I Have Cooling Problems What Do I Do?

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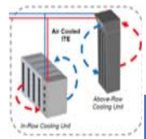
BAE Systems

Overview

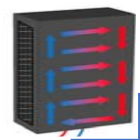
How Do I See If A Problem Exists

- Equipment
- CRAC/CRAH
- Ancillary



What Is The Negative Outcome Of These Problems

- Equipment Failure & Efficiency
- CRAC/CRAH Failure & Efficiency
- Ancillary Equipment



How Do We Fix These Problems

- Equipment Containment
- CRAC Settings
- Ancillary Settings & Equipment

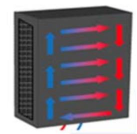
How Do I See If Problems Exist

Equipment

- Equipment Intake Temps
- Hot Ailes Temps
- Cold Ailes Temps

CRAC/CRAH Equipment

- CRAC/CRAH Return Temp
- Constant Humidifier

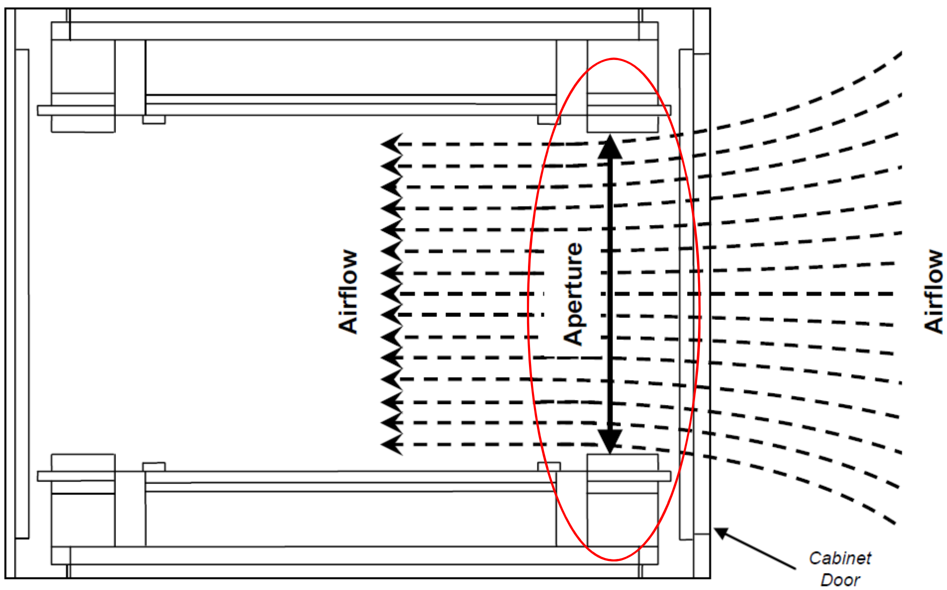


Ancillary Equipment

- Are Pump Failures More Frequent Than Expected
- Constant Draining & Refilling Water

Air Intake Temps & Humidity

- The sole purpose of our entire cooling infrastructure
- Temperature & Humidity

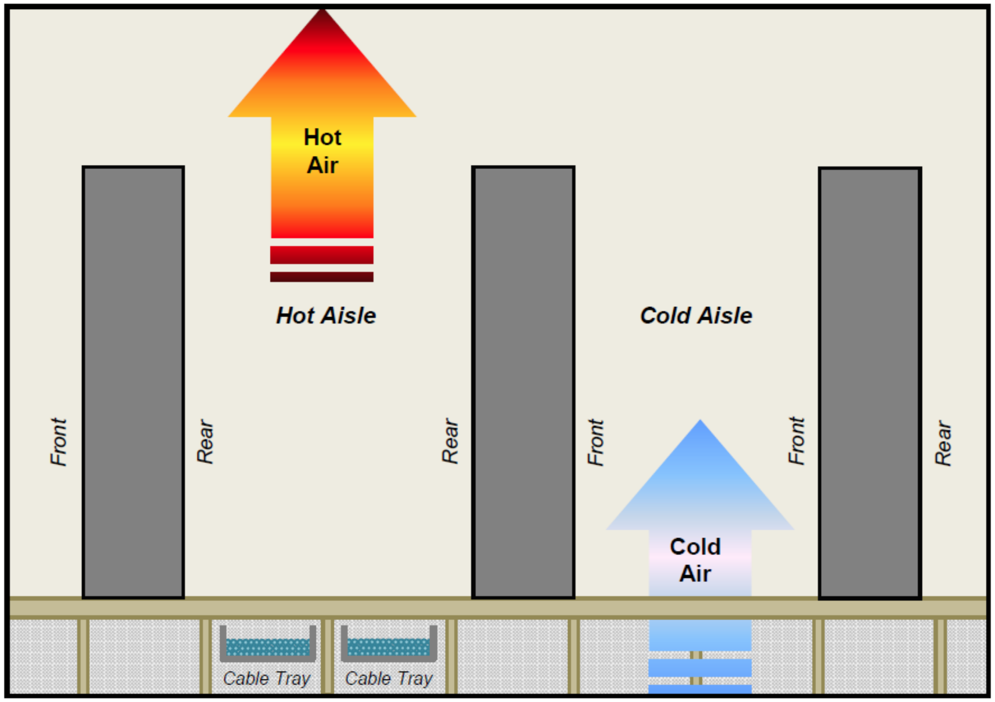


Hot Ailes Temps

The Hot Aisles IS SUPPOSED TO BE HOT

The perfect hot aisles temperature is the cold aisle temperature plus the delta T of the equipment. The delta T is the change in temperature from one end of the equipment to the other.

Low hot aisle temperatures are a sign of bypass airflow.

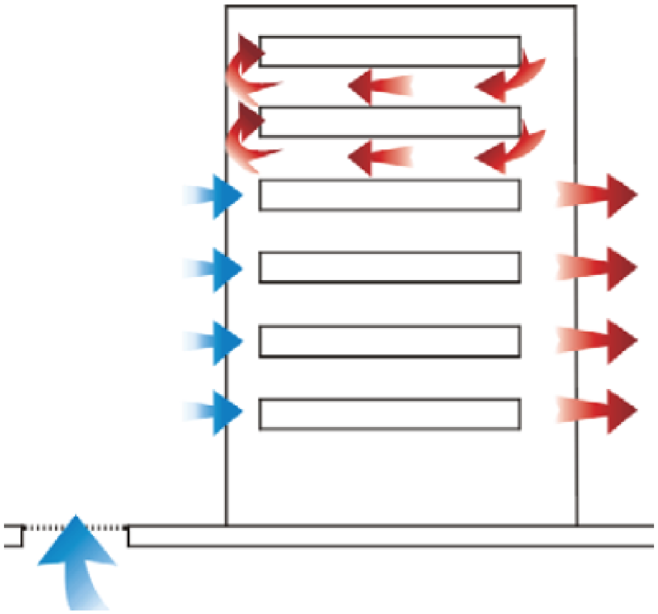


Cold Ailes Temps

Cold Aisles are NOT SUPPOSED TO BE "COLD"

Temperatures within standard range from 68-80 degrees, with custom equipment manufacturers such as Google going as high as 86 degrees

Higher cold aisle temperatures than supply temperatures from the CRAC are a sign of recirculated airflow.



CRAC/CRAH Return Temps

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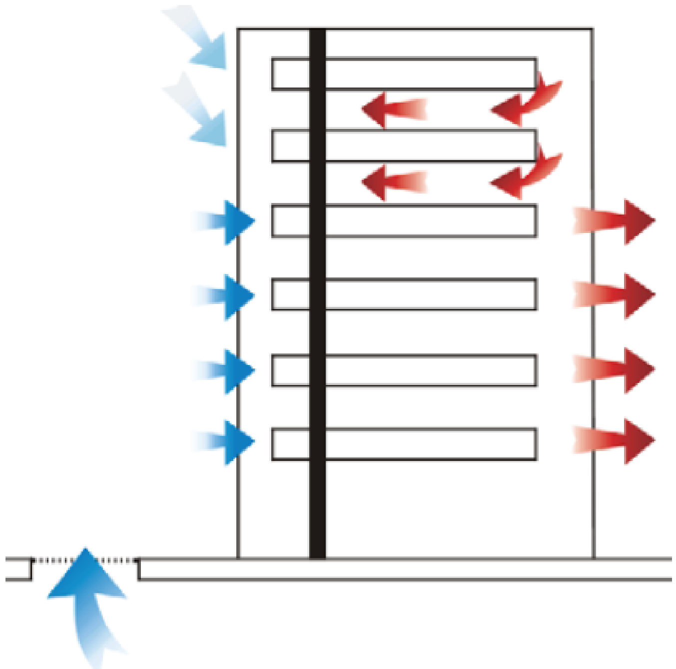


Ancillary Failures

Talk to your manufacturers and have expected failure and repair rates on equipment

Equipment well outside those rates may be overworked or over utilized due to poor configuration

Pumps, cooling tower emptying and refilling, etc.

How Problems Effect My Data Center

Equipment

- Mean Time Between Failure
- Mean Time To Repair
- Efficiency
- Lifecycle

CRAC/CRAH Equipment

- Mean Time Between Failure
- Mean Time To Repair
- Efficiency
- Lifecycle

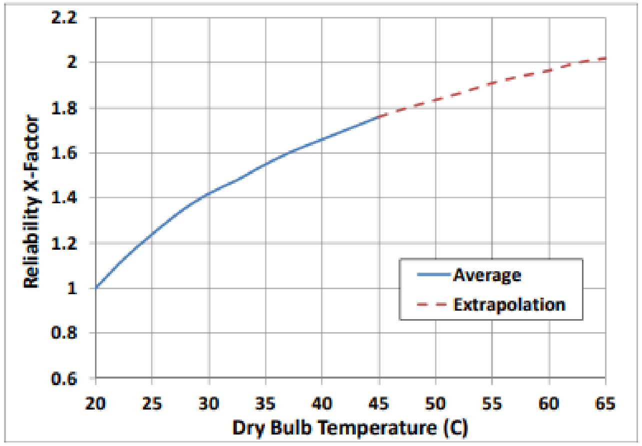
Ancillary Equipment

- Mean Time Between Failure
- Mean Time To Repair
- Efficiency
- Lifecycle

Mean Time To Repair

How long will it be down for?

Physical destruction of equipment via increased workloads tied to inefficiency has a large MTTR.

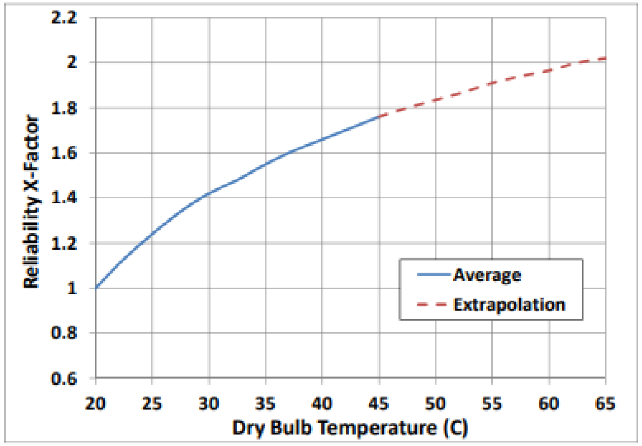


BICSI 002 B.8.2, ASHRAE 9.9

Mean Time Between Failure

How frequently will it be down?

Overworking equipment causes it to not only fail in a more spectacular fashion, but it also fails more frequently.

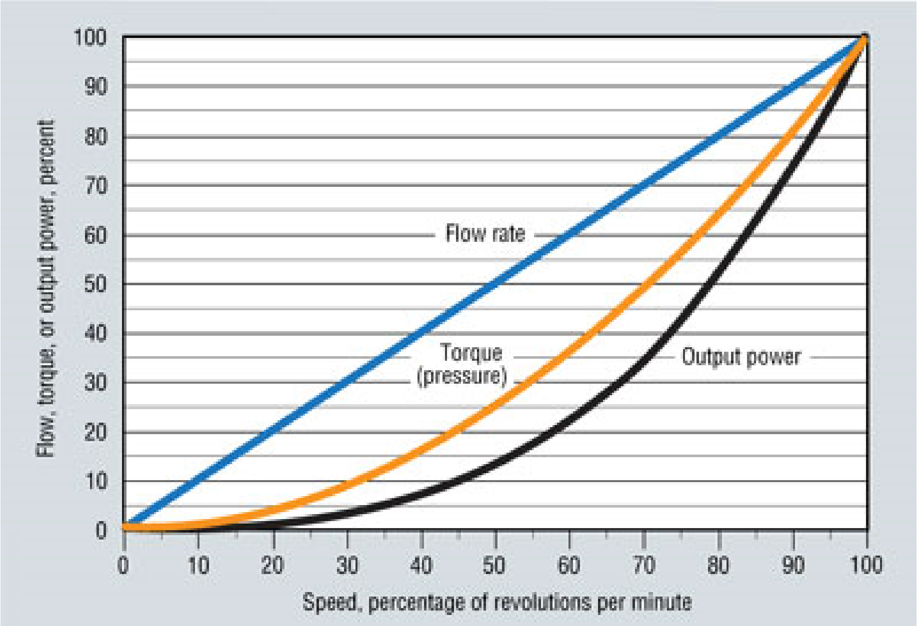


BICSI 002 6.6.3.4.1, 10.7.2.1, ASHRAE 9.9

Efficiency

Fans don't operate linear from power to speed, their relation is exponential.

Lower the fan speed even a small percentage can cut cost consumption of fans significantly.

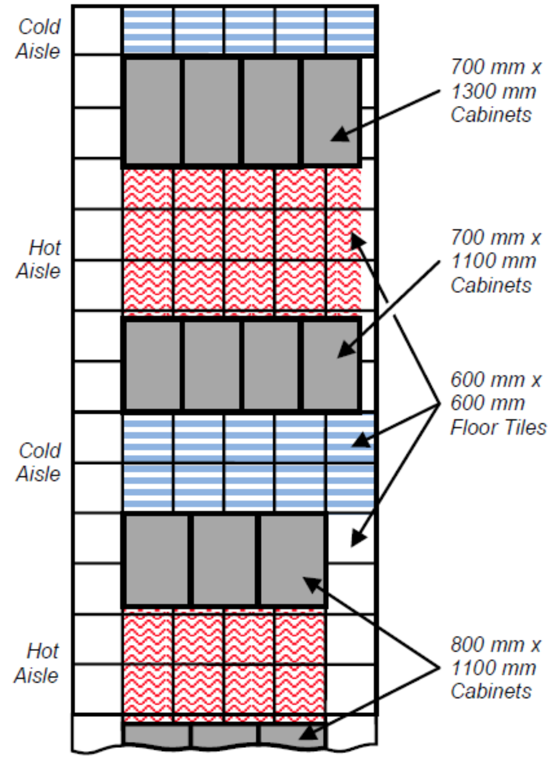


BICSI 002 6.6.3.4.1, 10.7.2.1, ebmpapst.com

Efficiency

Cooling at proper temperatures with proper containment will increase return temperatures maximizing the efficiency of the cooling system.

1% of increased efficiency for 1 degree of increased return temperature.



BICSI 002 6.6.3.4, ASHRAE TC 9.9

Lifecycle

Equipment X factor

In a perfect environment this X factor is manipulated to follow perfectly with equipment lifecycle

Dry Bulb Temperature (C)	Average Failure Rate X-Factor	Lower Bound of Failure Rate X-Factor	Upper Bound of Failure Rate X-Factor
15	0.72	0.72	0.72
17.5	0.87	0.80	0.95
20	1.00	0.88	1.14
22.5	1.13	0.96	1.31
25	1.24	1.04	1.43
27.5	1.34	1.12	1.54
30	1.42	1.19	1.63
32.5	1.48	1.27	1.69
35	1.55	1.35	1.74
37.5	1.61	1.43	1.78
40	1.66	1.51	1.81
42.5	1.71	1.59	1.83
45	1.76	1.67	1.84

BICSI 002 B.8.2

How To Solve This Problem

Equipment

- Internal Containment
- External Containment
- Monitoring

CRAC/CRAH Equipment

- External Containment
- Monitoring

Ancillary Equipment

- Monitoring

Equipment Internal Containment

A solid wall on the front of the rack separating the hot and cold side of the equipment

Blanking Panels

Air Dam around rails

Brush in cable openings

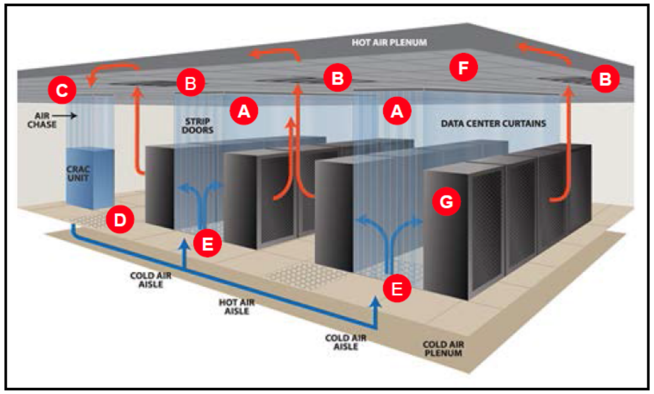
External Containment

Separate rooms or pathways for hot and cold air exist with no way for a transfer from one to the other

Hot Aisle Containment

Cold Aisle Containment

Chimney

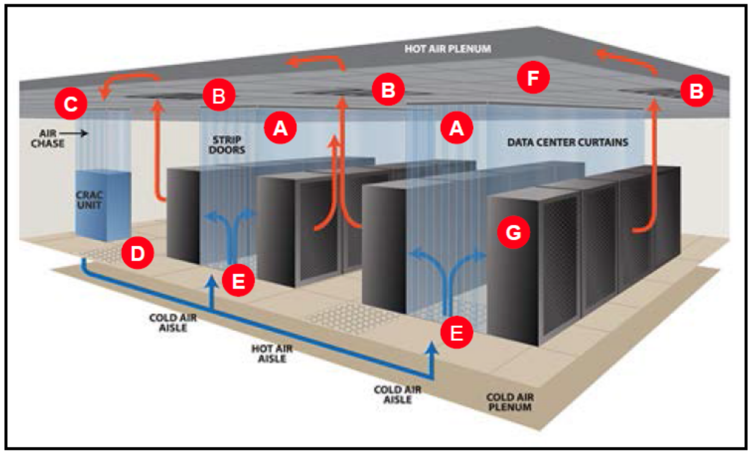


(Illustration courtesy of Tiesche Engineered systems)

External Containment With The CRAC/CRAH

Follow supply air and ensure the air doesn't exit to enter the hot aisle.

Follow the return air to the return of the equipment.



(Illustration courtesy of Tiesche Engineered systems)

Monitor Everything

You can't manage what you don't monitor!!!!!!!

Equipment sensors

CRAC sensors

Ancillary equipment sensors

Follow trending

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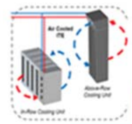

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Questions


THAT CONCLUDES MY TWO-HOUR PRESENTATION. ANY QUESTIONS?
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DID YOU INTEND THE PRESENTATION TO BE INCOMPREHENSIBLE, OR DO YOU HAVE SOME SORT OF RARE "POWERPOINT" DISABILITY?
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ARE THERE ANY QUESTIONS ABOUT THE CONTENT?
THERE WAS CONTENT?