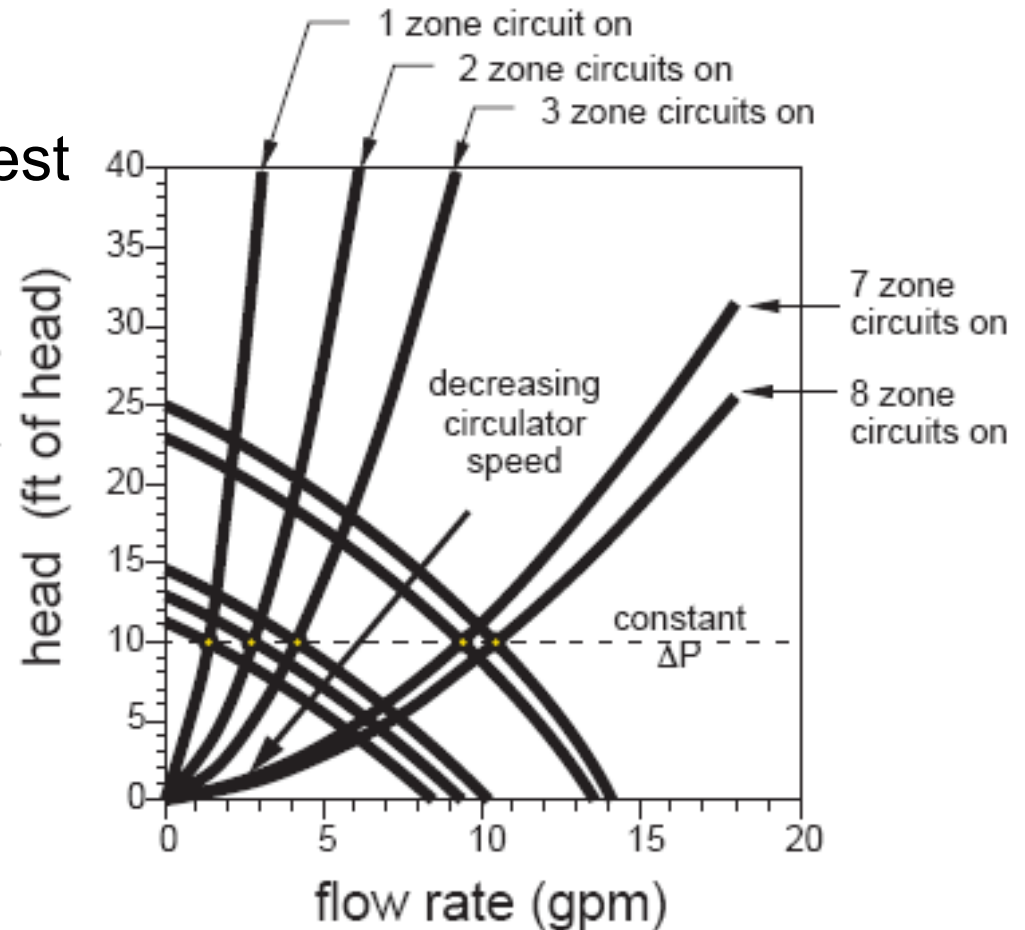
Wickid Smahttah!

- Taco 00-VDT Variable Speed Circulator
- Varies speed to maintain Delta T
 - All zones calling – full speed
 - As valves close – slow down!
 - Reduces noise, smoother operation



How Does It Work?

- All zones calling – lowest flow resistance
- As zones close, flow resistance increases
- System curve “backs up” pump curve
- Noisy traffic jam!
- 00-VDT is traffic cop!



ESP

- Can't I just "tweak" the flow?
- I like to make my own manifolds
- What if those things fail?
- They won't pay for it!



The End Result...

- Doing the job right



Important Info...

- www.taco-hvac.com
- flopro.taco-hvac.com
- flopro.ning.com
- johbar@taco-hvac.com

