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ASHRAE Data Center Environmental Standards

Some Field Observations

Mukesh Khattar
Tech Executive, EPRI

SVLG Data Center Efficiency Workshop
April 15, 2015

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Advancing safe, reliable, affordable and environmentally responsible electricity for society through global collaboration, thought leadership and science and technology innovation.

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Indoor Temperature

- Depends on type/criticality of data center—production; owned/colo facility; IT labs; Server room
- Indoor temperature varies as air moves through data center
- Indoor environments in most data centers are controlled on Return Air (RA)—and not on Supply Air (SA)—temperature
- It is impractical to control on SA temp with *conventional* Direct Expansion (DX) air conditioning equipment
- Air inlet temperature to IT equipment is not the same as SA temp
- Air inlet temperature varies with height of IT equipment and where it is located

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Relative Humidity (RH), or Absolute Humidity?

- Indoor Relative Humidity (RH) will vary based on where you measure it; it changes with the Dry Bulb temperature
- However, Absolute Humidity—measured by Dew Point (DP) temperature—does not change with ambient temperature
- Humidity was not as tightly controlled, *even before ASHRAE expanded its range*
- Indoor Dew Point (DP) temperature would reach the same as outdoor DP with some time delay unless moisture is added (humidification) or removed (dehumidification)
- Dehumidification is automatically accompanied with cooling in most applications

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Some Field Observations-Random Sample

- These are RA conditions
- Cooling and humidifying *simultaneously*! *It must be winter.*

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Cooling, Heating, Dehumidifying, Humidifying Simultaneously

- It can happen when you have multiple units that are independently controlled!

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Some Extreme Conditions

- It can happen when estimated IT load does not materialize

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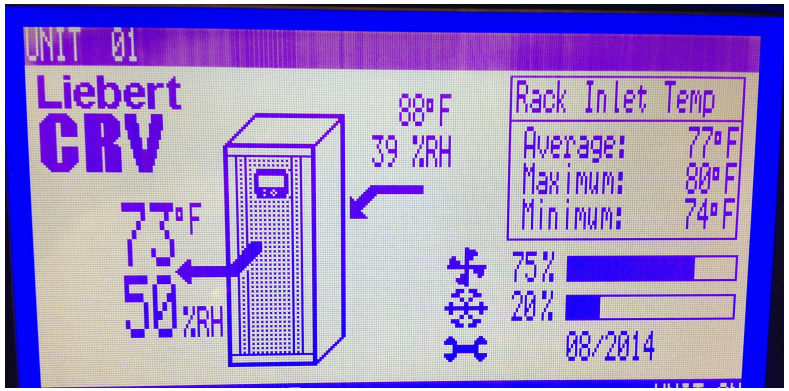
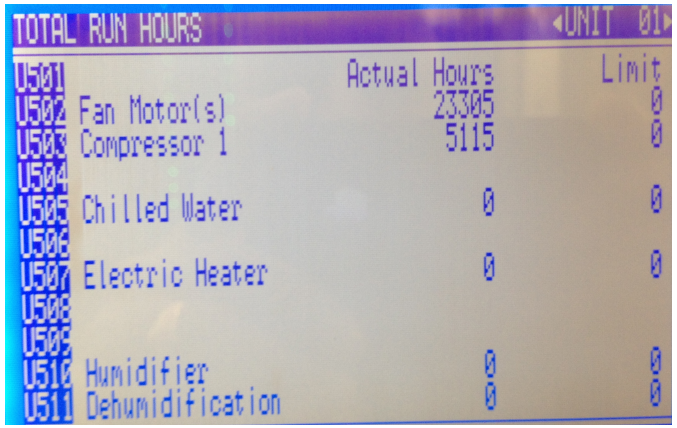
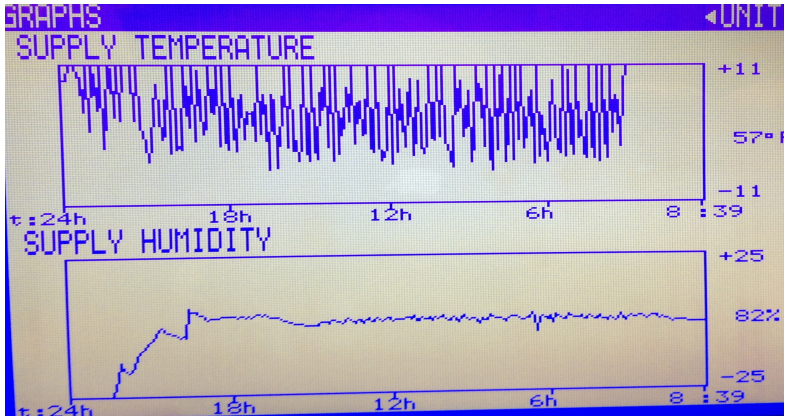
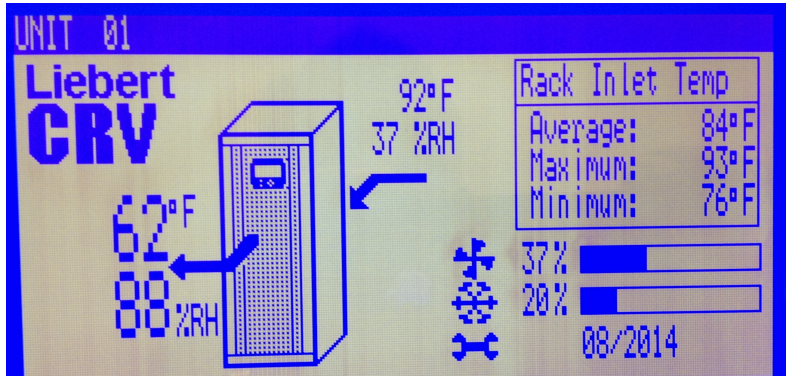
Newer DX Units With Variable Cooling Capacity









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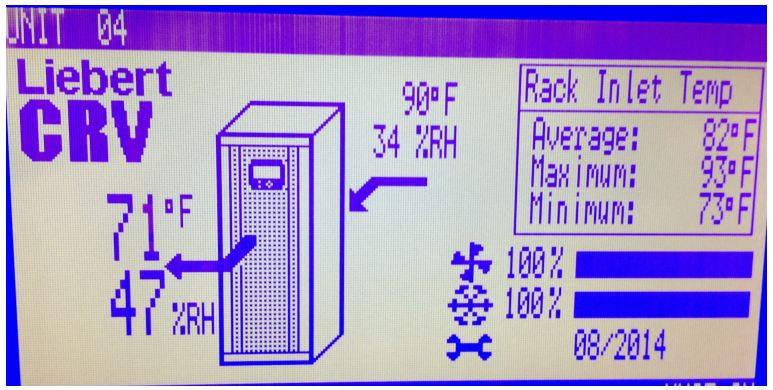
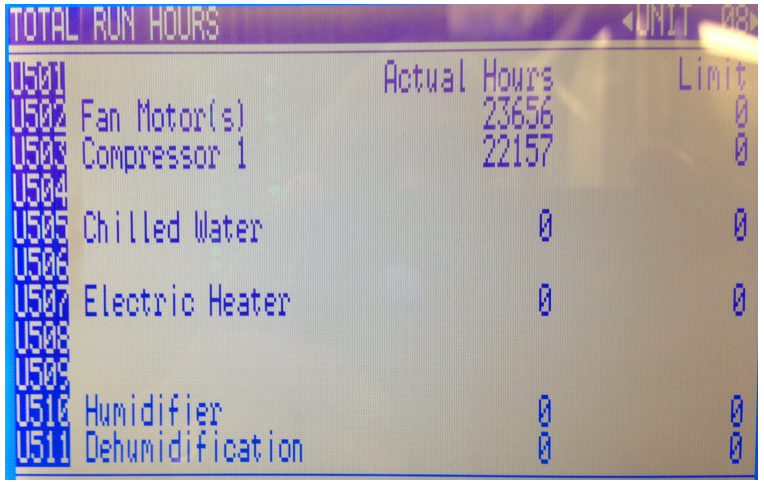
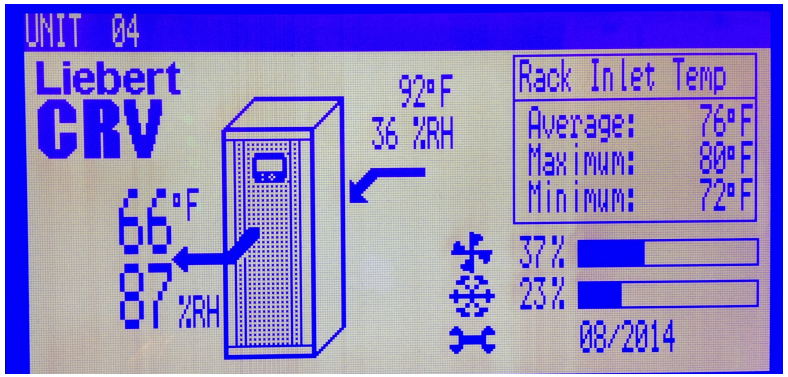
Newer DX Units With Variable Cooling Capacity







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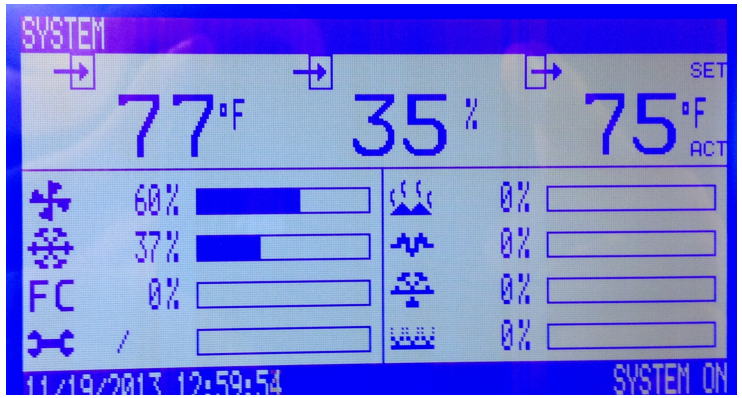
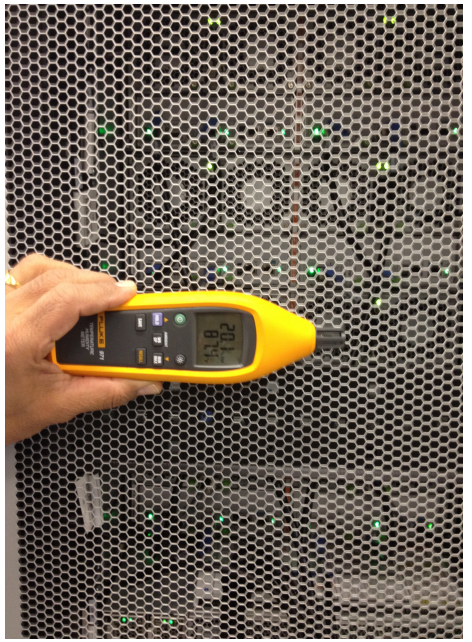
Newer units screens and one off measurements

- Supplement data with hand held measurements





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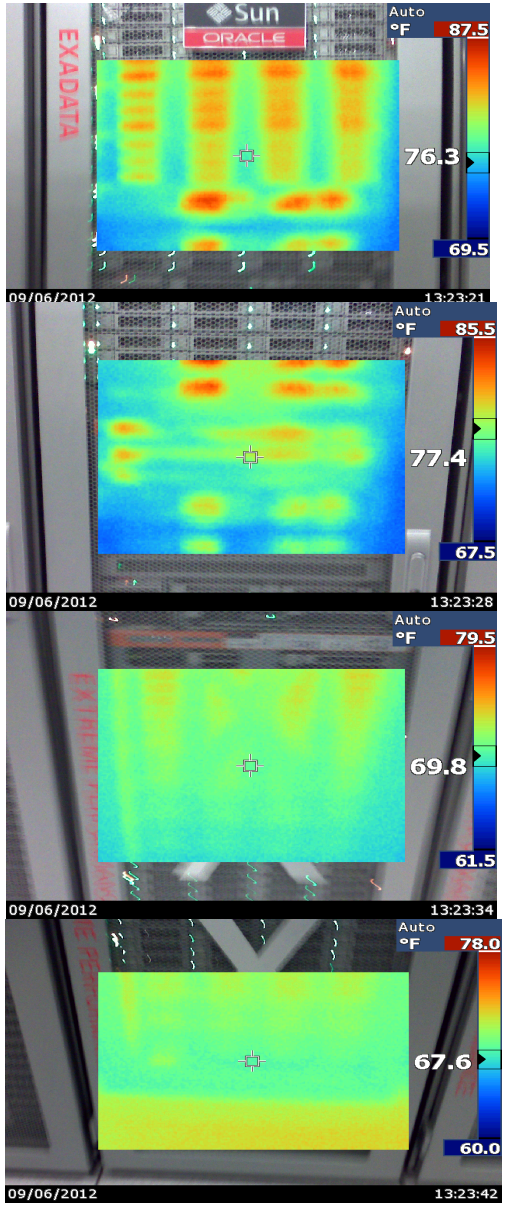
Rack Inlet Air Temperature Profile

- Thermal plot for a rack under no containment and overhead air delivery
- Temperature variation of ~5-10 F from bottom to top of the rack
- Average temperature rise across IT equipment is ~15-18 F



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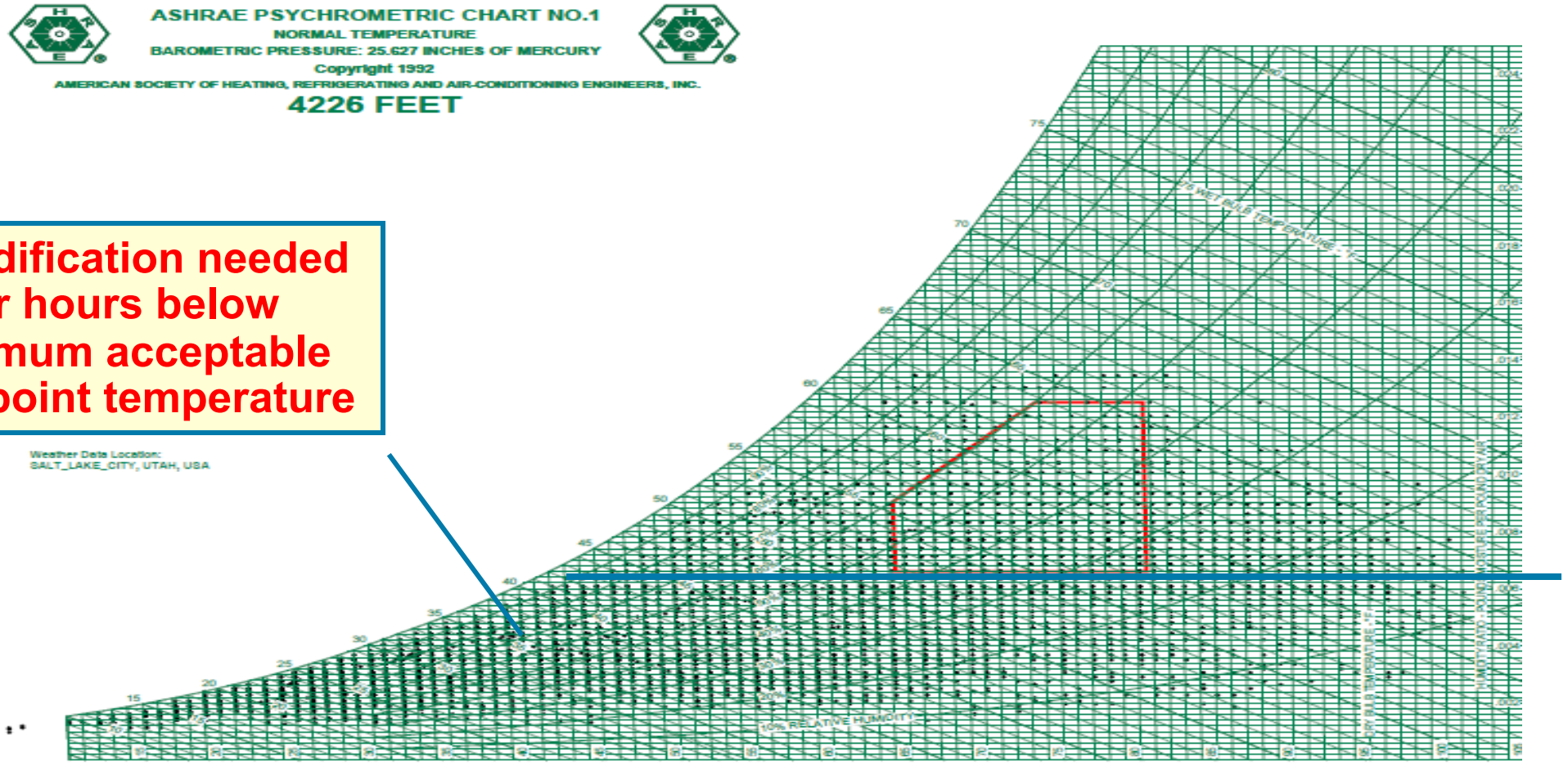
Cool weather needs humidification



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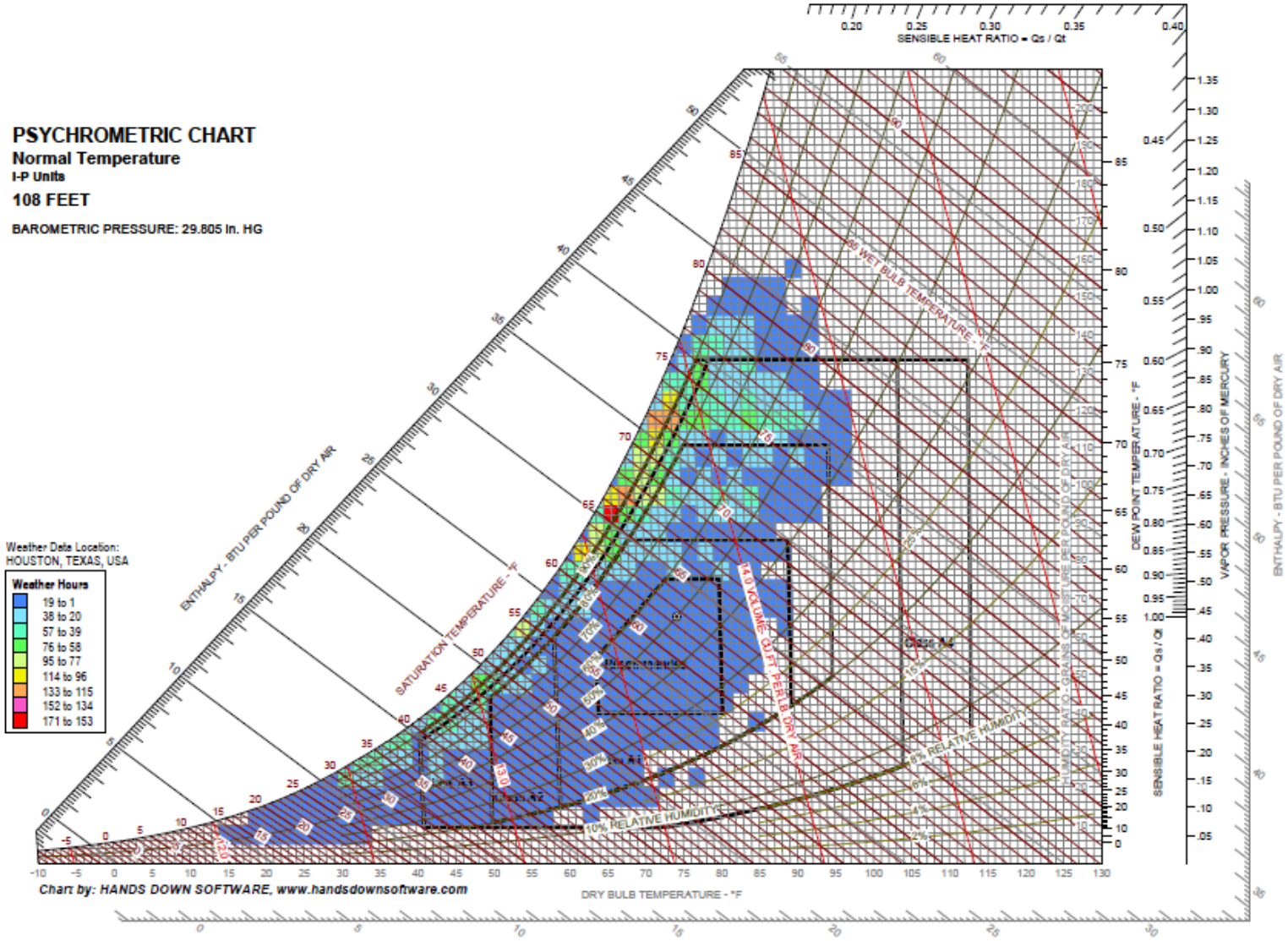
Houston Climate

- Winter humidification and summer dehumidification needed for a few hours only



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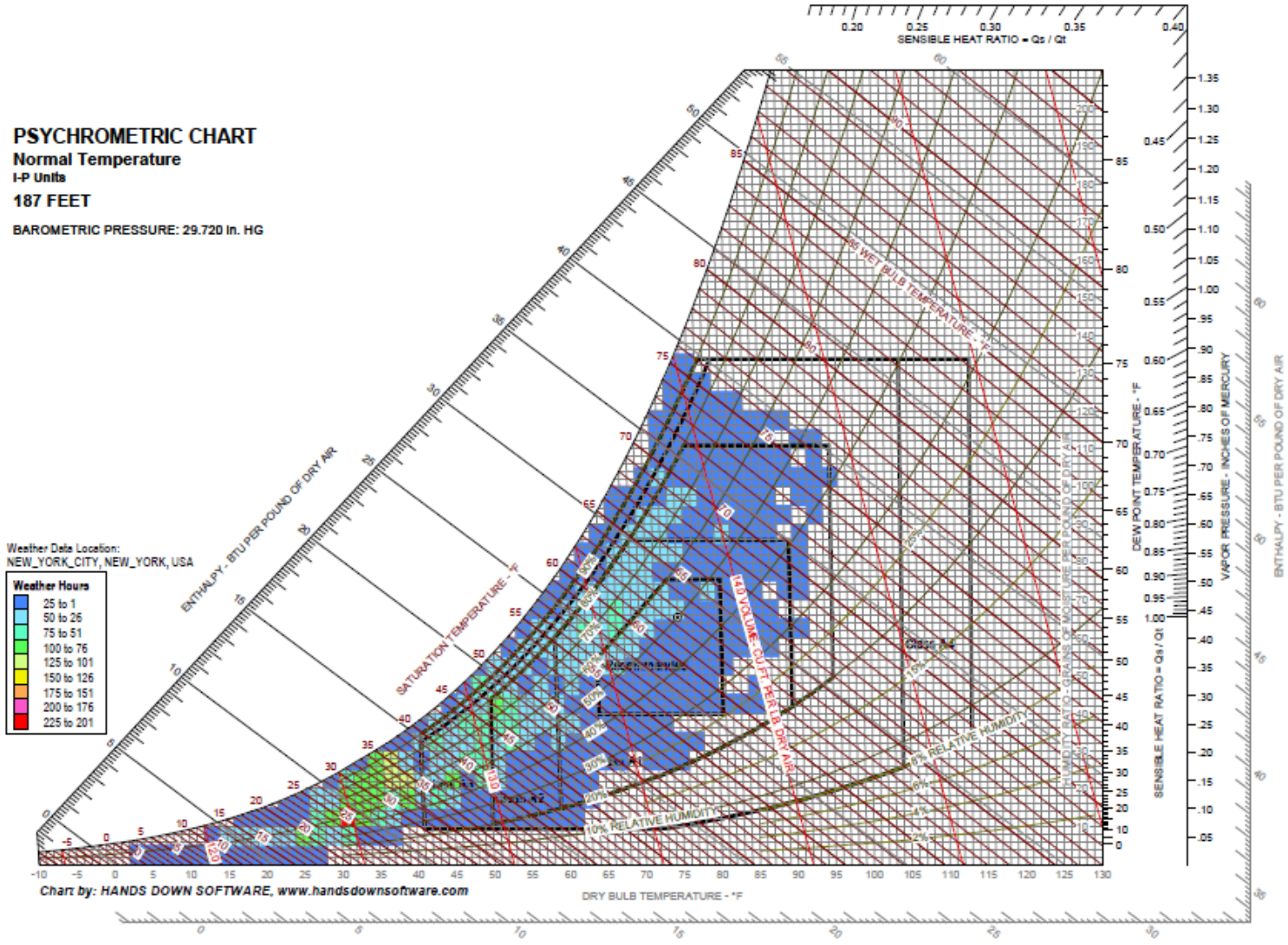
New York City

- Winter humidification needed for a few hours only



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