LAZY A/C with KEN GEHRING

President Emeritus at Therma-Stor

On Earth

Weather in most regions range from very comfortable to life threatening.

Because weather depends on massive weather systems moving around the earth, you may have weather typical of the last season, current season or the next season.

Weather systems typically pass in 1-14 days.

Follow man's search for survival and comfort.

Outline

Weather's Seasonal Impact on the House as a System

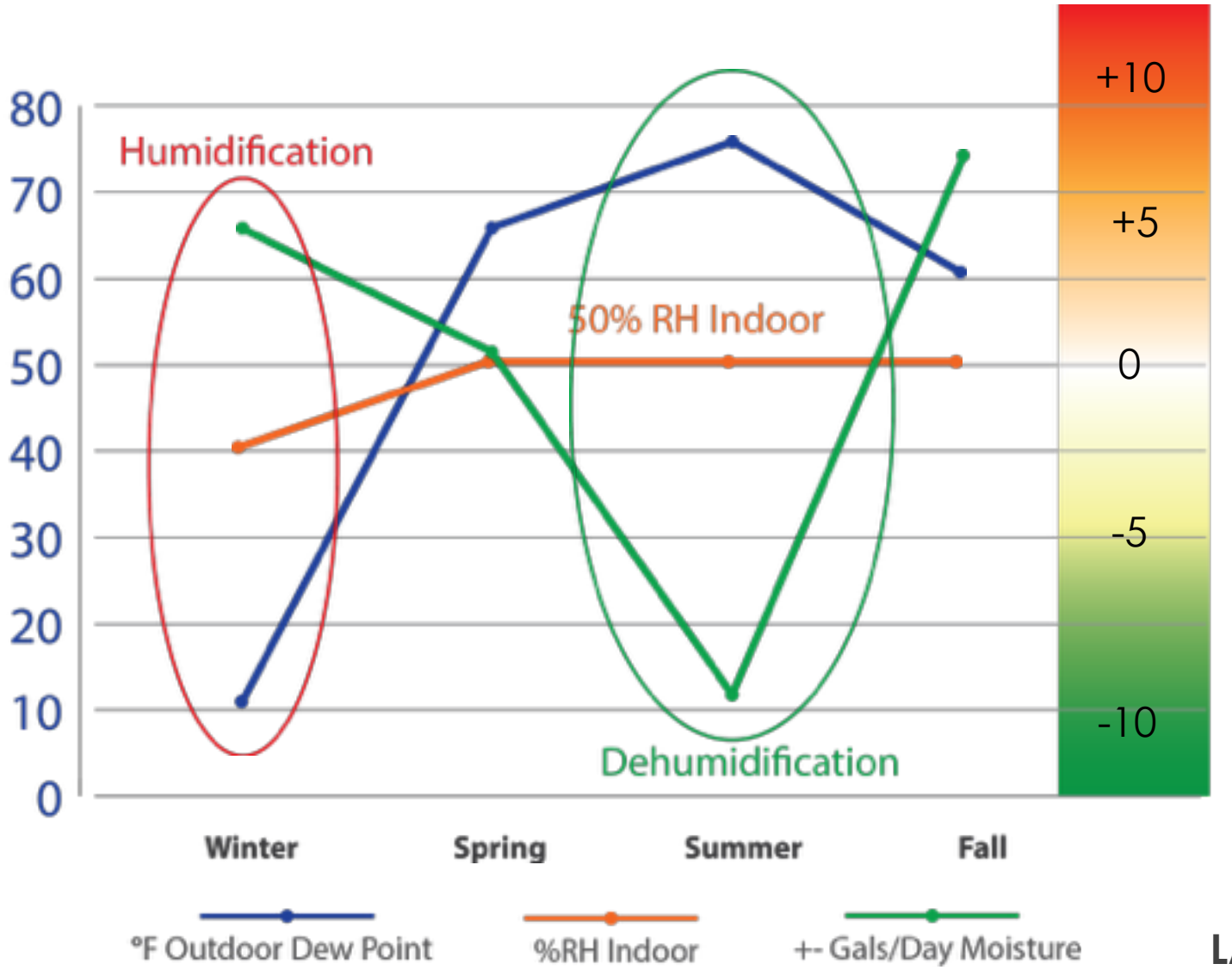
Current Best Practices

Concerns

The Lazy A/C

The Gold Standard

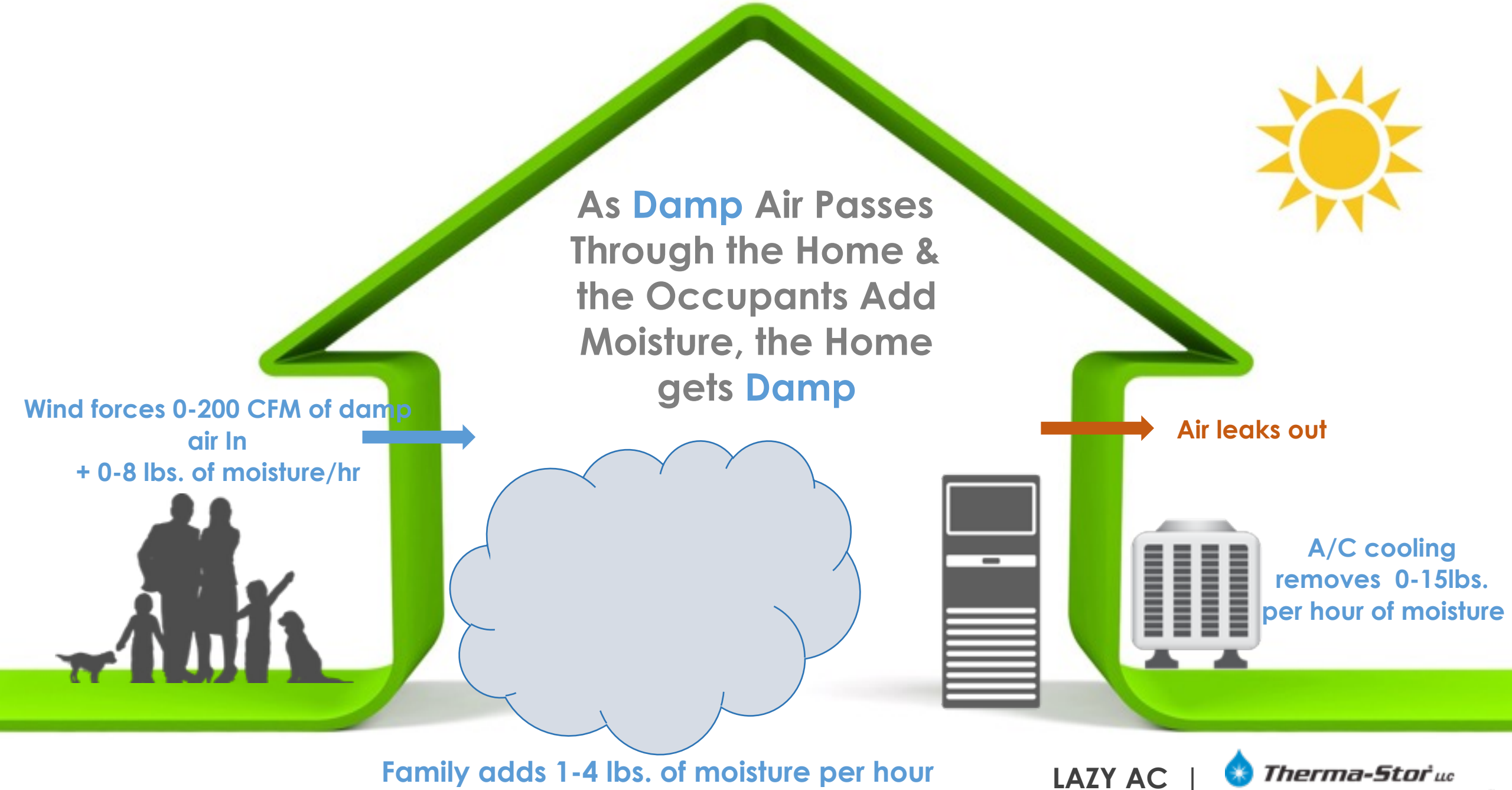
Fou



'ass Climate"

+- Gals Per Day

Per 100 cfm of Infiltration/
Ventilation Air
To Maintain 75°F, 50%RH



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5/7/2016

Design Indoor Cooling Temp.: 78 °F
Design Outdoor Cooling Temp.: 93 °F
Temp. Difference Cooling: 15°F
Indoor Humidity: 50 Grains difference: 53

Chetan Mehta
4510 Colony Oaks Coart
Area: Houston Hobby Airport, TX
Front Door Orientation: South West

Design Indoor Heating Temp.: 69 °F
Design Outdoor Heating Temp.: 34 °F
Temp. Difference Heating: 35°F

Whole House Load Calculator

TD:Cool:15°F Heat:35°F	Sq. ft. - types 1 and 2	shading	Sq. ft. - types 1 and 2	shading	Sq. ft. - types 1 and 2		Sq. ft.
Outside Wall: North	1: 2:	Windows x	1: 12.5 2: 12.5	Glass Doors x	1: 2:	Doors	
Outside Wall: South	1: 2:	Windows	1: 2:	Glass Doors	1: 2:	Doors	
Outside Wall: E & W	1: 2:	Windows	1: 12.5 2:	Glass Doors	1: 2:	Doors	
Outside Wall: NE & NW	1: 1500 2:	Windows x	1: 36 2: 110	Glass Doors x	1: 2:	Doors	
Outside Wall: SE & SW	1: 1440 2:	Windows	1: 75 2: 96	Glass Doors	1: 2:	Doors	
Sky Lights	N: S:	E-W:	NE-NW:	SE-SW:			
Floor - (linear ft. if slab)	1: 144 2:	Basement	Walls-above grade	below grade	Sq. ft.		
Ceiling	1: 170 2:	Basement	Floor --	width 23 ft. or	feet below grade:	2 ft.	
Number of Appliances	2 Fireplaces 1						
Number of People	4	Fresh Air	recommended:	71 CFM			
Conditioned - Sq. ft.:	2640	Cubic Ft.: 22440	Construction	Average	Duct System:	Attic R-4	below av

Calculate Load

Total Btu's Cooling	Sensible Load	Latent Load	Total Btu's Heating
36577	29407	7170	42432

manual_s

Sizing Calculator based on Manual S

Choosing the Right Equipment (Safety Factor?)

Condensing Unit

Nominal Tons	Power Supply V-ph-Hz	Rated Current	Capacity BTU	Performance Air Flow / Noise	Liquid Pipe	Gas Pipe	Price (full system)
1.5	208-230/1/60	6.65 A	17500	1500 CFM / 62 DB (A)	3/8"	3/4"	$1336
2.0	208-230/1/60	8.75 A	23000	1580 CFM / 62 DB (A)	3/8"	3/4"	$1432
2.5	208-230/1/60	11.95 A	30000	3000 CFM / 62 DB (A)	3/8"	3/4"	$1532
3.0	208-230/1/60	20 A	35000	3250 CFM / 65 DB (A)	3/8"	7/8"	$1674
3.5	208-230/1/60	22.1 A	42000	4200 CFM / 65 DB (A)	3/8"	7/8"	$1764
4.0	208-230/1/60	24.3 A	48000	4400 CFM / 65 DB (A)	3/8"	1 1/8"	$1985
5.0	208-230/1/60	29.4 A	57500	4250 CFM / 65 DB (A)	3/8"	1 1/8"	$2118

Air Handler

Nominal Tons	Power Supply V-ph-Hz	Rated Current	Capacity BTU	Performance Air Flow / Noise	Liquid Pipe	Gas Pipe	Price (full system)
1.5	208-230/1/60	1.5 A	18000	650 CFM / 45 DB (A)	3/8"	3/4"	$1336
2.0	208-230/1/60	1.5 A	22400	800 CFM / 48 DB (A)	3/8"	3/4"	$1432
2.5	208-230/1/60	2.0 A	29000	950 CFM / 53 DB (A)	3/8"	3/4"	$1532
3.0	208-230/1/60	2.0 A	36000	1350CFM / 53 DB (A)	3/8"	7/8"	$1674
3.5	208-230/1/60	2.0 A	42000	1350CFM / 55 DB (A)	3/8"	7/8"	$1764
4.0	208-230/1/60	2.0 A	48000	1600CFM / 55 DB (A)	3/8"	1 1/8"	$1985
5.0	208-230/1/60	3.0 A	57000	1960CFM / 58 DB (A)	3/8"	1 1/8"	$2118

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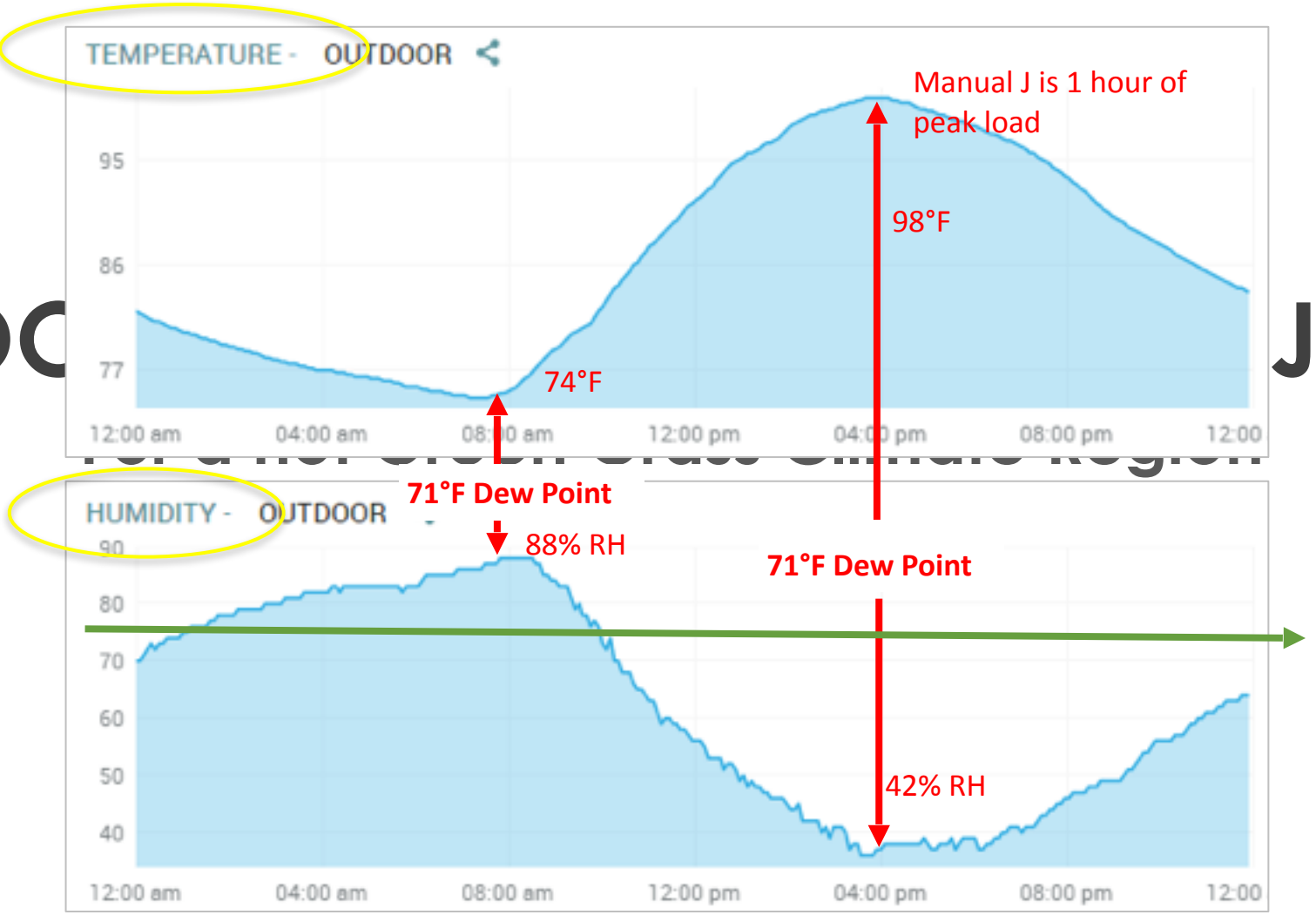
HVAC system has been sized according to industry best practices, it is installed, collect $, some would consider this done – right?

WRONG!

Concern – the system has been sized for peak load conditions, but the house sees mostly partial and no-load conditions

Sensible Load
90% to near zero
most days

OUTDOO J LOADS



Latent load is fairly uniform throughout the day and night

New Example: Manual J Load Calculation

45,000 btus per hour sensible

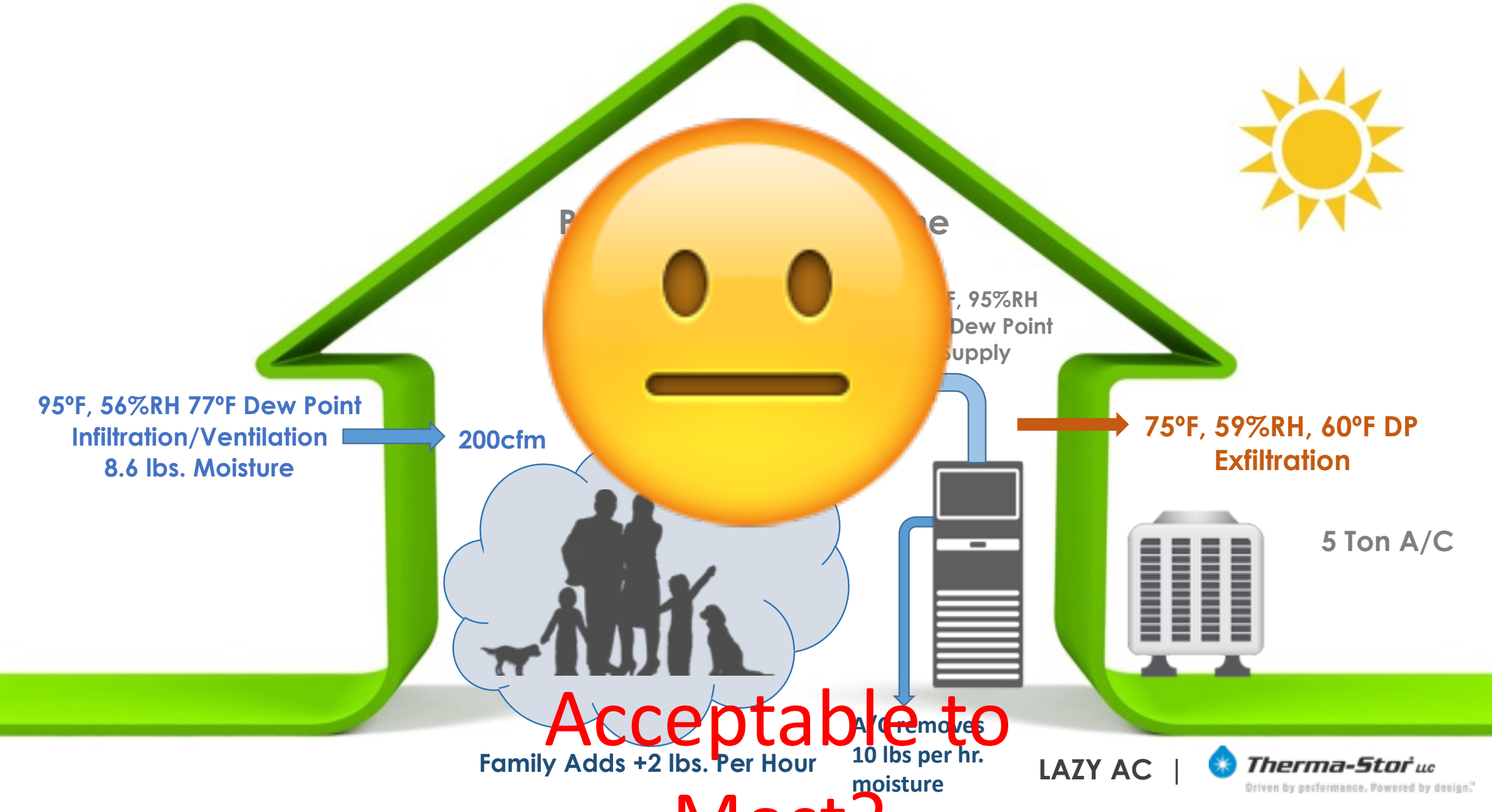
12,000 btus per hour latent

In a green grass climate 3,000 sq. ft. home @ peak load times of the day + heat/moisture from occupants.

57,000 btus per hour cooling

ON a hot day 4 hours per day declining to near zero at night

Potential 24 hours per day



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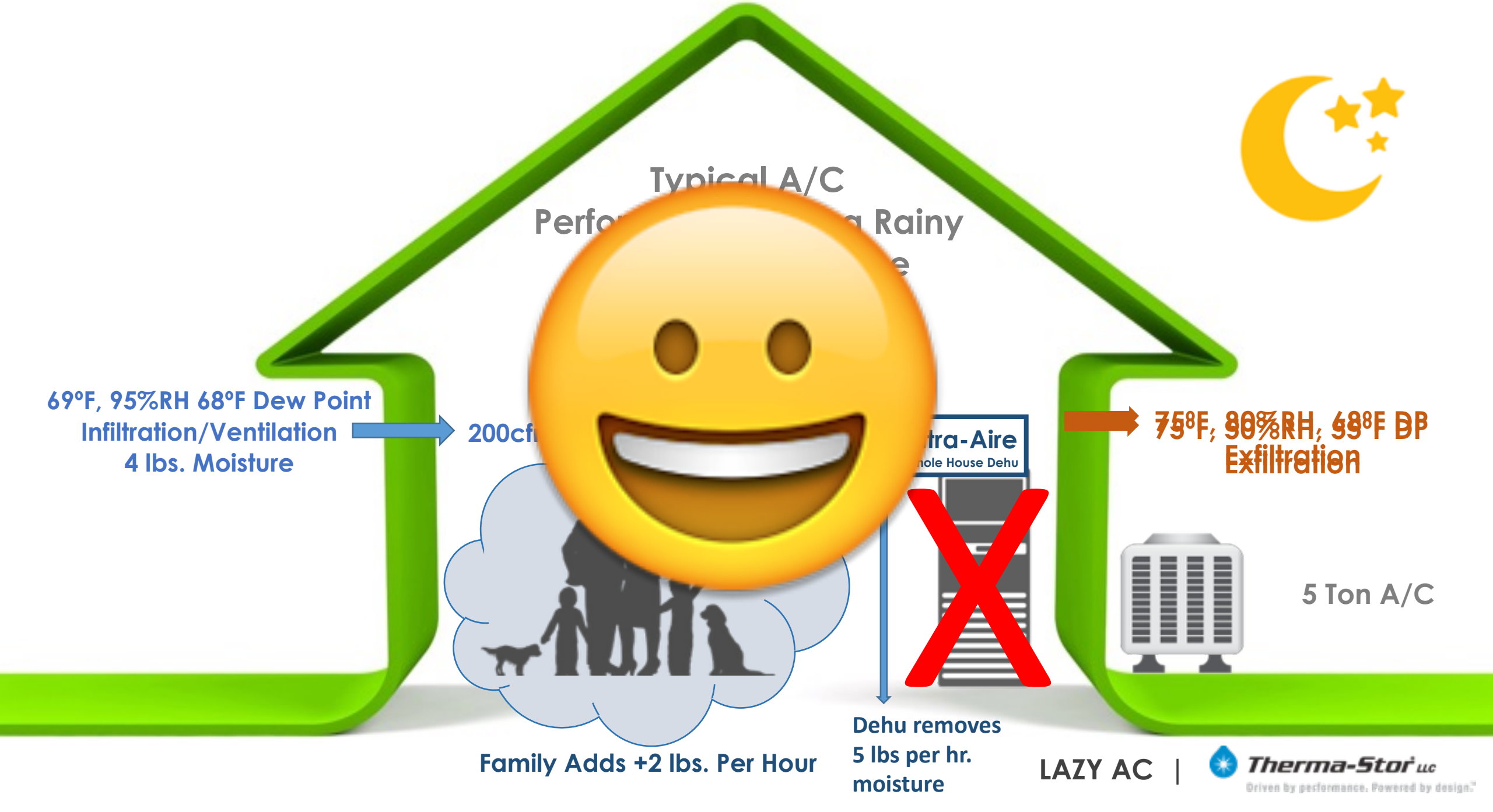
Typical A/C
Perfo a Rainy
e
69°F, 95%RH 68°F Dew Point
Infiltration/Ventilation
4 lbs. Moisture
200cf
tra-Aire
ole House Dehu
75°F, 50%RH, 55°F DP
Exfiltration
5 Ton A/C
Family Adds +2 lbs. Per Hour
Dehu removes
5 lbs per hr.
moisture
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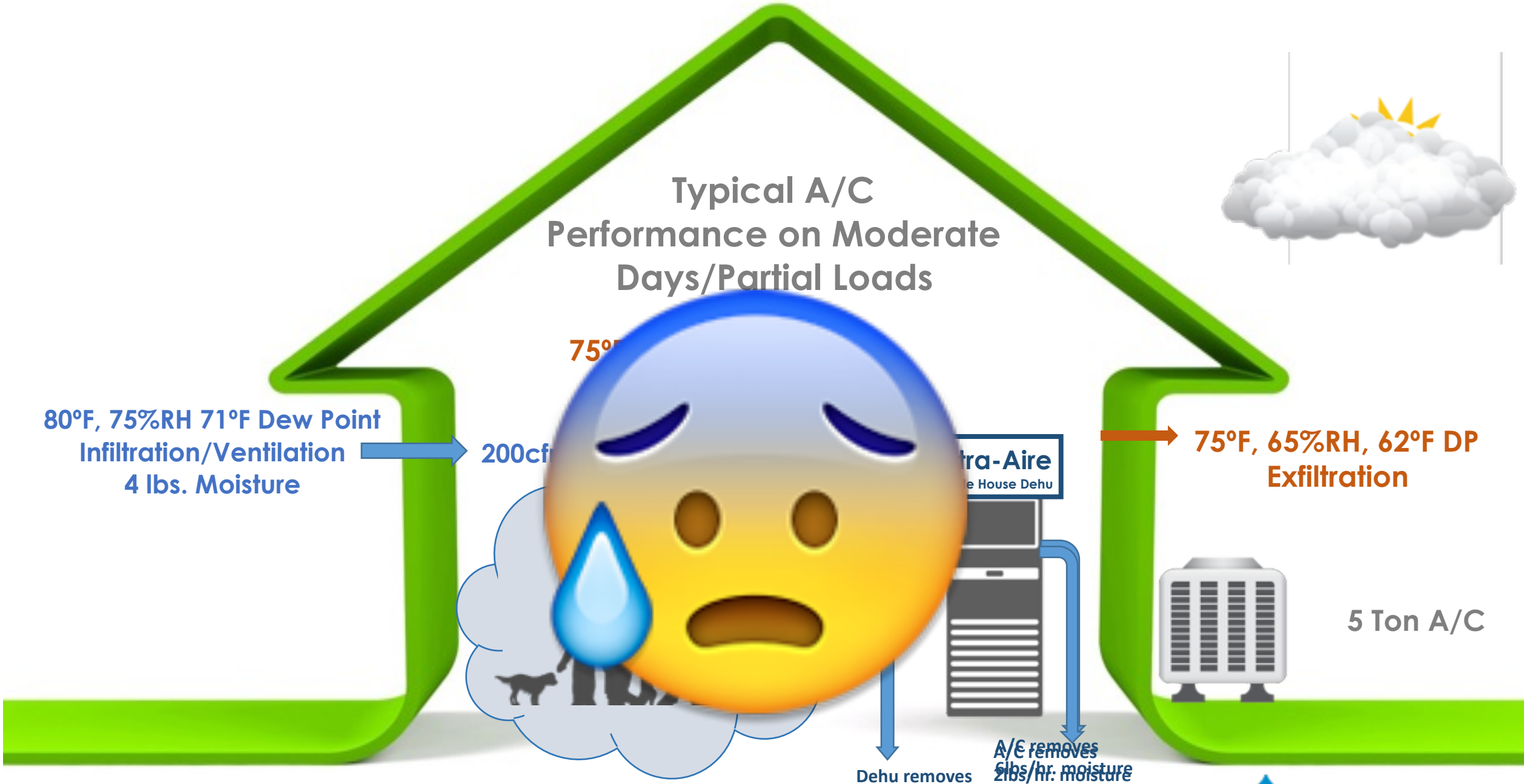
Typical A/C Performance on Moderate Days/Partial Loads



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Thread: oversized unit

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05-10-2016, 07:15 PM #1

superfittertech
Professional Member*

Join Date: Jun 2004
Location: St Paul, minnesota
Posts: 1,500
Post Likes

oversized unit

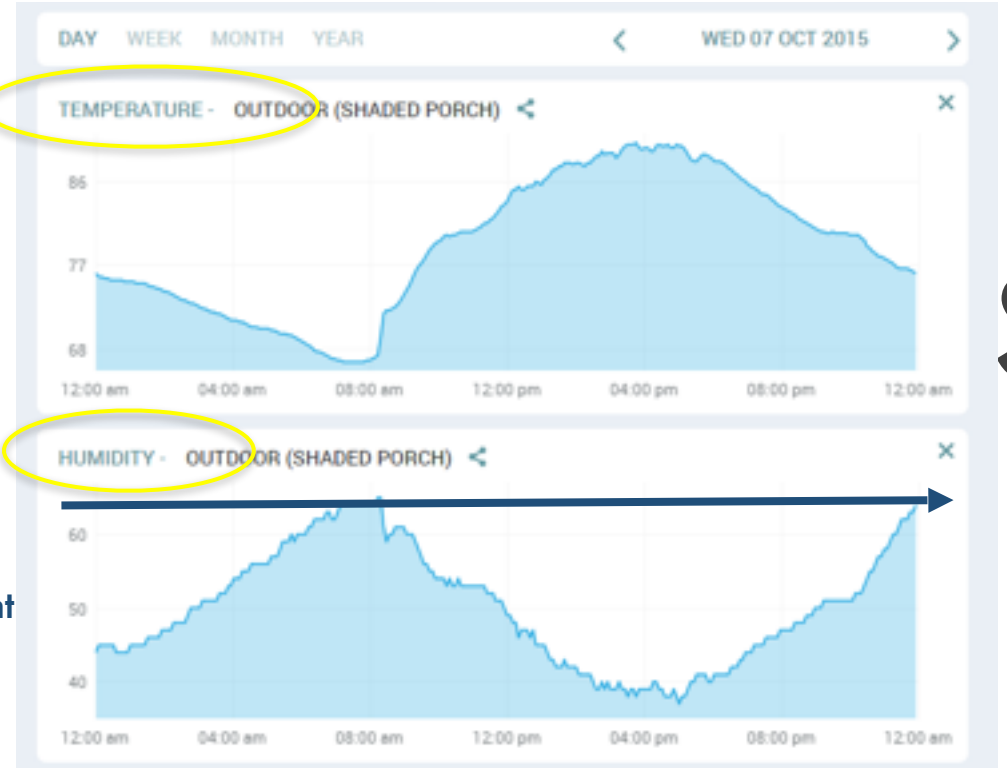
Help. I have a foam house approximately 2600 square ft. upstairs 960 sq ft the indoor unit is a Bryant 38MVC060-14 furnace with a CNRVP2417ACAABAA cased "N" coil and a 20 year old Lennox 2 ton condensing unit. Obviously oversized. load calcs slightly under 1 ton. The problem is I need to replace the condensing unit, but I'm unable to find anything less than a 1.5 ton unit. Thought about using an EPR valve with a hot gas bypass valve as I've done a few times in the past, but I really don't want to travel down that road again. Does anyone know if they still make a 1 ton condensing unit anymore? (R-410A of course). The unit already has a honeywell VNT5070E1000 erv. I can't get the humidity below 60%

05-11-2016, 07:13 AM #5

teddy bear
Sponsor & Professional Member*

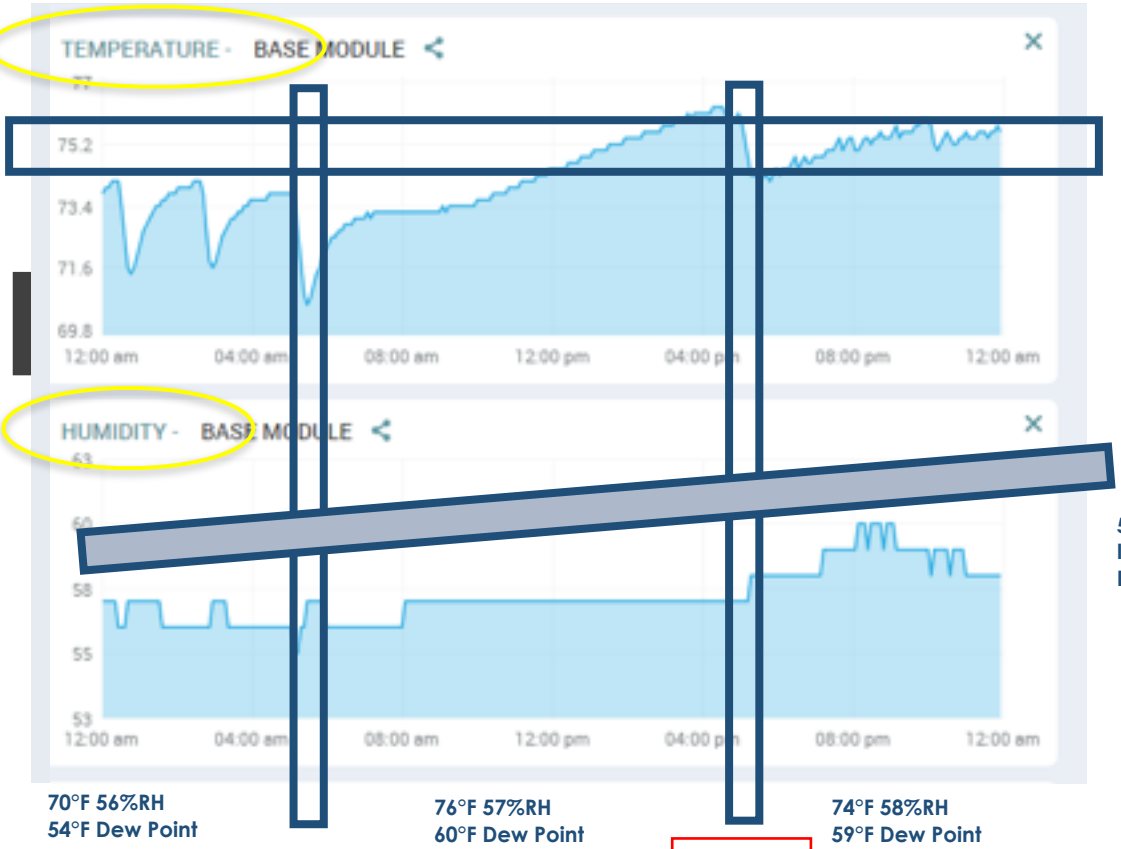
Join Date: Jun 2003
Location: Madison, WI/Cape Coral, FL
Posts: 7,535
Post Likes

You need something that will remove 3-4 lbs. of moisture per hour minimum without any sensible cooling load for the damp evenings, occupants moisture,and moisture in the fresh air.
Add a small whole house dehumidifier and you have 50%RH during low/no sensible cooling loads and high outdoor dew points.
Also for the many days when there is no sensible cooling load, turn off the a/c and let the dehumidifier keep the home dry for pennies.
Over-cooling is costly and uncomfortable compare to a high efficiency whole house like the Ultra-Aire 70H.
Your thoughts?
Regards Teddy Bear



63°F
Outdoor
Dew Point

S I



59-61°F
Indoor
Dew point

70°F 56%RH
54°F Dew Point

76°F 57%RH
60°F Dew Point

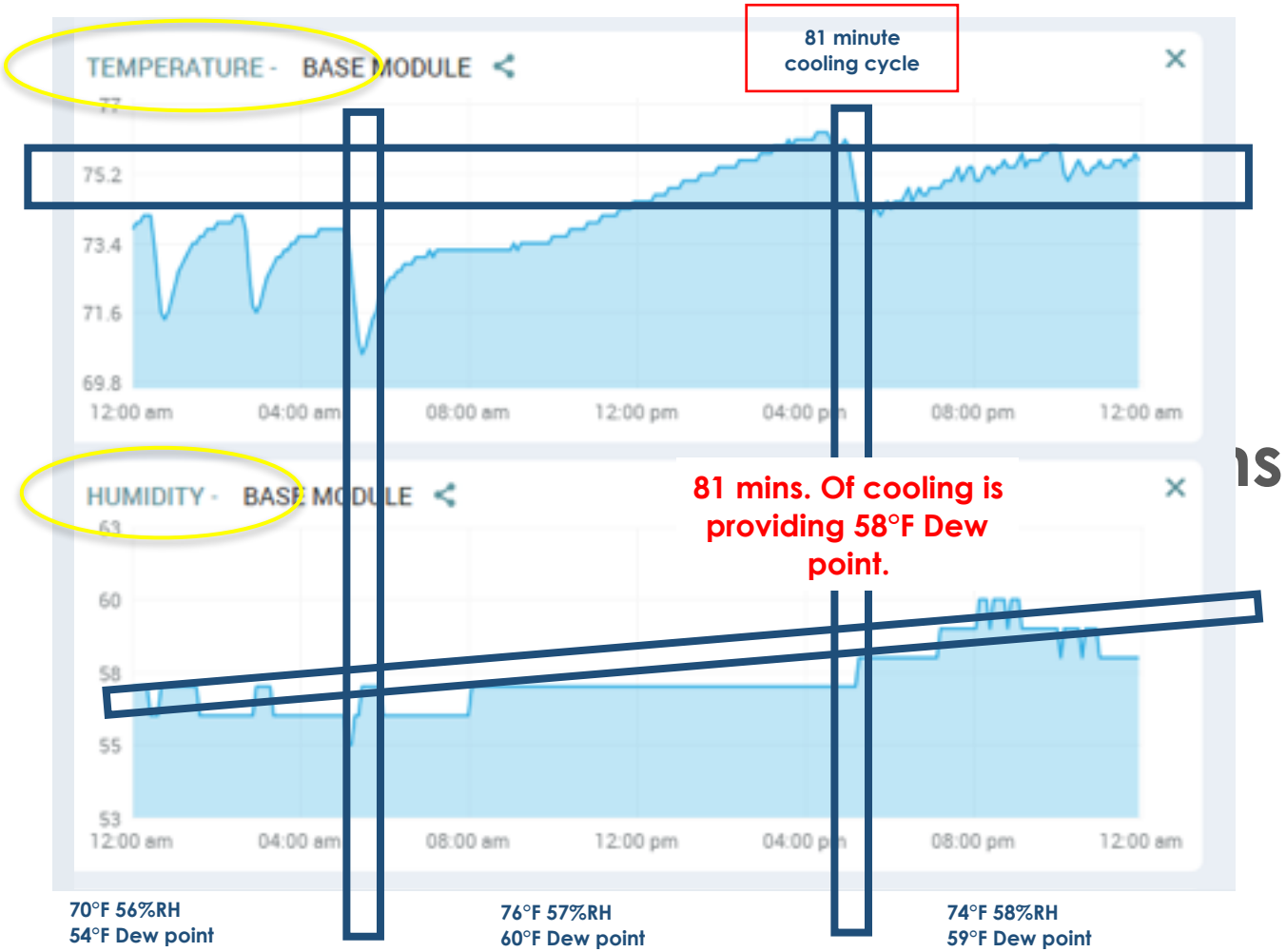
74°F 58%RH
59°F Dew Point

81 minute
cooling
cycle

This A/C is incapable of lowering the indoor dew point below 59°F during extended cooling cycles.

Possible reasons for lack of %RH reduction?

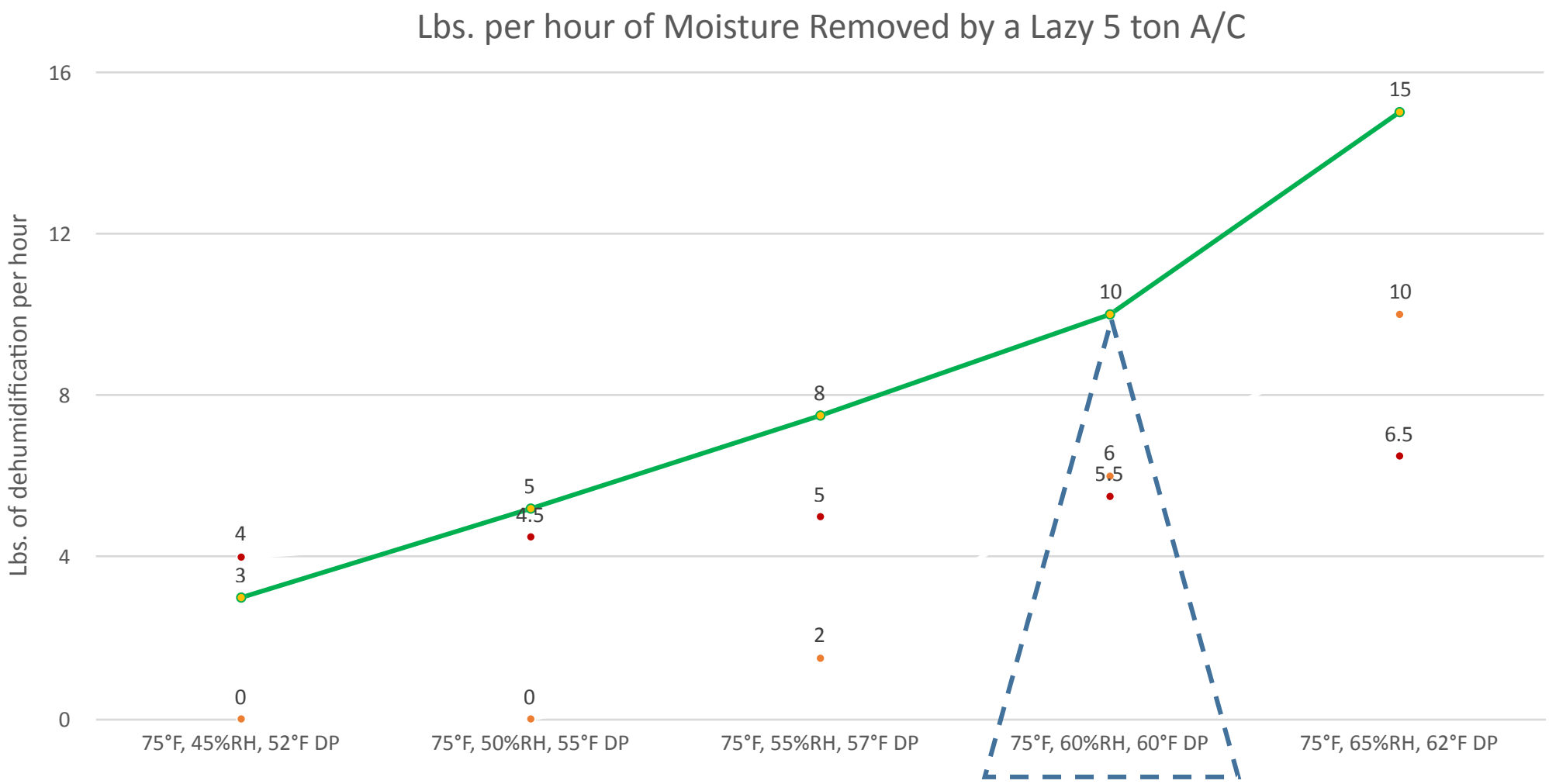
63°F Outdoor Dew point



Adding 150 pint whole house dehumidifier did not change this home much.

What is going on?

The Lazy A/C!



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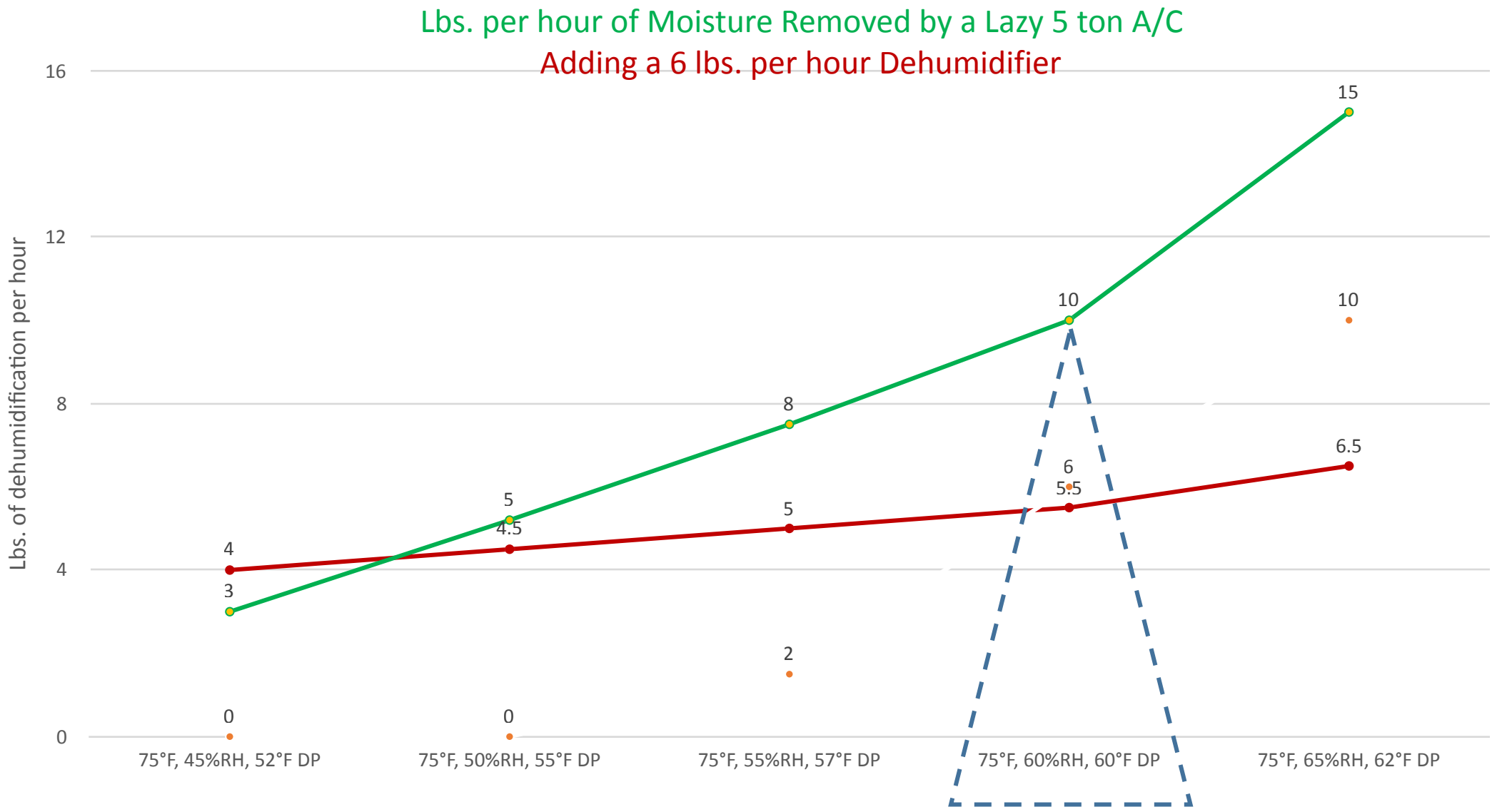

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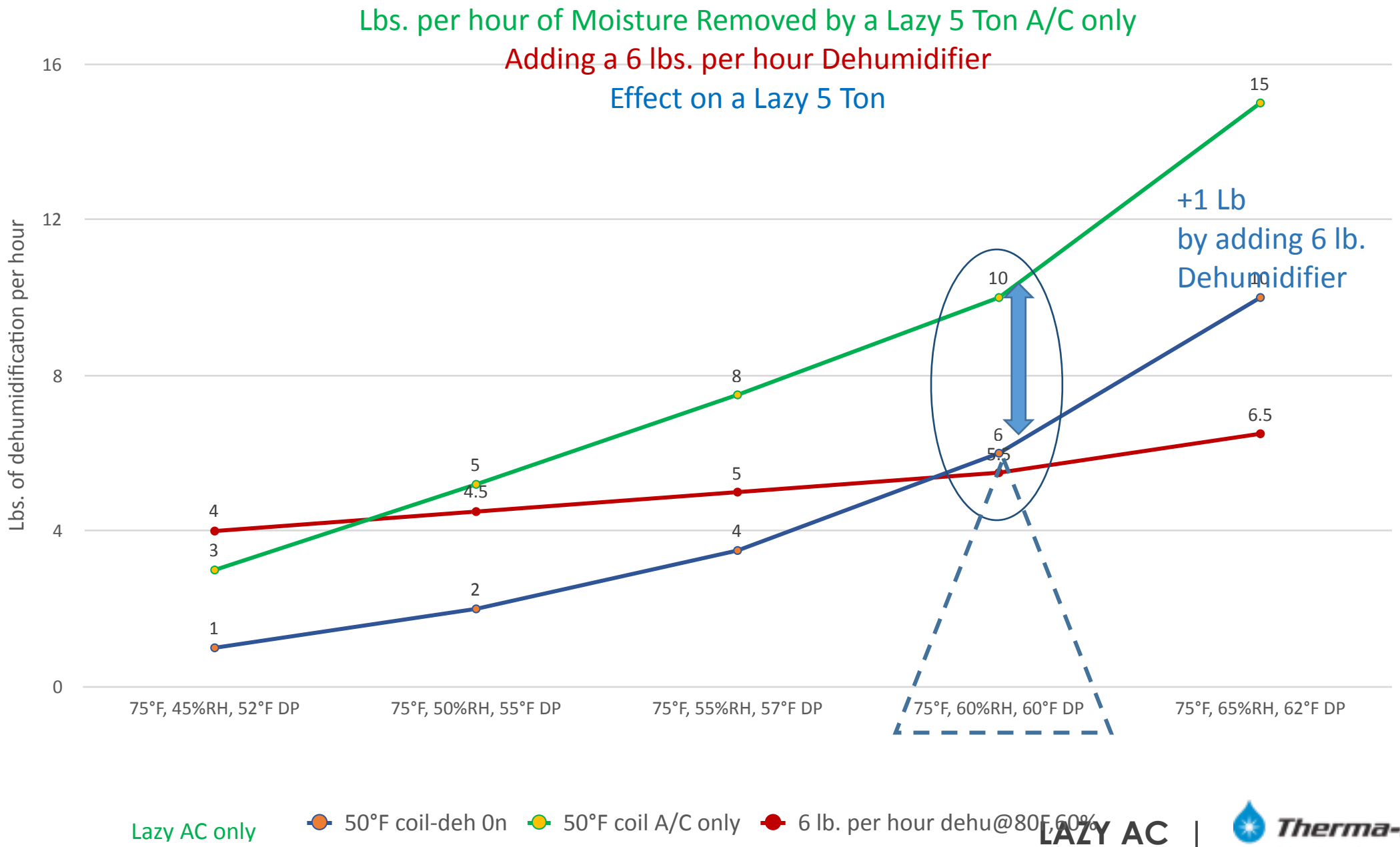
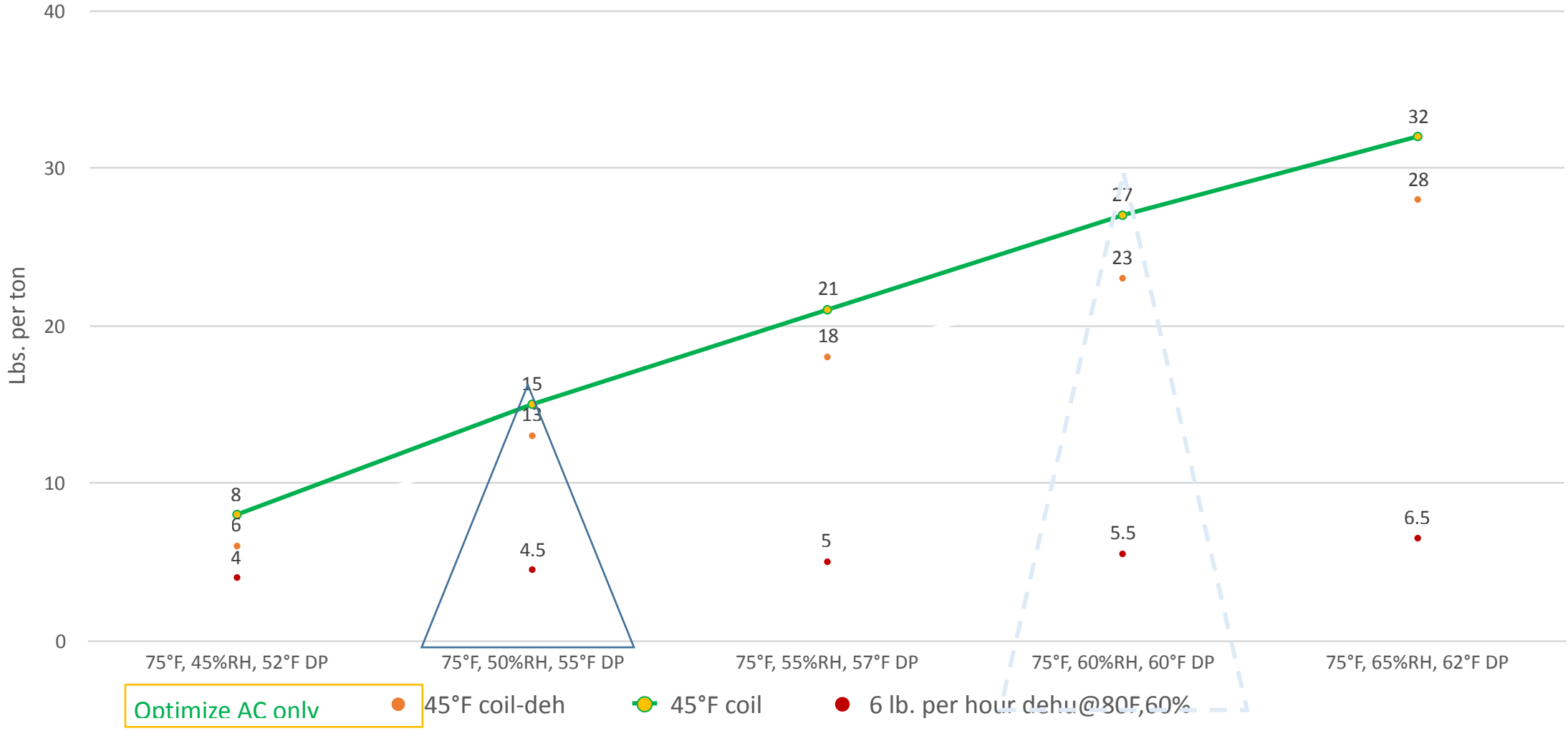

Lbs. per hour of Moisture Removed by a Lazy 5 Ton A/C only
Adding a 6 lbs. per hour Dehumidifier
Effect on a Lazy 5 Ton
Lbs. of dehumidification per hour
16
12
8
4
0
+1 Lb
by adding 6 lb.
Dehumidifier
15
10
10
8
6.5
6
5.5
5
5
4.5
4
4
3
2
1
75°F, 45%RH, 52°F DP
75°F, 50%RH, 55°F DP
75°F, 55%RH, 57°F DP
75°F, 60%RH, 60°F DP
75°F, 65%RH, 62°F DP
Lazy AC only
50°F coil-deh 0n
50°F coil A/C only
6 lb. per hour dehu@80F,60%

Lbs. per of Moisture Removed per House by a Optimized 5 Ton A/C



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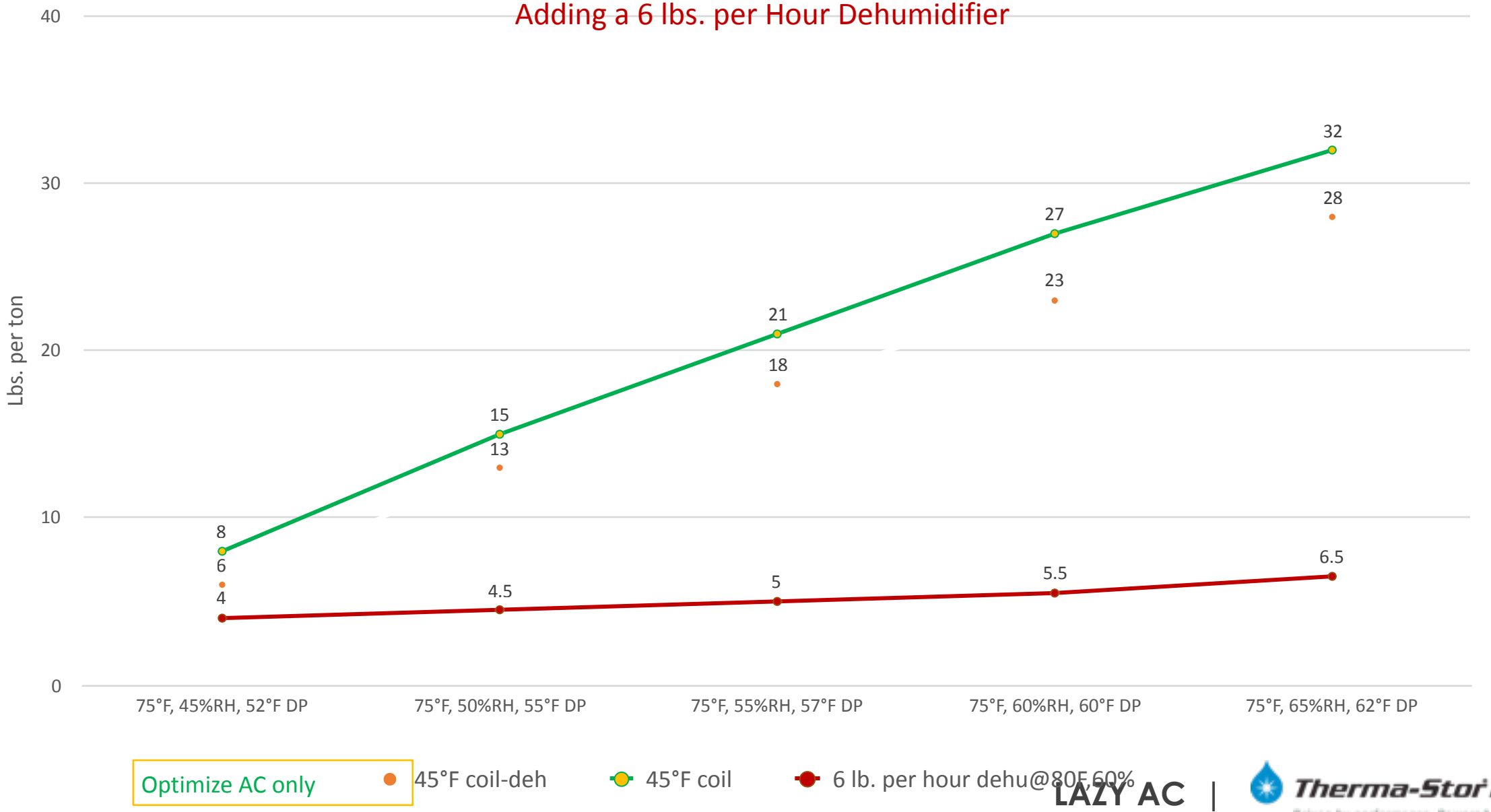
Lbs. per of Moisture Removed per House by a Optimized 5 Ton A/C
Adding a 6 lbs. per Hour Dehumidifier



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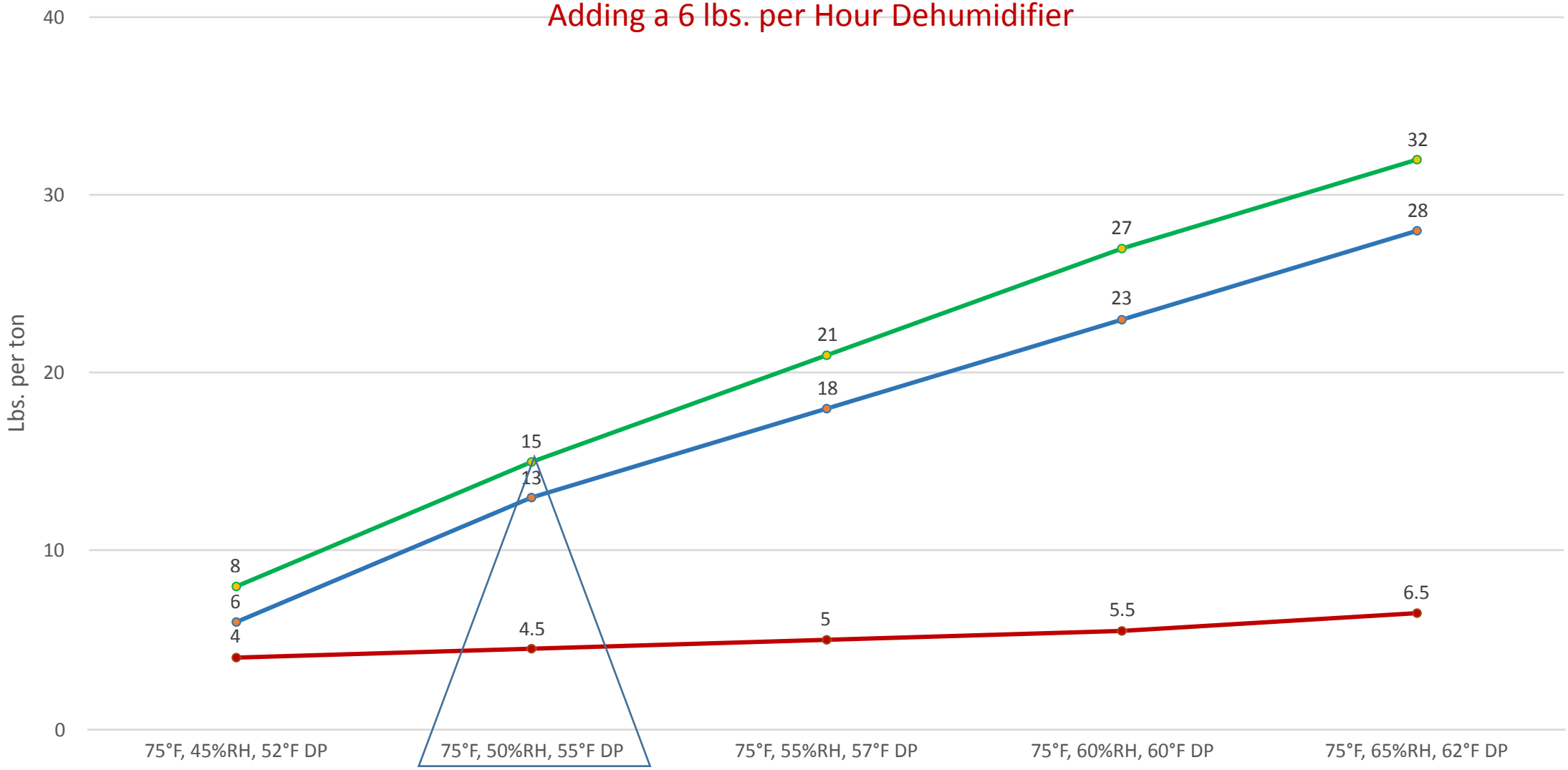
Lbs. per of Moisture Removed per House by a Optimized 5 Ton A/C
Adding a 6 lbs. per Hour Dehumidifier



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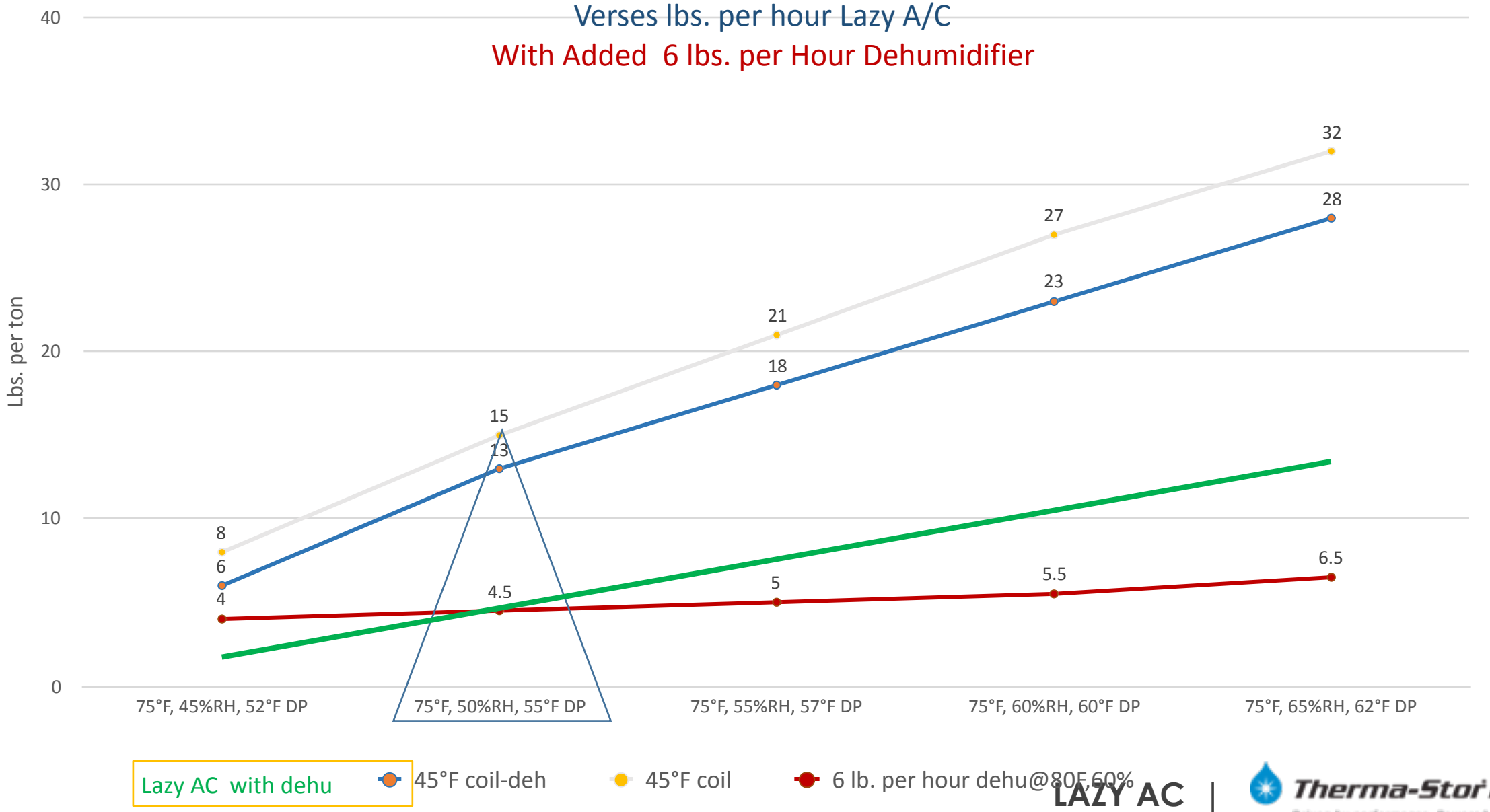
Lbs. per of Moisture Removed per Hour by a Optimized 5 Ton A/C Verses lbs. per hour Lazy A/C With Added 6 lbs. per Hour Dehumidifier



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How to Fix the Lazy AC

Step 1) Adjust the airflow to get desired evaporator coil temperature.

Step 2) Verify you have achieved the desired evaporator coil temperature – three options:

1) Measure suction line pressure
2) Measure dew point off the supply
3) Measure condensate at 75F/50%

Total Cooling Capacity

Typical 5 ton HP

Slowing the air flow increases the lbs. per hour of dehumidification and slows sensible cooling

Entering Wet Bulb Tempera-ture	Total Air Volume		95°F (35°C)						
			Total Cooling Capacity		Comp Motor kW Input	Sensible To Total Ratio (S/T)			
						Dry Bulb			
	cfm	L/s	kBtuh	kW		75°F 24°C	80°F 27°C	85°F 29°C	Dehumidification lbs./hr
63°F (17°C)	1750	825	57.1	16.7	4.64	.76	.91	1.00	14 lbs. @45°F coil temp
	1950	920	58.2	17.1	4.65	.79	.95	1.00	12 lbs. @47°F coil temp
	2150	1015	59.3	17.4	4.66	.82	.98	1.00	10 lbs. @50°F coil temp
	2350		60.4			.85		1.00	8 lbs. @55°F coil temp

50%RH @75°F

Optimized A/C Coil

Lazy A/C Setup

How to Fix the Lazy AC

Step 1) Adjust the airflow to get desired evaporator coil temperature.

Step 2) Verify you have achieved the desired evaporator coil temperature – three options:

1) Measure suction line pressure
2) Measure dew point off the supply
3) Measure condensate at 75F/50%

Option 1) Measure the suction line pressure and compare to the temperature / pressure chart

Temperature °F	Temperature °C	R22	R407C Liquid Press.	R407C Vapor Press.	R417A Liquid Press.	R417A Vapor Press.	R410A
-40	-40.0	0.5	3.0	4.4	0.5	4.2	11.6
-35	-37.2	2.6	5.4	0.6	2.4	0.8	14.9
-30	-34.4	4.9	8.0	1.8	4.5	1.5	18.5
-25	-31.7	7.4	10.9	4.1	6.9	3.6	22.5
-20	-28.9	10.1	14.1	6.6	9.4	5.9	26.9
-15	-26.1	13.2	17.6	9.4	12.2	8.4	31.7
-10	-23.3	16.5	21.3	12.5	15.2	11.2	36.8
-5	-20.6	20.1	25.4	15.9	18.5	14.3	42.5
0	-17.8	24.0	29.9	19.6	22.0	17.6	48.6
5	-15.0	28.2	34.7	23.6	25.9	21.2	55.2
10	-12.2	32.8	39.9	28.0	30.0	25.1	62.3
15	-9.4	37.7	45.6	32.8	34.5	29.3	70.0
20	-6.7	43.0	51.6	38.0	39.3	33.9	78.3
25	-3.9	48.8	58.2	43.6	44.5	38.9	87.3
30	-1.1	54.9	65.2	49.6	50.8	44.2	96.8
35	1.7	61.5	72.6	56.1	56.0	49.9	107
40	4.4	68.5	80.7	63.1	62.4	56.1	118
45	7.2	76.0	89.2	70.6	69.2	62.7	130
50	10.0	84.0	98.3	78.7	76.4	69.8	142
55	12.8	92.6	108	87.3	84.2	77.3	155
60	15.6	102	118	96.8	95.7	85.4	170
65	18.3	111	129	106	105	93.9	185
70	21.1	121	141	117	114	103	201
75	23.9	132	153	128	124	113	217
80	26.7	144	166	140	134	123	235
85	29.4	156	180	153	146	134	254
90	32.2	168	195	166	157	145	274
95	35.0	182	210	181	170	158	295
100	37.8	196	226	196	183	170	317
105	40.6	211	243	211	197	184	340
110	43.3	226	261	229	211	198	365
115	46.1	243	280	247	225	212	391
120	48.9	260	300	266	241	227	418
125	51.7	278	321	286	258	244	446
130	54.4	297	342	307	275	261	476
135	57.2	317	365	329	293	279	507
140	60.0	337	389	353	312	297	539
145	62.8	359	-	-	-	-	573
150	65.6	382	-	-	-	-	608

Outdoor air temperatures
70°F
80°F
90°F

Cooling coil temp for 75°F, 50%RH, 55°F Dew point.

Return conditions at typical outdoor conditions

Trained A/C techs know how to do this.

Change the air flow through the cooling coil to get the desired coil temperature.

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Option 2) Measure Dew Point at the Closest Supply

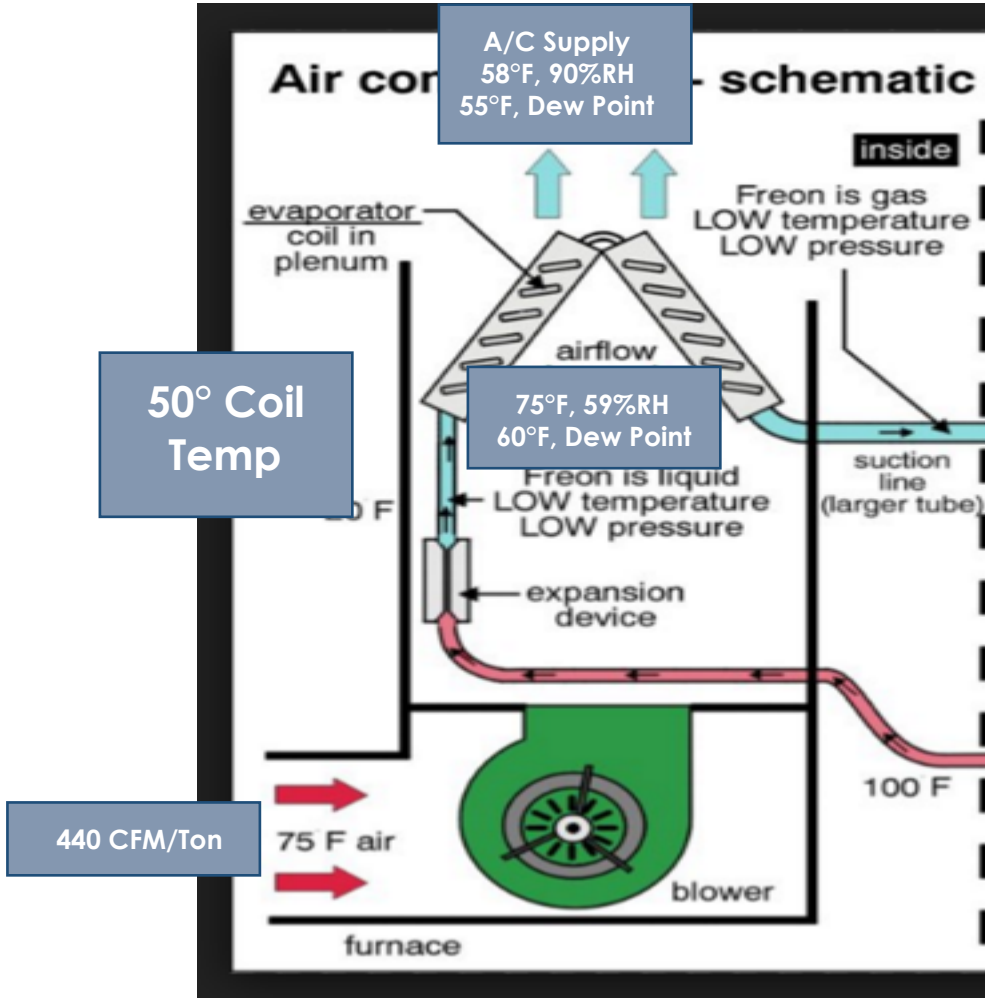
Aim for 49°F dew point (at least 5 degrees lower than desired ambient dew point)

Option 3) Measure Condensate Removal

It can take up to 30 minutes of operation to wet the evaporator coil and get condensate dripping at a steady state rate out of the hose

Goal is 3 lbs of condensate per hour per ton of AC

Let's review How The Lazy A/C Operates



THE A/C SYSTEM REQUIRES

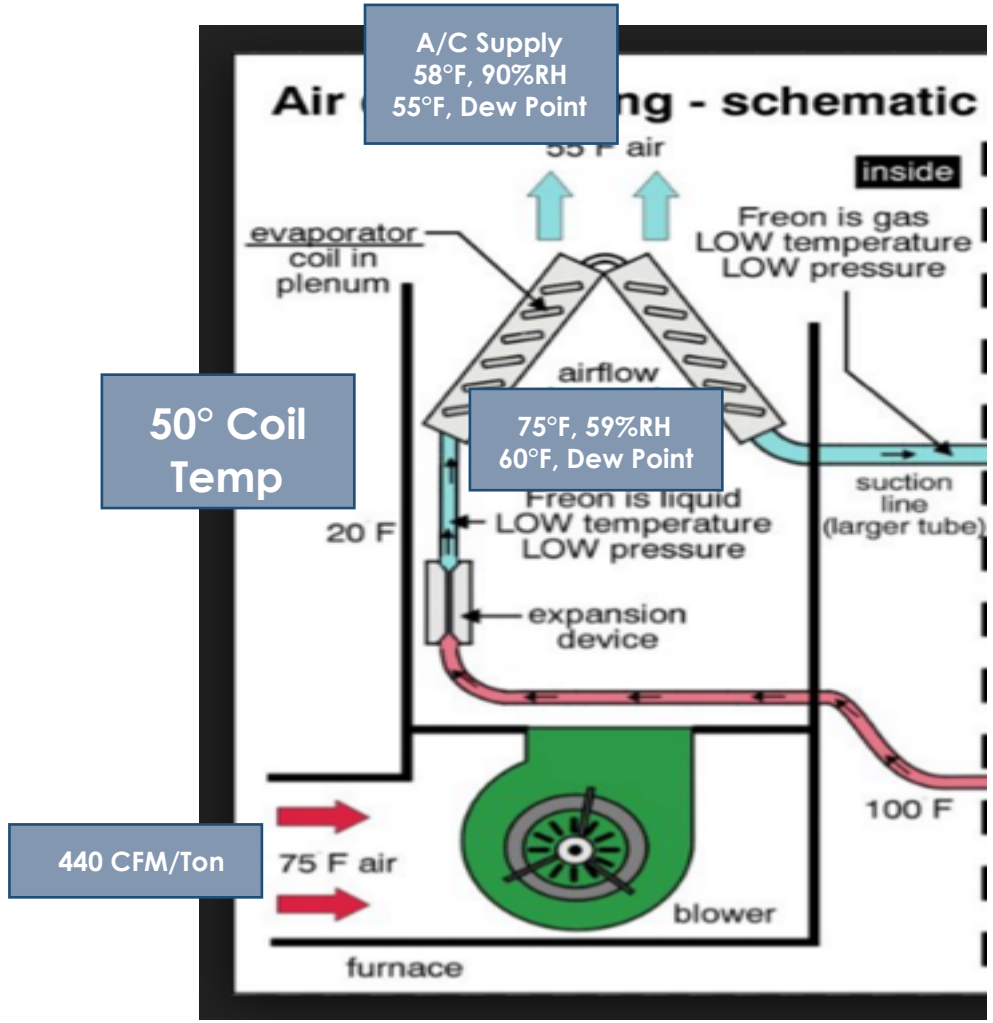
Functioning components

The correct amount of refrigerant

Unrestricted air flow through the hot outside condensing coil.

The quantity of air flow through the cold inside cooling coil determines the sensible and latent (moisture) removal

Let's review How The Lazy A/C Operates



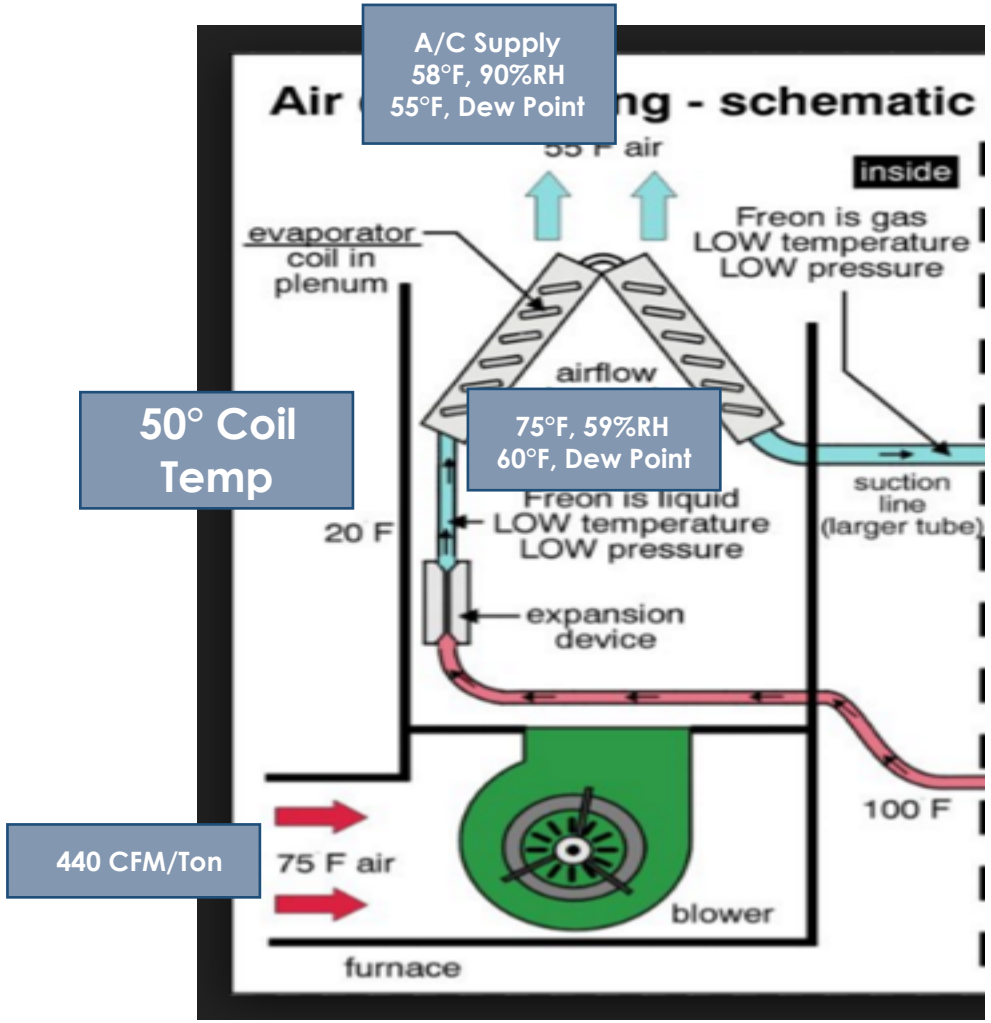
At the Damp Home Condition,
1 ton of Lazy A/C Provides

12,000 btu per hour of total cooling
10,000 btu of sensible cooling
2,000 btu of latent cooling

2 lbs. per hour of dehumidification
Uses the first lb. of condensate per ton of coil to load the coil/pan

A LAZY 5 ton A/C would remove only 10 lbs. per hour

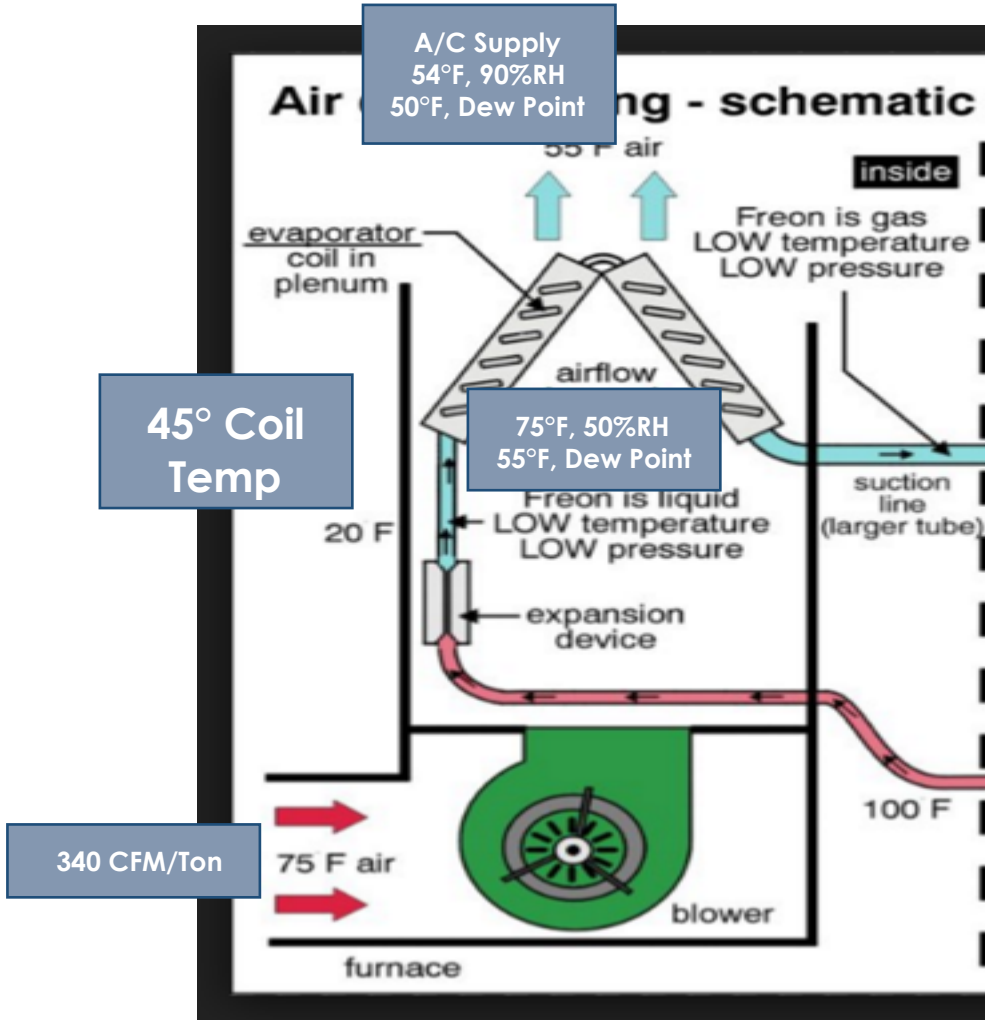
Let's review How The A/C Operates



Remember the typical A/C setup takes up to 30 minutes to wet its coil and drain pan. This is before any condensate drains.

At the end of cooling cycle, moisture on the coil evaporates into the home in 30 minutes (Fan-On) or 90 minutes (Fan-Auto).

Optimize the A/C Setup for 50%RH



In a Green Grass Climate

Adjust the A/C air flow to get a <45°F coil temperature under typical conditions.

Increase the T-stat dead band to increase the length of cooling cycle.

Set the fan operation to "Auto" mode.

This is similar to "Ideal Home" set-up

5 ton removes 15 lbs. per hour

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Entering Air

Dry Bulb	Rel. Humidity	Wet Bulb	Dew Point	Absolute Humidity
75 °F	50 %	62.8 °F	55.13 °F	66.14 grains/lb

T = 534.67 °R

Leaving Air

Dry Bulb	Rel. Humidity	Wet Bulb	Dew Point	Absolute Humidity
52. °F	90 %	50.69 °F	49.17 °F	52.93 grains/lb

T = 511.67 °R

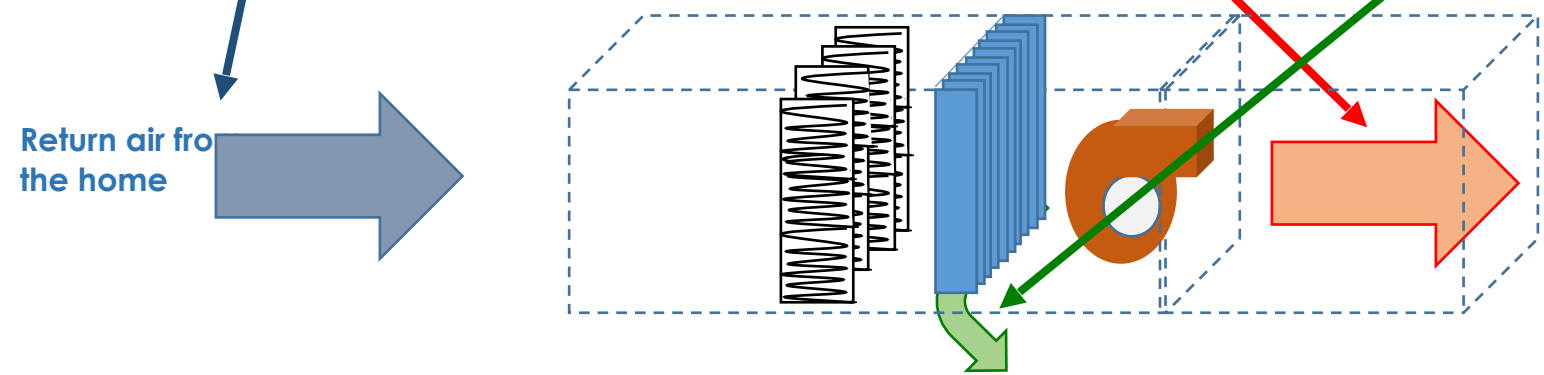
Airflow

Altitude	Entering sCFM₁
500 ft	1750 ft³/min

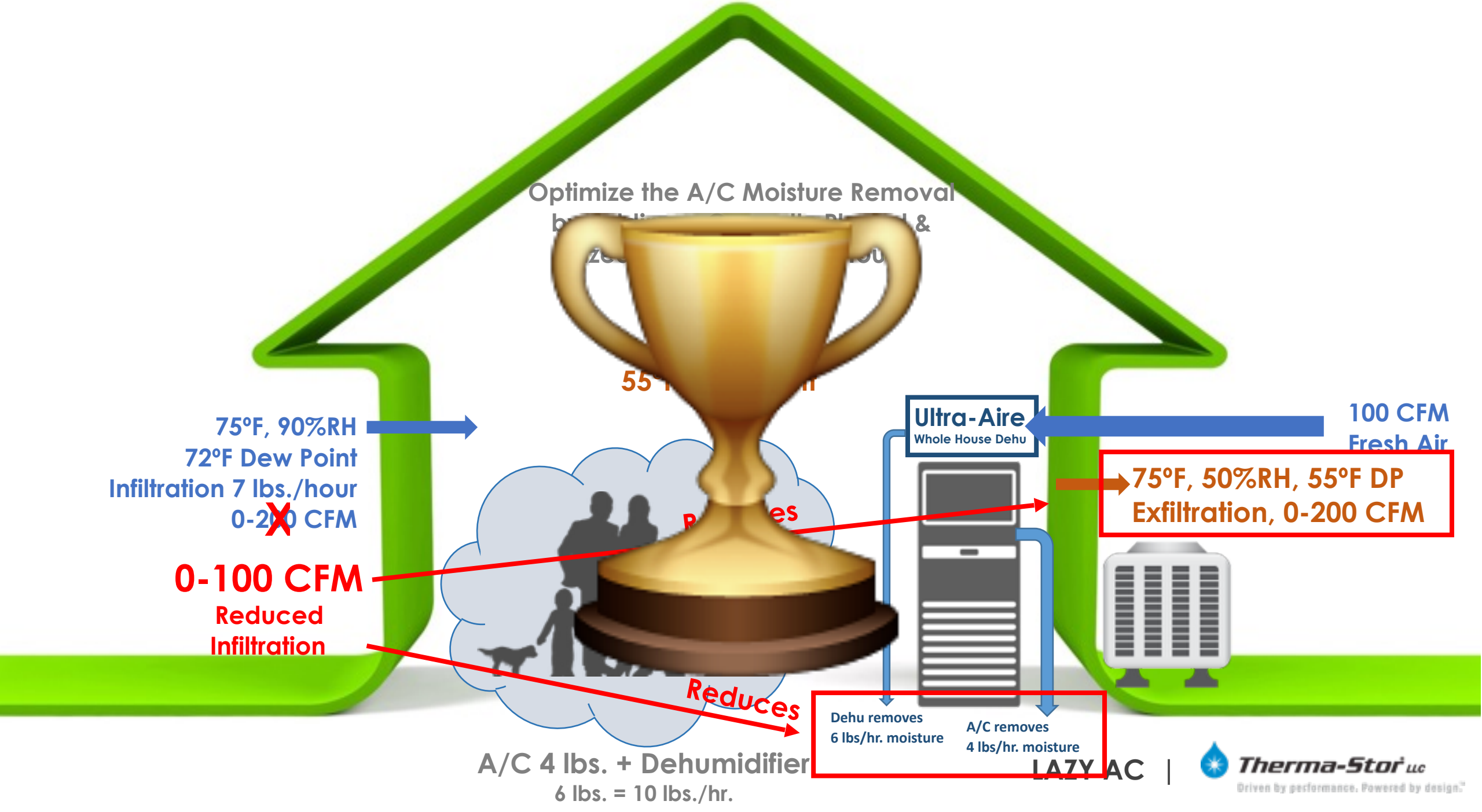
Entering Standard CFM₁ converts to 1,828 Actual Dry Air Specific CFM for calculations

Cooling & Dehu

Sensible Cooling Btu/h	44,261
Latent Dehumidifying Btu/h	16,134
Total Cooling Btu/h	60,395
Tons Total Cooling	5.03 Tons
aCFM₁ /Ton	363 ft³/min
Dry Bulb Delta	23 °F
Sensible Heat Ratio	0.73
$\dot{m}_a$ Dry Air Mass Flow	131.2 lb/min
Condensation Rate	14.87 lb/hr
hg_4 Water Vapor Enthalpy	1085.31



LAZY AC | Therma-Stor LLC
Driven by performance. Powered by design.


Optimize the A/C Moisture Removal
75°F, 90%RH
72°F Dew Point
Infiltration 7 lbs./hour
0-200 CFM
0-100 CFM
Reduced
Infiltration
Ultra-Aire
Whole House Dehu
100 CFM
Fresh Air
75°F, 50%RH, 55°F DP
Exfiltration, 0-200 CFM
Reduces
Dehu removes
6 lbs/hr. moisture
A/C removes
4 lbs/hr. moisture
A/C 4 lbs. + Dehumidifier
6 lbs. = 10 lbs./hr.
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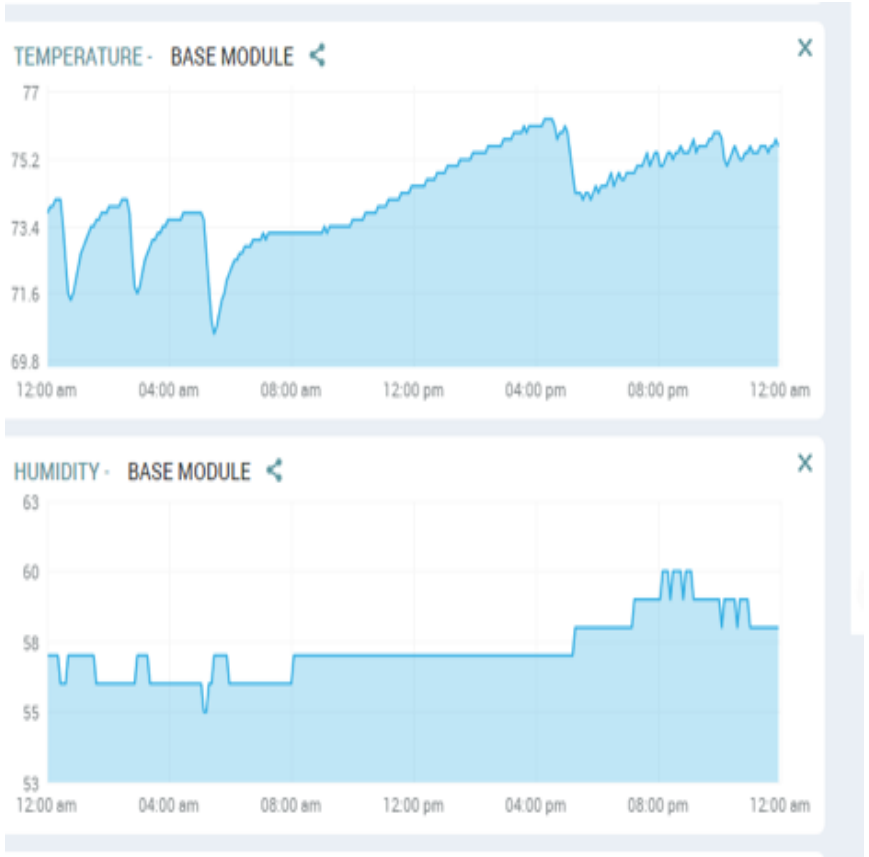
Proof of the Analysis? Fixed Home in TX

Before



After

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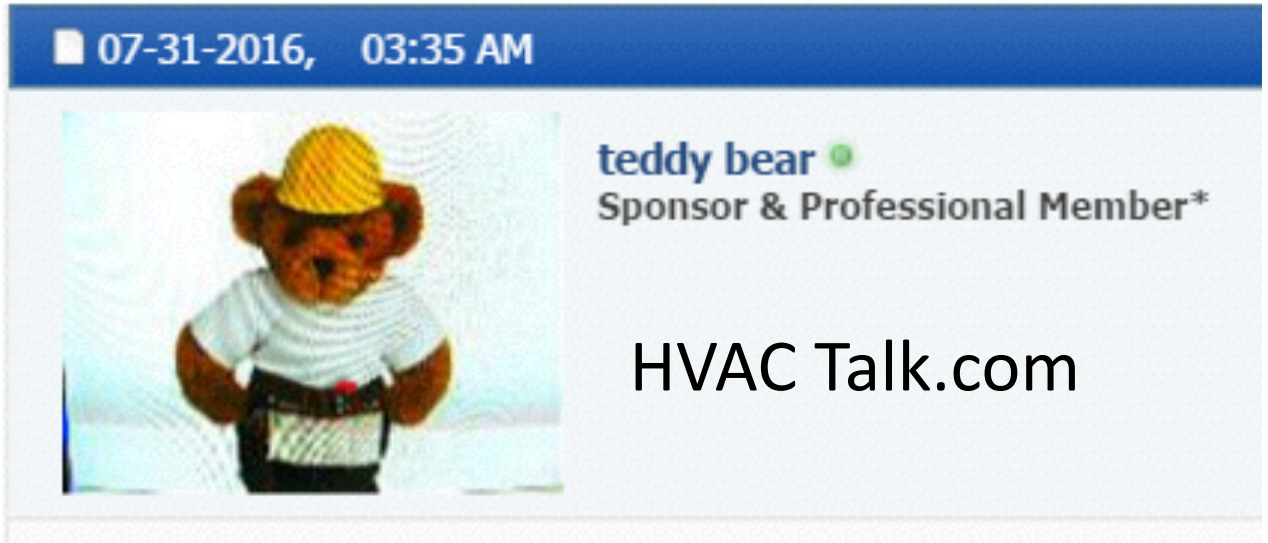


and not changed.

Benjamin Franklin (18 Century)

Source: Indoor Environment Engineering, 2000

Sounds like Teddy Bear's forefather?

In Summary

To cover all your bases:

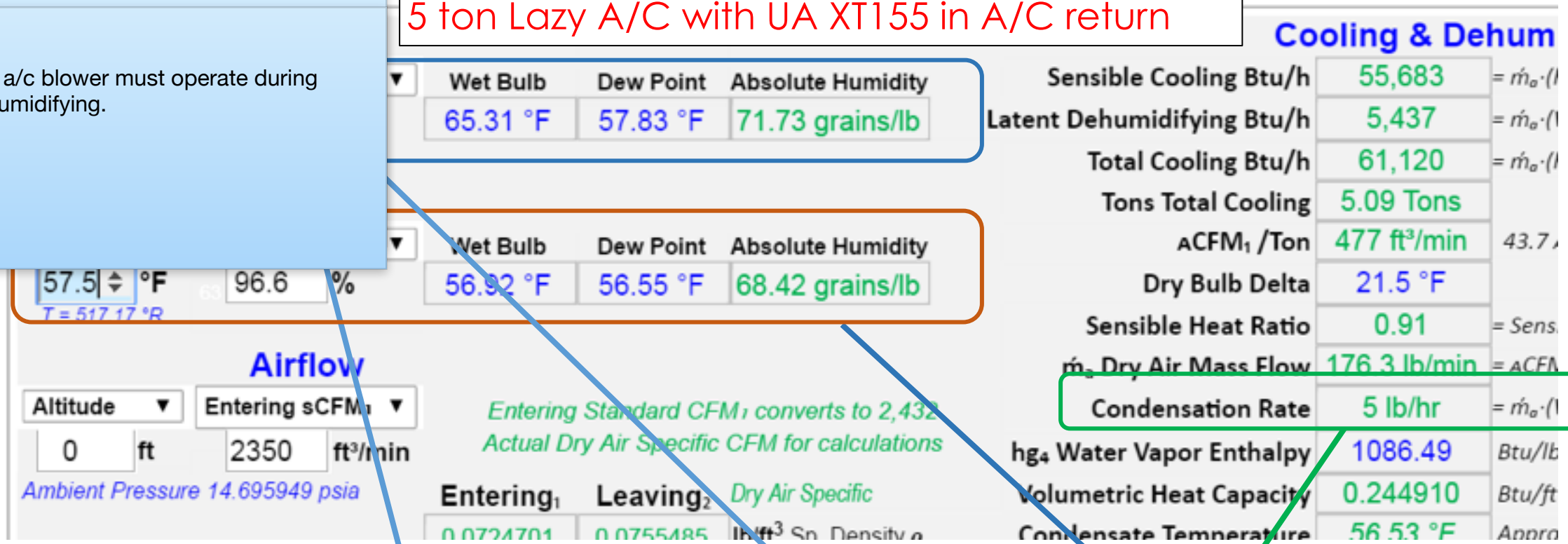
- Size HVAC according to Manual J and Manual S to handle peak design loads + occupants + fresh air ventilation+ any special needs without fear of over-sizing
- Set up the HVAC properly (Optimized vs. Lazy) to handle partial load latent conditions
- Install a whole house dehumidifier to handle low/no load conditions (70F and rainy) and to guarantee comfort in partial load situations

Bonus Material

- Lazy A/C with incorrect dehumidifier install
- Controlling %RH in Unoccupied homes
- How to use the Ultra-Aire calculator
- SF Sentry

The a/c blower must operate during dehumidifying.

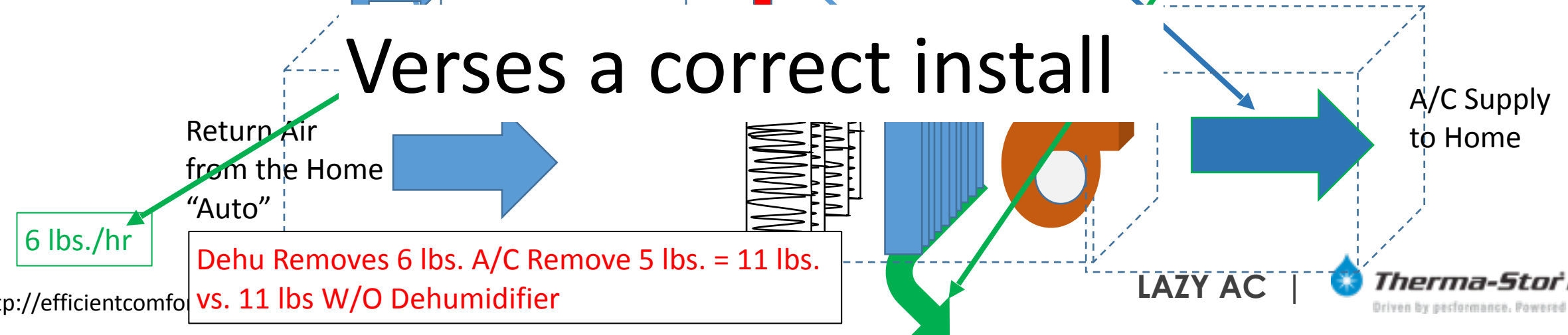
5 ton Lazy A/C with UA XT155 in A/C return



Ultra-Aire XT155H 300 cfm

Ultra-Aire
Whole House Dehu

Verses a correct install



http://efficientcomfo

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Entering Air

Dry Bulb	Dew Point	Wet Bulb	Rel. Humidity	Absolute Humidity
75 °F	55 °F	62.48 °F	49.77 %	64.64 grains/lb

T = 534.67 °R

Leaving Air

Dry Bulb	Dew Point	Wet Bulb	Rel. Humidity	Absolute Humidity
98 °F	45 °F	65.94 °F	16.48 %	44.34 grains/lb

T = 557.67 °R

Airflow

Altitude	Entering sCFM₁
0 ft	350 ft³/min

Ambient Pressure 14.695949 psia

Entering Standard CFM₁ converts to 358.95 Actual Dry Air Specific CFM for calculations

Entering₁	Leaving₂	Dry Air Specific
0.0731306	0.0704293	lb/ft³ Sp. Density ρ

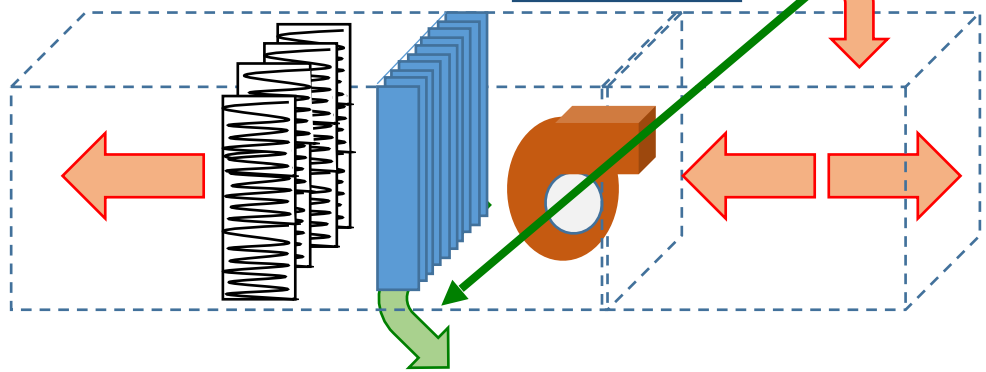
Heating & Dehumidifying

Sensible Heating Btu/h	8,773	= ṁ
Latent Dehumidifying Btu/h	4,957	= ṁ
Net Enthalpy Increase Btu/	3,816	= ṁ
Tons Dehumidifying	0.32 Ton	
Temperature Rise	23 °F	
Sensible Heat Factor	0.64	= Se
ṁₐ Dry Air Mass Flow	26.25 lb/min	= AC
Moisture Removal Rate	4.57 lb/hr	= ṁ
hg₄ Water Vapor Enthalpy	1085.26	Btu
Volumetric Heat Capacity	0.242179	Btu

Independent Return from Open Space

Ideal Ultra-Aire XT155H

Ultra-Aire
Whole House Dehu



Return air fro
the home "o

A/C supply to home

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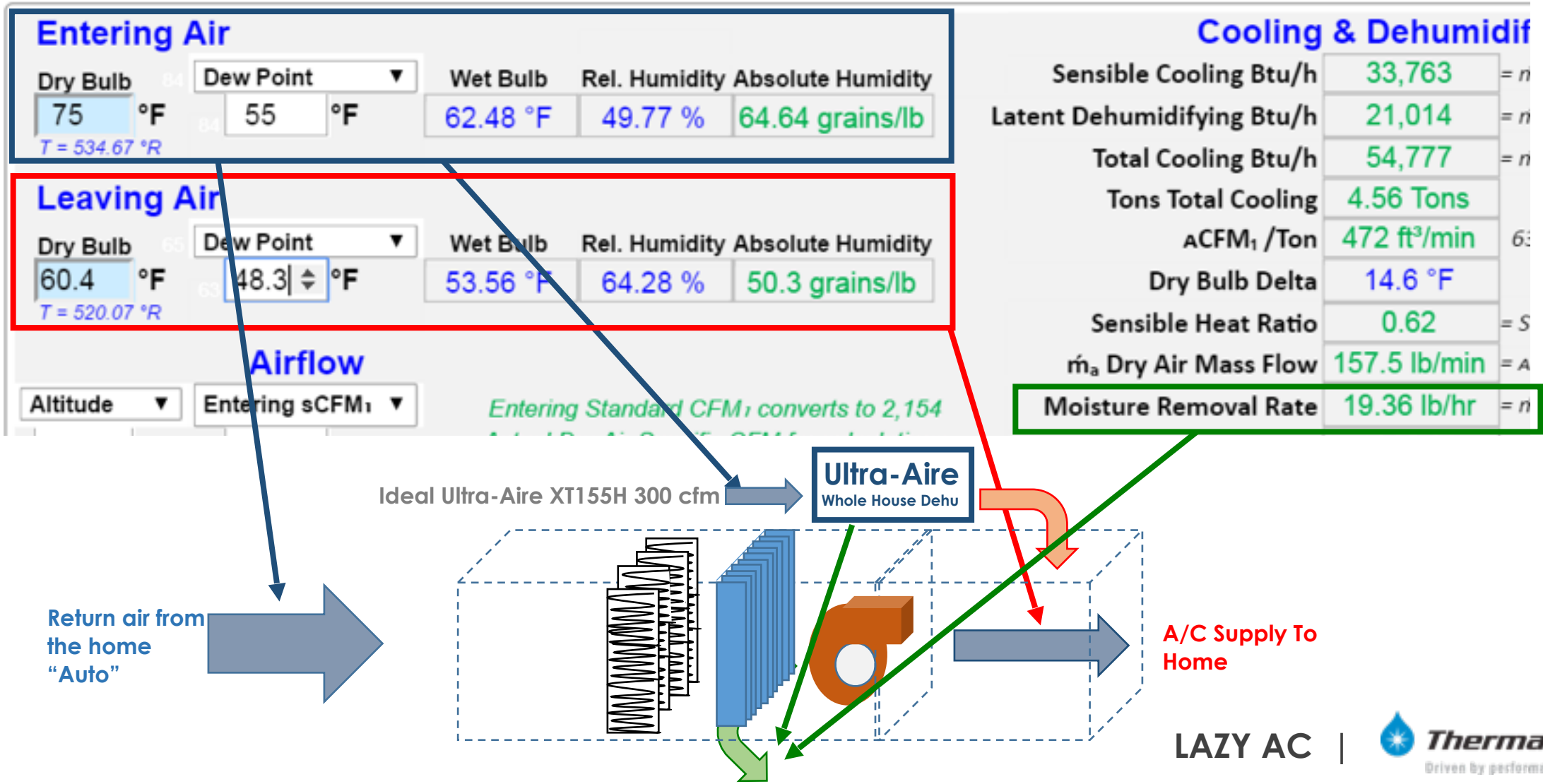

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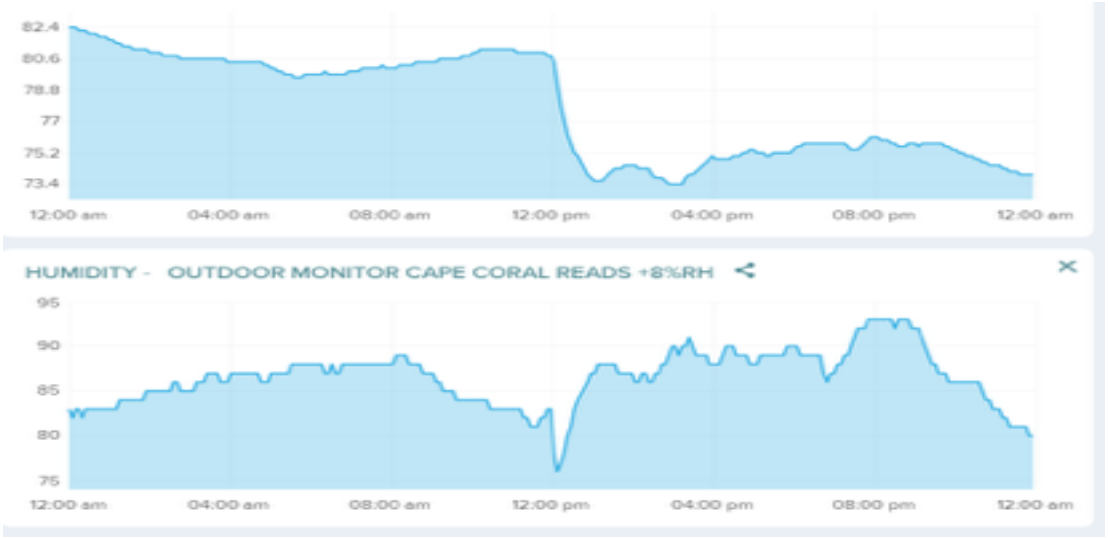
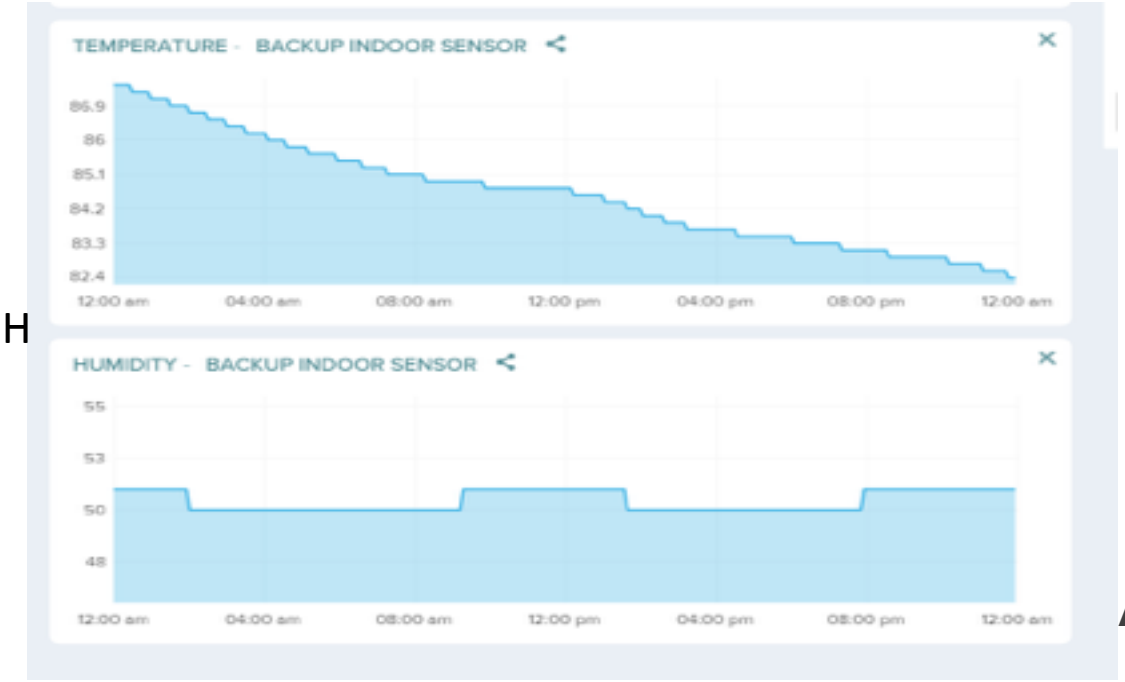
Example of Unoccupied Home: A/C Off with Dehumidifier set at 50% RH

Cool wet afternoon & evening



Dehumidifier maintains 52% RH inside



Dehumidifier raises the temperature 2^F, lowering 4%RH + removes 4-8 lbs. per KWH

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CULA MOIST

noval fr th iPhon

Using a-Aire

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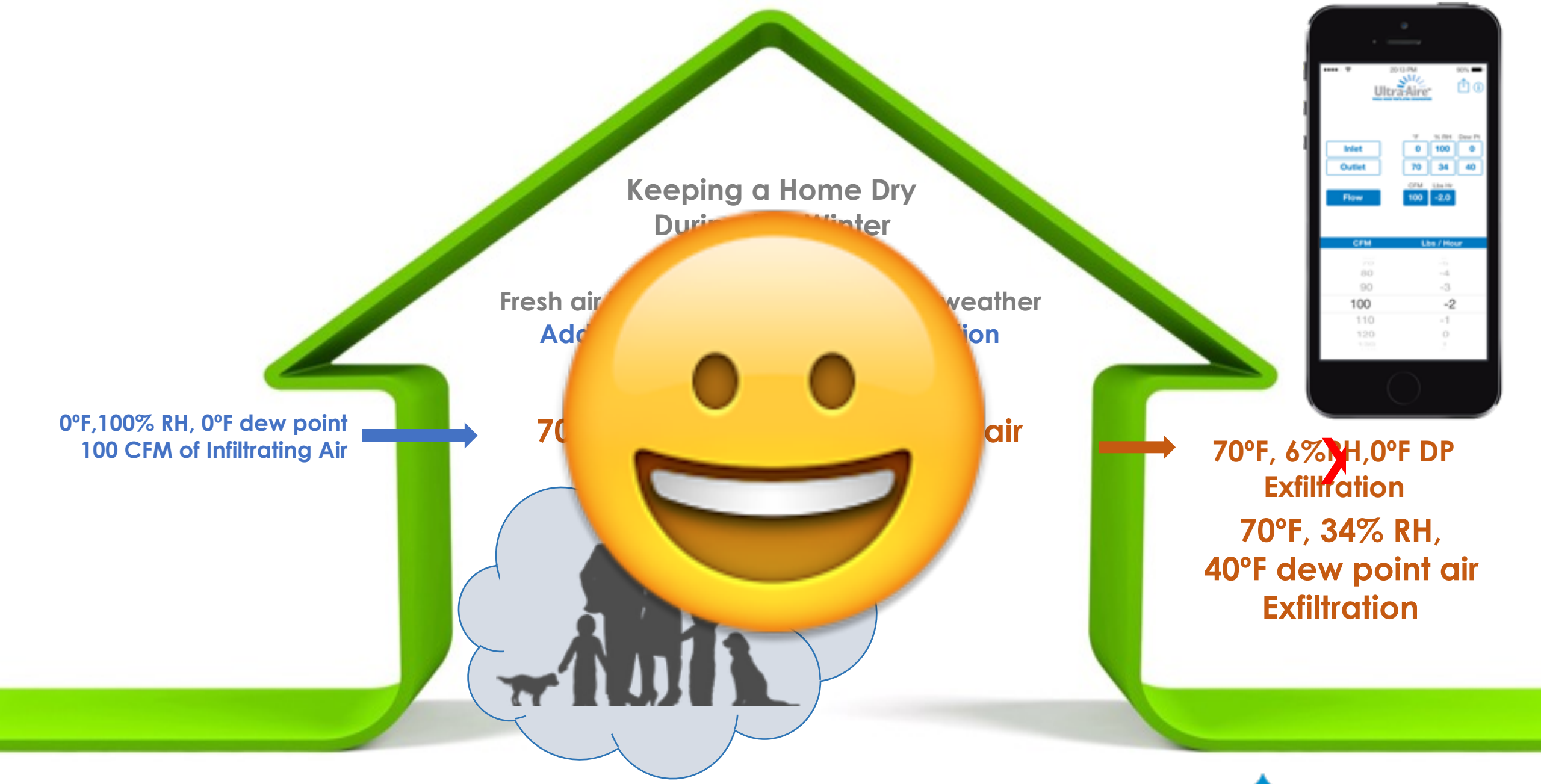

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Warning! Warning! Trouble ahead, a new way to think

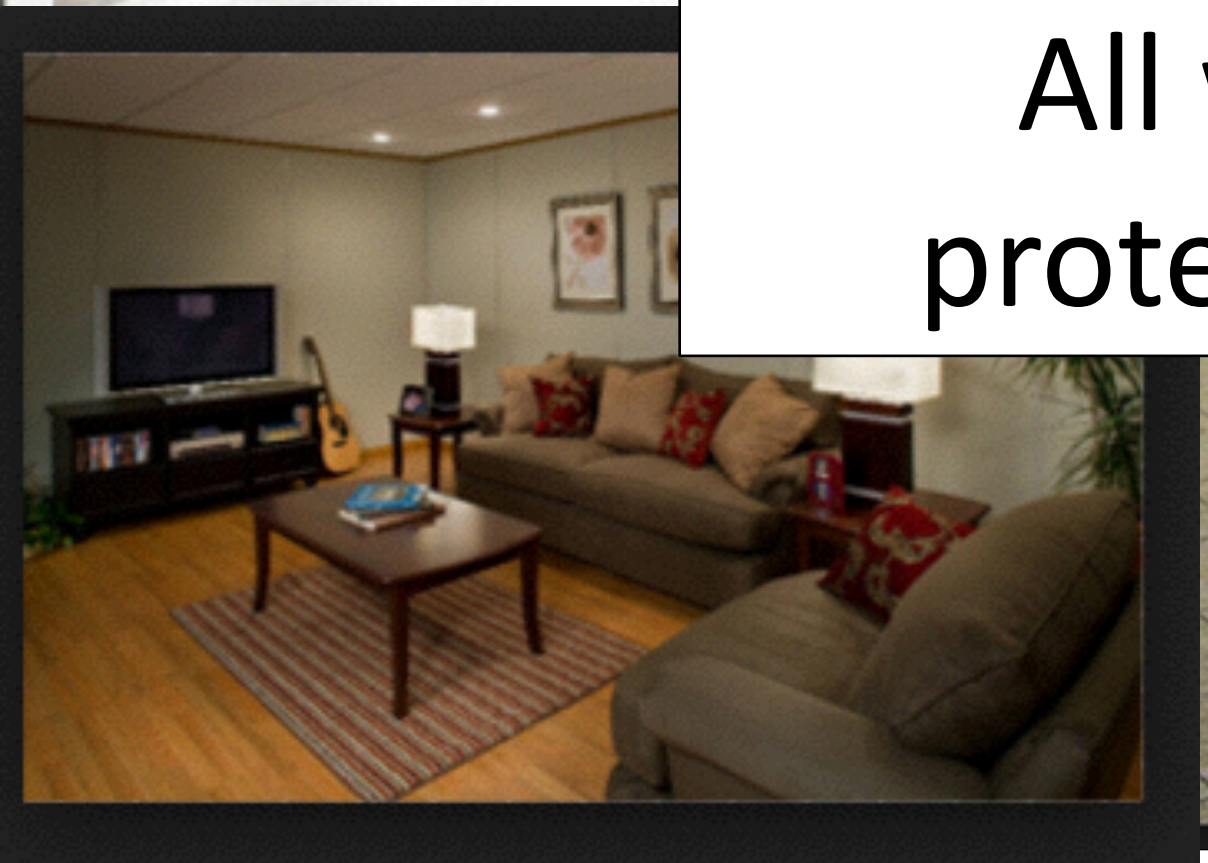
Resources

Hazard Alerts

Hazard Alerts

SafeWork SA issues Hazard Alerts to warn people about serious workplace safety risks. To receive new Hazard Alerts and be notified of updates use the **Notify Me ...** link.

LAZY ***Know your Home***



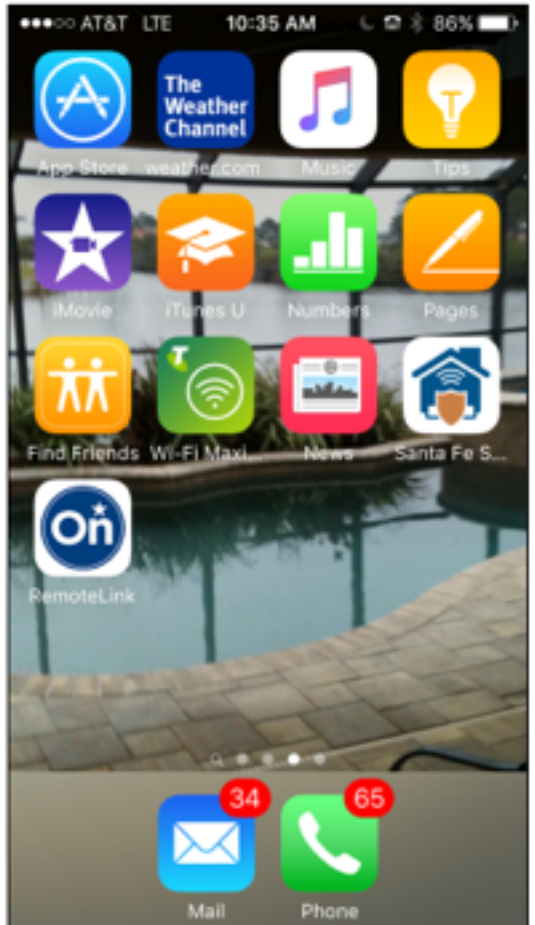
Below grade but

All worth protecting!!

Here is practical way to get a

Heads Up before it is too late!!

No surprise, its on your I phone



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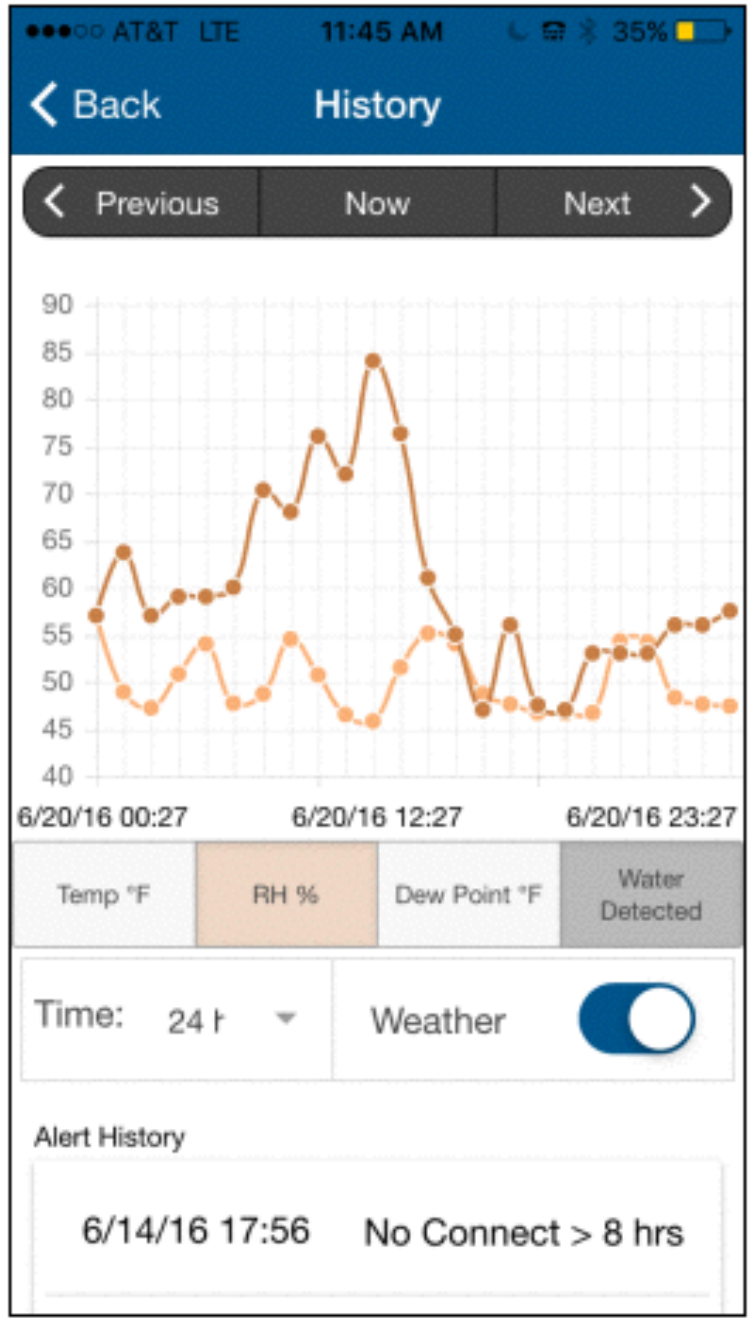
No surprise, its on your IPhone

Santa·Fe SENTRY™



Outdoor/Indoor %RH

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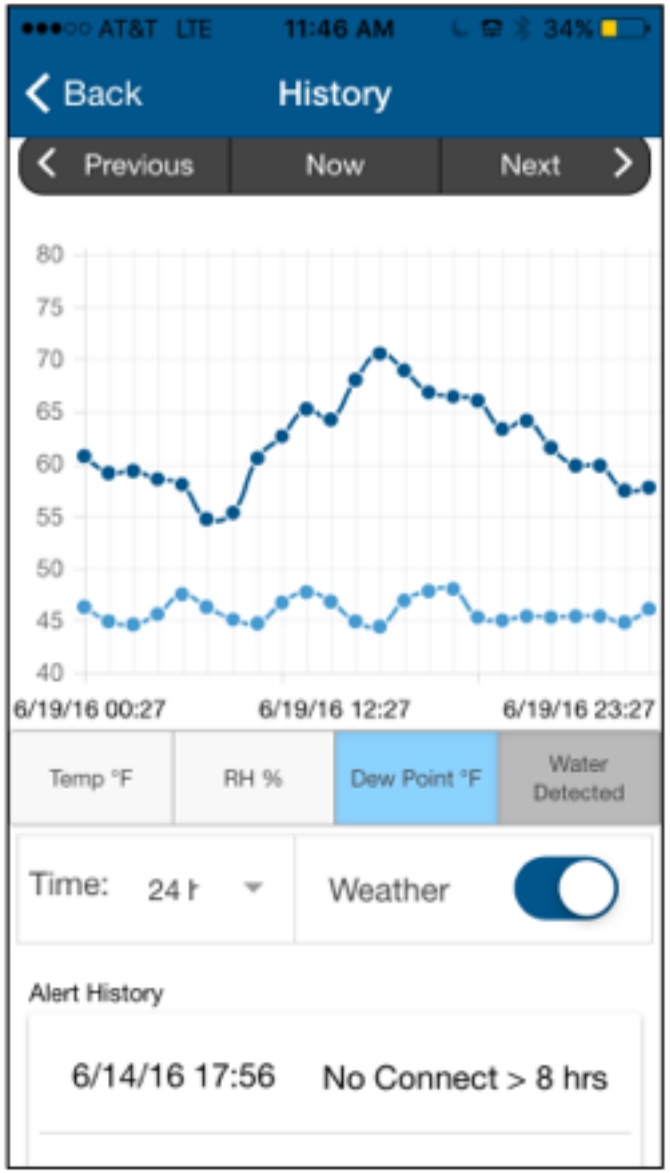
Santa Fe SENTRY™



Outdoor/Indoor
Dew Point

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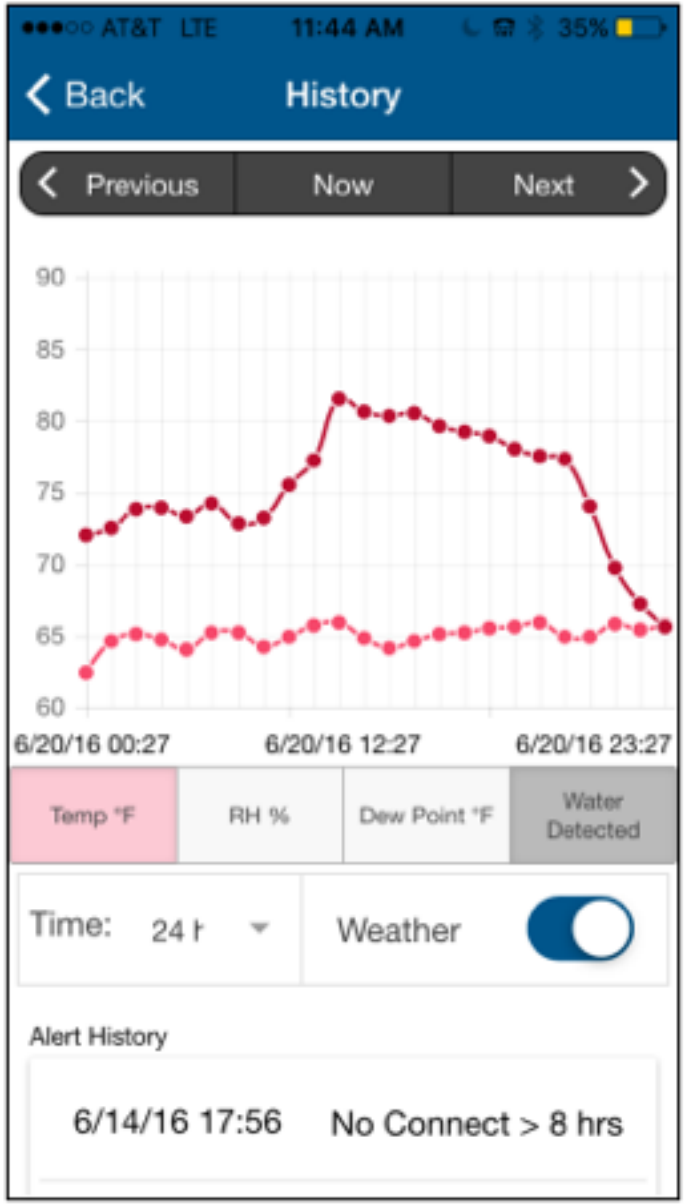

Outdoor/Indoor Temperature

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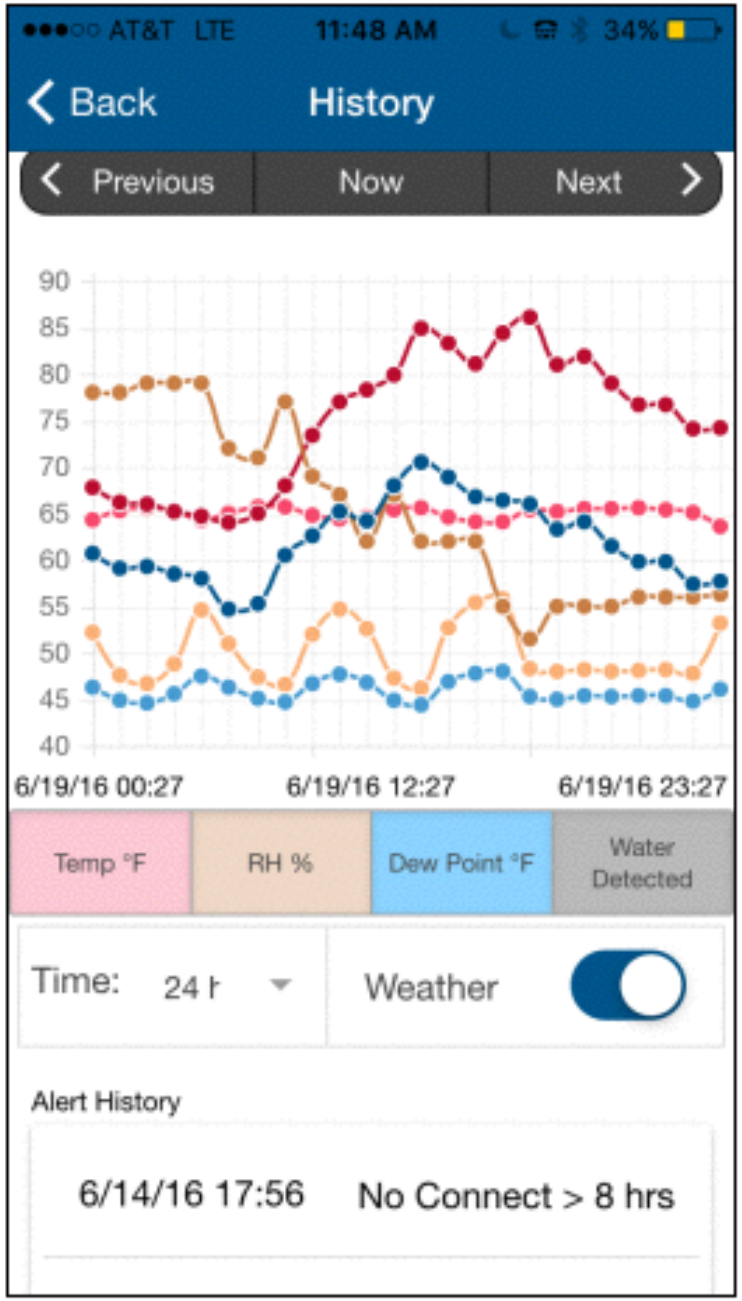

Outdoor/Indoor
Everything

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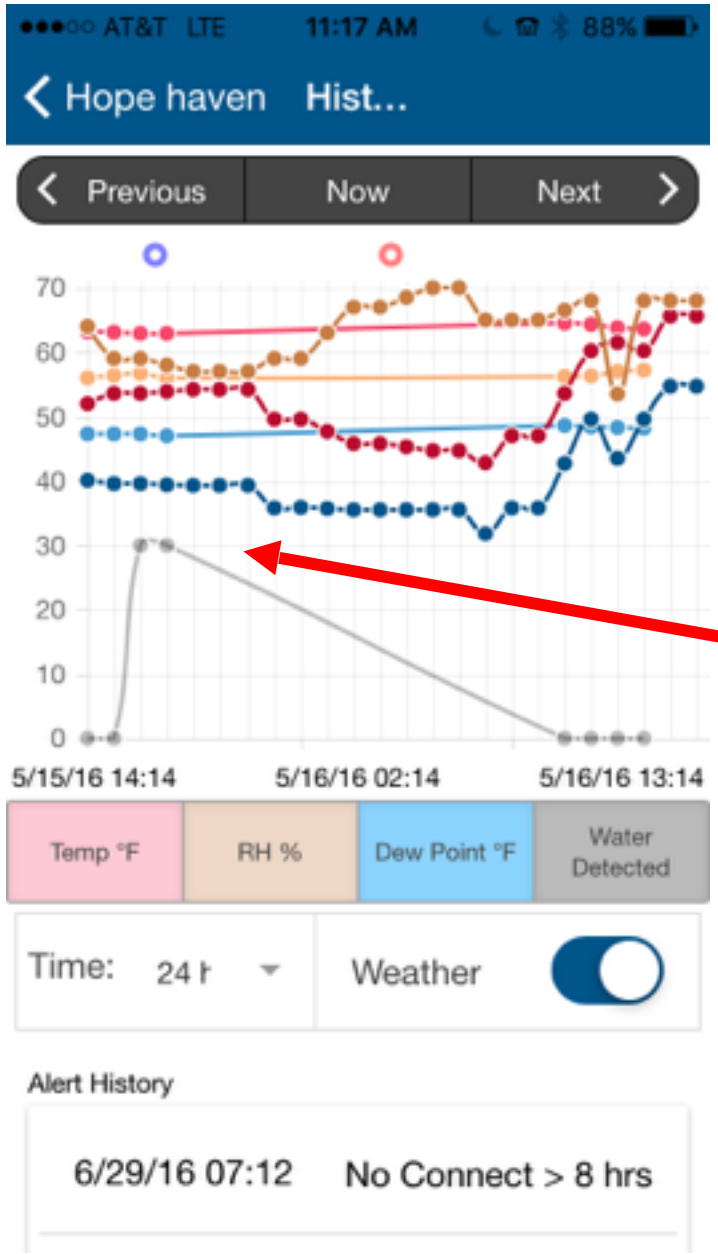

Water Alert

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Santa Fe SENTRY™

Wed 6/15/2016 5:52 PM

Santa Fe Sentry <support@santa-fe-products.com>

Alert

To Ken Gehring

Connect Failure at Hope haven 2

No connection since Jun 14 09:49 AM

Currently: RH 0.0%
Temperature 0.0°F
Dew Point 0.0°F

Current rule: No Connect > 8 hrs

Link to Santa Fe dehumidifer products

LAZY AC | Therma-Stor LLC

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Thu 6/2/2016 9:44 AM

Santa Fe Sentry <support@santa-fe-products.com>

Alert

To Ken Gehring

Mold Warning at Hope haven

RH greater than 65% since May 25 18:59 PM

Currently: RH 68.4%
Temperature 66.1°F
Dew Point 55.4°F

Current rule: RH > 65% for 24 hrs

Link to Santa Fe dehumidifer products

Therma-Stor LLC
Driven by performance. Powered by design.

Thu 6/2/2016 9:44 AM

Santa Fe Sentry <support@santa-fe-products.com>

Alert

To Ken Gehring

Water Detected at Hope haven

Water detected since May 27 20:39 PM

Currently: RH 69.2%
Temperature 64.9°F
Dew Point 54.6°F

Current rule: Water for > 10 mins

Link to Santa Fe dehumidifer products

Thu 6/2/2016 9:44 AM

Santa Fe Sentry <support@santa-fe-products.com>

Alert

To Ken Gehring

Water Detected at Hope haven

Water detect

Currently: RI
Tem
Dew

Current rule:

Link to Santa

Santa
SENT

Thu 6/2/2016 9:44 AM

Santa Fe Sentry <support@santa-fe-products.com>

Alert

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Currently:
Te
De

Current rul

Link to San

Santa
SEN

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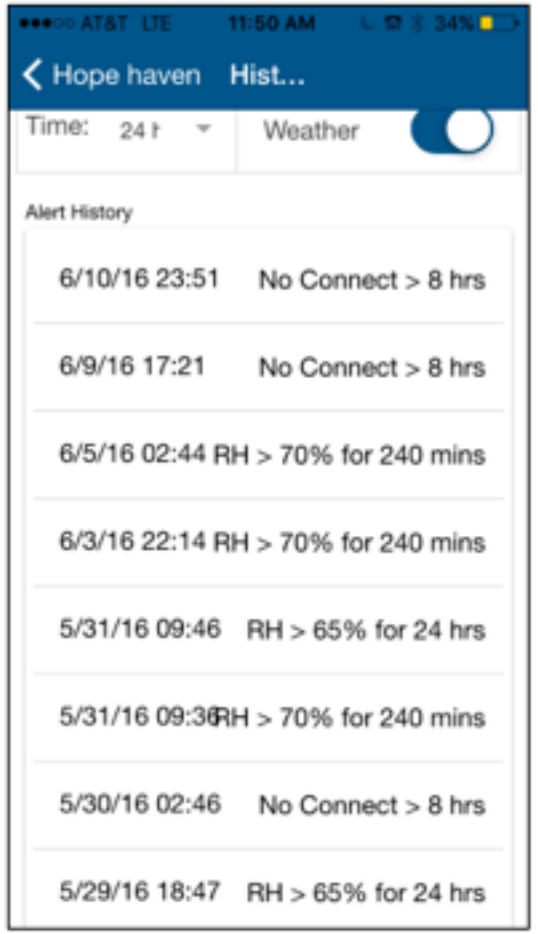
Summary



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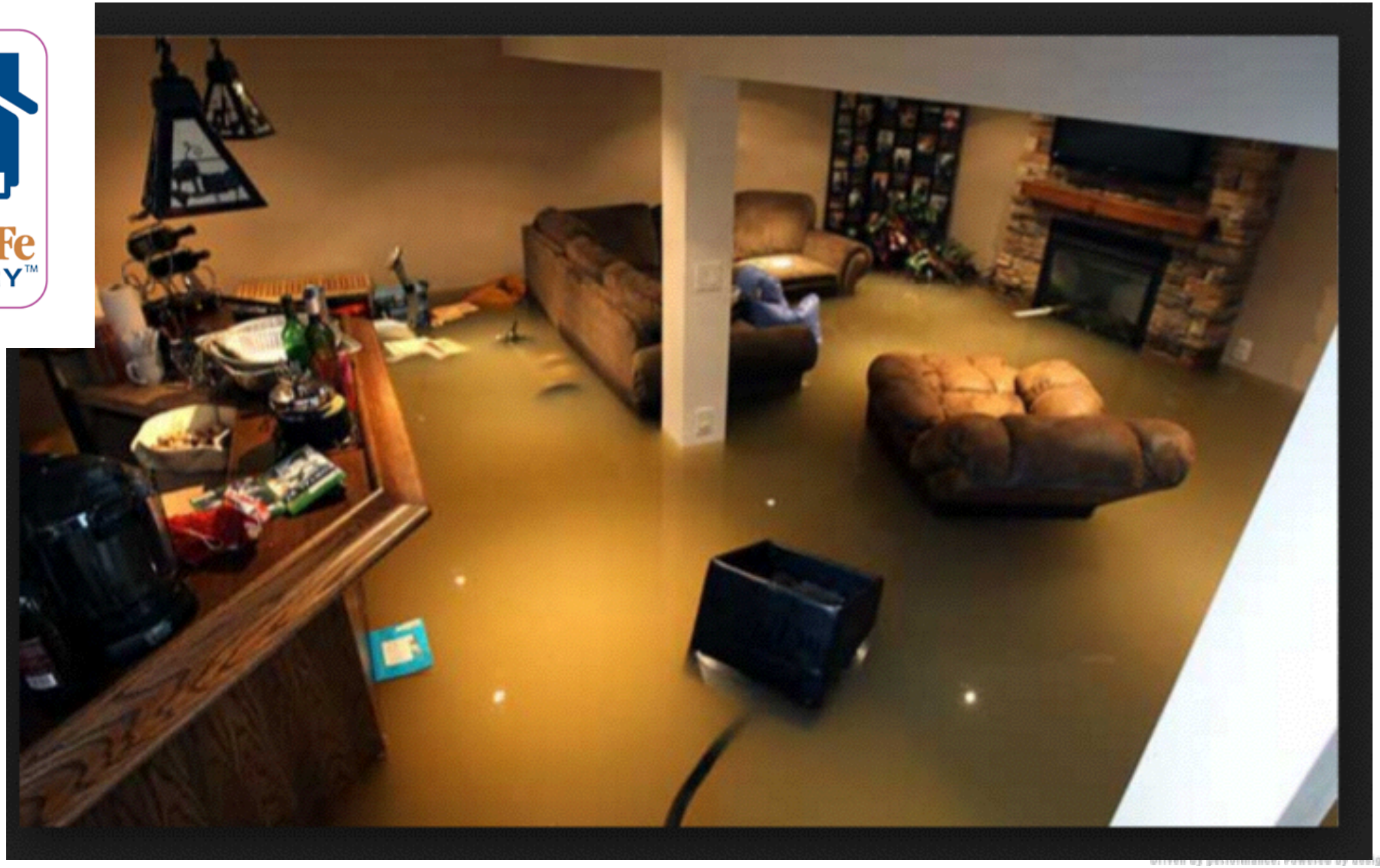
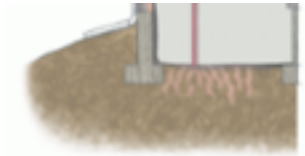
Prevent this from happening to you and yours!


Santa Fe
SENTRY™

LAZY AC | Therma-Stor LLC
Driven by performance. Powered by design.™

walls.

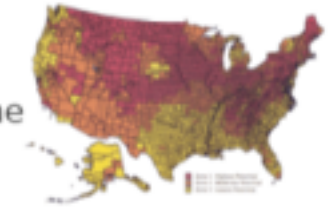


MORE ABOUT CRAWL SPACES

SEAL CRAWL SPACES TIGHTLY

All crawl spaces require a layer of 6-mil (or heavier) polyethylene plastic spread over the floor of the crawl space to help keep moisture and soil gases from getting in. The plastic should be continuous, taped at any seams, and mechanically attached and sealed at the perimeter. For a superior crawlspace, consider covering the polyethylene with a thin slab.

For more information on best-practice details for sealed crawl spaces, see Building an Unvented Crawl Space.



Where radon is a hazard, the crawl space can be safely vented by installing perforated plastic pipe in gravel beneath the polyethylene ground cover and running the stack up through the roof.

For more information, see All About Radon.

Crawl space walls should be damp-proofed just like a full foundation wall to prevent water from migrating inside. If the floor of the crawl space is lower than the exterior grade, the foundation must have perimeter footing drains.

Newly built sealed crawl spaces may contain high moisture levels, especially if the crawl space was open during a spell of rainy weather before the house was closed in. In such circumstances, it may be prudent to install a portable dehumidifier in the crawl space, at least temporarily, to remove moisture that accumulated during construction. After six months, the dehumidifier can probably be safely removed.

THE END

OR

THE BEGINNING OF CONTROLLED COMFORT

AND

INDOOR AIR QUALITY

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