AABC Commissioning Group

AIA Provider Number 50111116

Exploring ASHRAE 90.4P, Energy Standard for Data Centers & Telecommunications

CXENERGY1534

Jeff Sloan, P.E., McKinstry Co.

Wednesday, April 29

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Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

Agenda (and learning objectives):

1. How does an ANSI consensus standard, like ASHRAE 90.4, become a law?
2. What sort of electrical advances in data center efficiency are becoming popular?
3. What sort of advances in data center cooling efficiency are becoming popular?
4. What are some commissioning best practices for efficient and reliable data centers?

McKinstry
For The Life Of Your Building

Jeff Sloan

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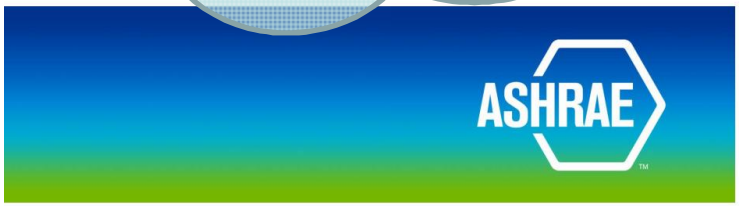
Definition of data center: A room or building, or portions thereof, with a primary function to house electronic equipment for the processing or storage of electronic data that has a design electronic data equipment power density exceeding 20 Watts/ft² of conditioned floor area (215 Watts/m2).



BSR/ASHRAE Standard 90.4P

First Public Review Draft

Energy Standard for Data Centers and Telecommunications Buildings

First Public Review (February 2015)
(Draft Shows Complete Proposed New Standard)

ASHRAE, 1791 Tullie Circle, NE, Atlanta GA 30329-23

90.4's Title, Purpose and Scope:

TITLE: Energy Standard for Data Centers and Telecommunications Buildings

PURPOSE: The purpose of this standard is to establish the minimum energy efficiency requirements of Data Centers and Telecommunications Buildings, for:

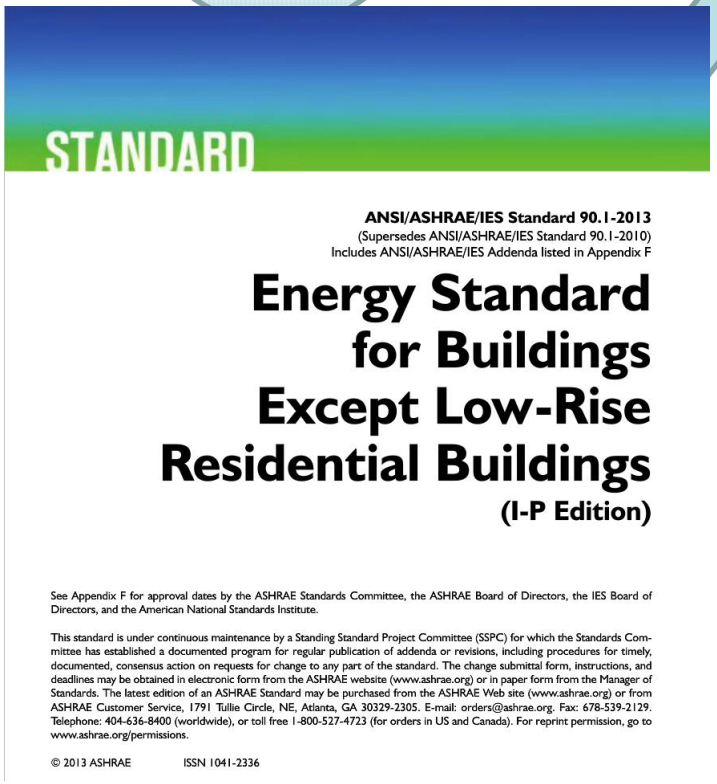
a. design, construction, and a plan for operation and maintenance, and
b. utilization of on-site, or off-site renewable energy resources

SCOPE: This Standard applies to:

a. new Data Centers and Telecommunications Buildings or portions thereof and their systems,
b. new additions to Data Centers and Telecommunications Buildings or portions thereof and their systems, and
c. modifications to systems and equipment in existing Data Centers and Telecommunications Buildings or portions thereof

Why have another Energy Code for data centersé

Definition of computer room: *A room whose primary function is to house equipment for the processing and storage of electronic data and that has a design electronic data equipment power density exceeding* ***20 Watts/ft²*** *of conditioned floor area (215 Watts/m²).*



é doesnôt Standard 90.1 cover that?

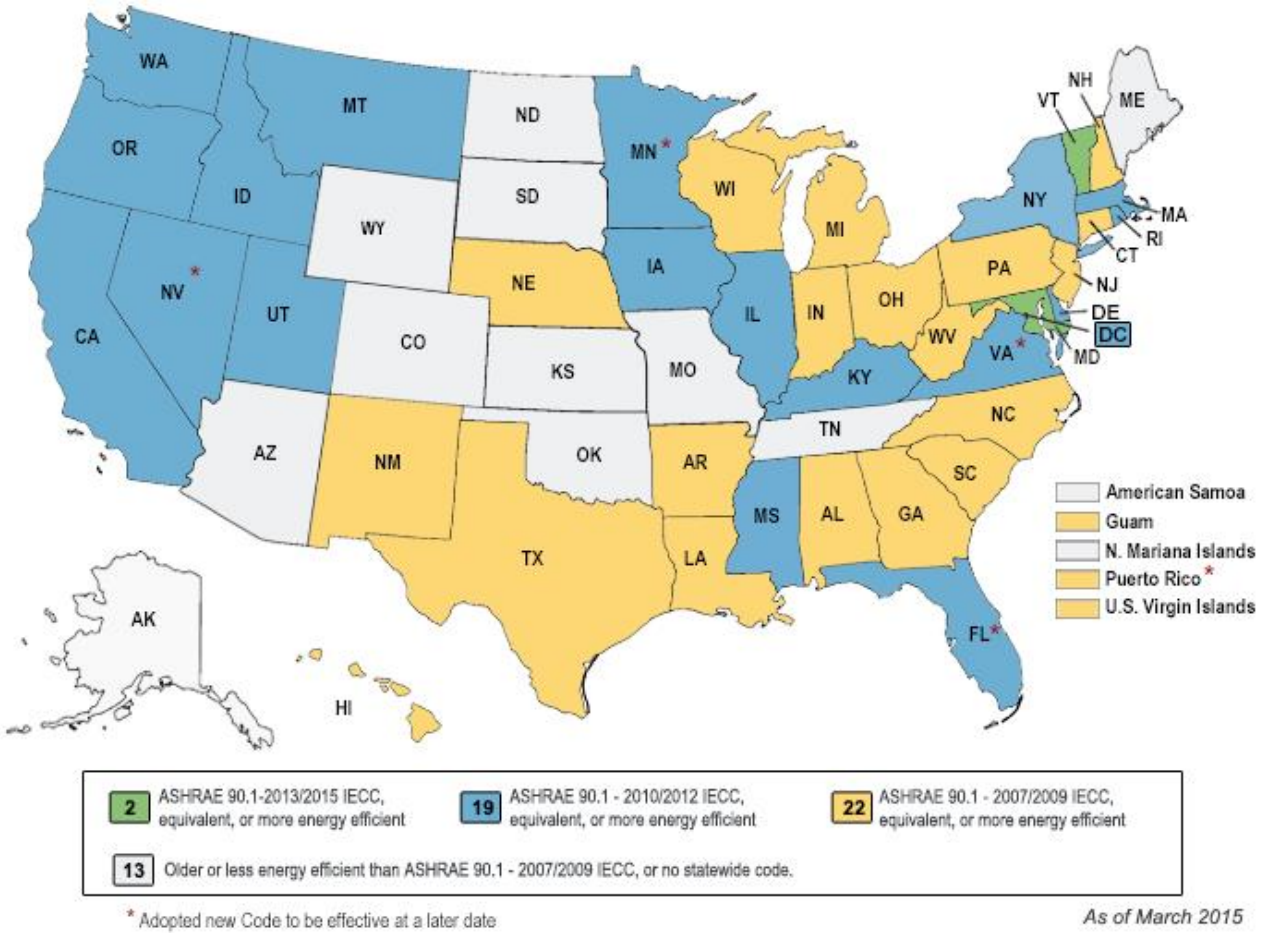
HISTORY- Standards Project Committee (SPC) 90.4P was created as a result of industry disagreements over newly published requirements in Standard 90.1 related to computer rooms and data centers. The intended purpose of the 90.4 Standard was to create a performance based approach that would be more flexible and accommodating of innovative changes which rapidly occur in the data center design, construction, and operations.

How does a proposed standard qualify to be an ANSI standard?

1. Consensus by a group that is open to representatives from all interested parties
2. Broad-based public review and comment on draft standards
3. Consideration of and response to comments
4. Incorporation of submitted changes that meet the same consensus requirements into a draft standard
5. Availability of an appeal by any participant alleging that these principles were not respected during the standards-development process.

How does an ANSI energy standard become law?

Answer: adoption by a jurisdictionôs authority.

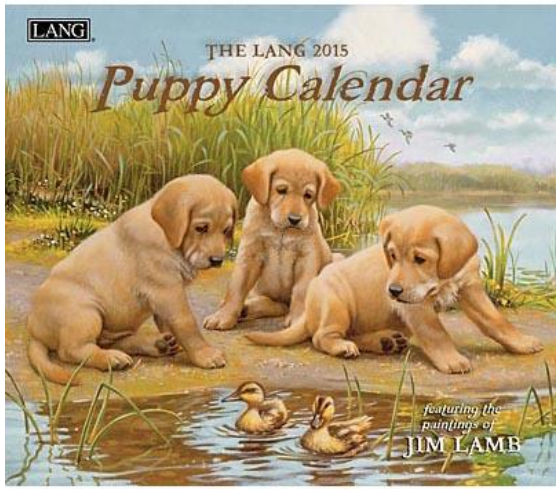


How stringent is the proposed 90.4 standard, out of the gate?

This is a performance standard, so it can be compared to the 90.1-2013 section 6.6 ñ*Alternate compliance Path*ò

Climate Zone	Representative City	ASHRAE 90.4 Electrical Efficiency Component	ASHRAE 90.4 Annualized Mechanical Efficiency Component	90.4 Resulting overall maximum annualized PUE_1	ASHRAE 90.1 Alternate 6.6 Path PUE values
1A	Miami	62%	0.36	1.74	1.61
2A	Houston	62%	0.35	1.73	1.49
3A	Atlanta	62%	0.33	1.71	1.41
4A	Baltimore	62%	0.33	1.71	1.36
5A	Chicago	62%	0.33	1.71	1.36
6A	Minneapolis	62%	0.32	1.70	1.34
1B		62%			1.53
2B	Phoenix	62%	0.36	1.74	1.45
3B	Las Vegas	62%	0.36	1.74	1.42
3B - Coast	Los Angeles	62%	0.32	1.70	1.42
4B	Albequerque	62%	0.35	1.73	1.38
5B	Boise	62%	0.33	1.71	1.33
6B	Helena	62%	0.34	1.72	1.33
3C	San Francisco	62%	0.32	1.70	1.39
4C	Seattle	62%	0.32	1.70	1.38
5C		62%			1.36
7	Duluth	62%	0.32	1.70	1.32
8	Fairbanks	62%	0.32	1.70	1.3

When is the next 90.4 public review likely?



2015

January							February							March							April						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
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May							June							July							August						
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September							October							November							December						
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27	28	29	30				25	26	27	28	29	30	31	29	30						27	28	29	30	31		

Likely starting July,
for 45 day period.

To receive notification, Contact:

Bert Etheredge, ASHRAE

BEtheredge@ashrae.org

What sort of electrical advances in data center efficiency are becoming popular ?

1. Higher efficiency UPS modules with overall efficiencies ~ 96% across load spectrum, without bypassing UPS

2. Very high efficiencies ~99% with UPS modules that can automatically bypass the double-conversion process

3. Avoidance of PDU transformers entirely, with 400Y230 distribution. Serversôpower supplies are more efficient, at higher input voltages, wire sizes slightly smaller

4. LED lighting, more reflective surfaces

What sort of advances in data center cooling efficiency are becoming popular ?

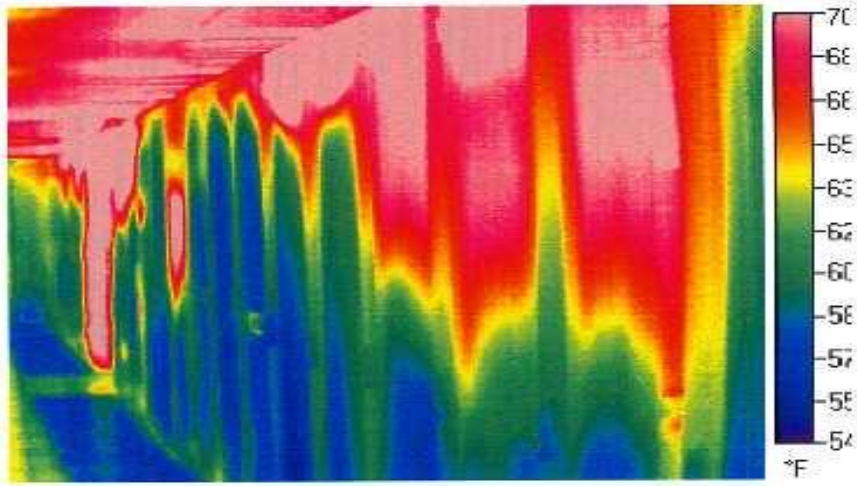
1. Combinations of containment and economizer do save refrigeration energy and can also reduce tonnage (infrastructure cost)

2. Battery containment can provide the same benefits, in the UPS room.

How does containment help cool data centers?

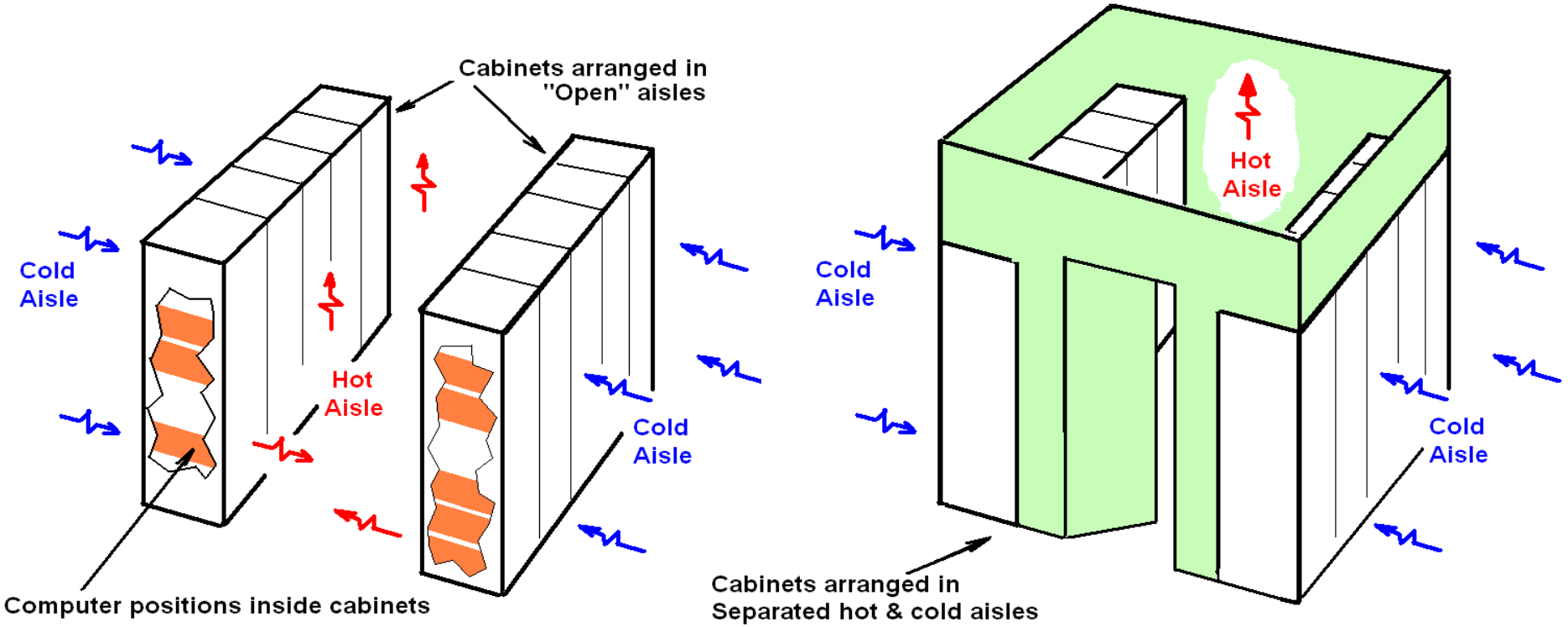
1. Traditional raised-floor or overhead ducted supply air doesn't lead to uniform temperature or relative humidity entering the IT equipment, see thermagraph below.

2. As a result, designers and operators often reduce supply air temperature. That harms economizer performance and reduces potential economizer savings.



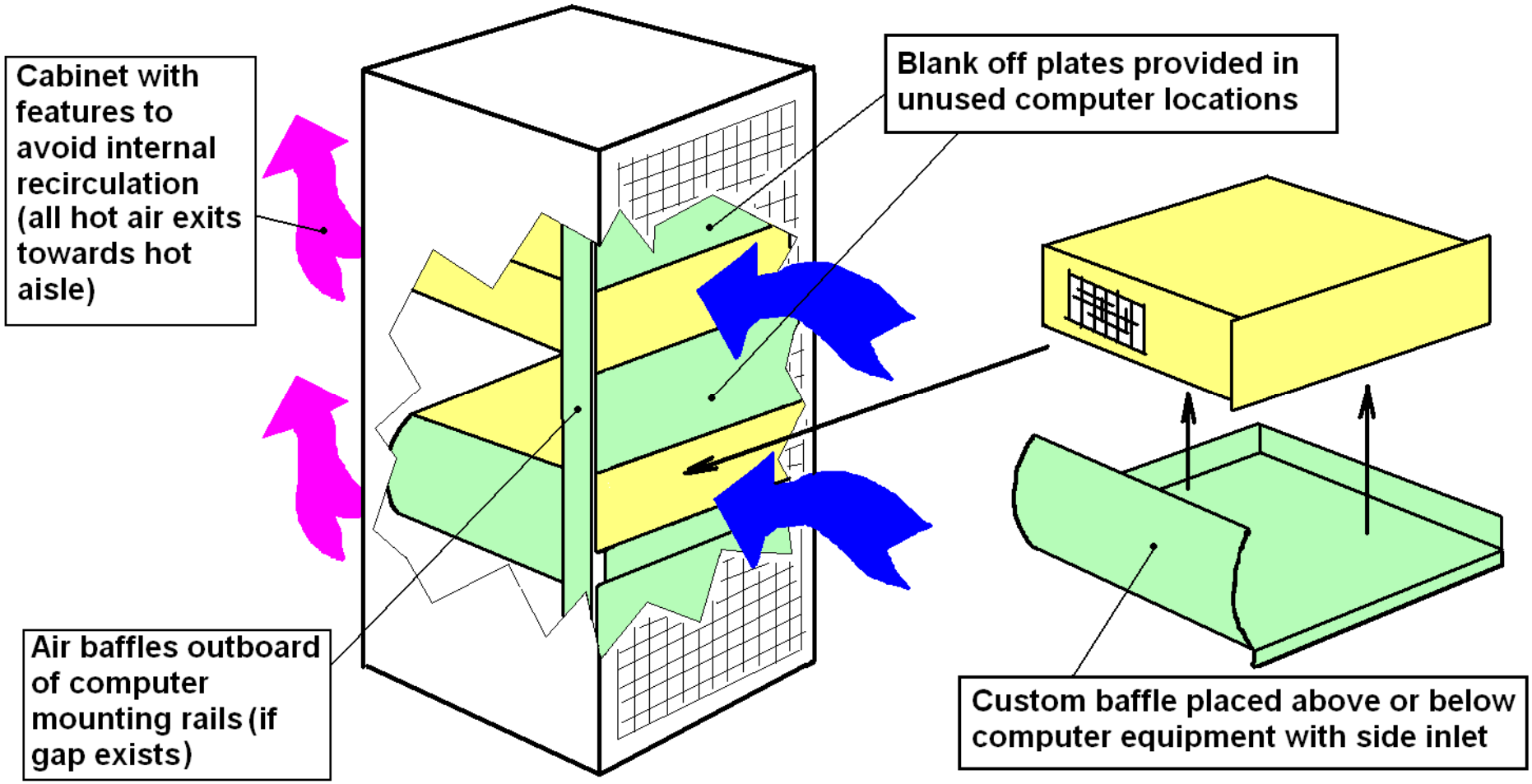
What does it take; to implement containment to save data center energy?

A continuous barrier between cool supply air and warm return air, all the way to the air handler. Commonly, a t-bar ceiling is suspended in the data center; then hot aisle containment (shown green, here) reaches up to the ceiling. Also, some method to reduce fan airflow to maintain a ñear-zeroòpressure across the containment.



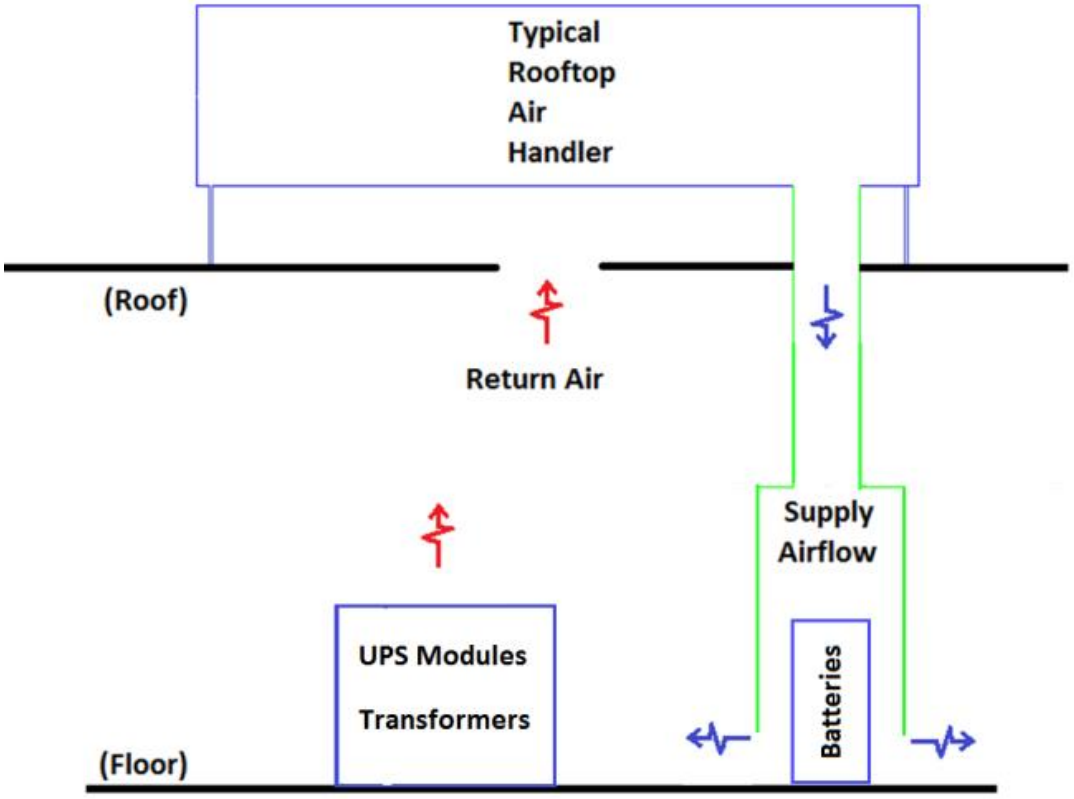
What does it take, to implement containment to save data center energy?

It is also necessary to continue this containment barrier (still shown green) inside the cabinet, too!



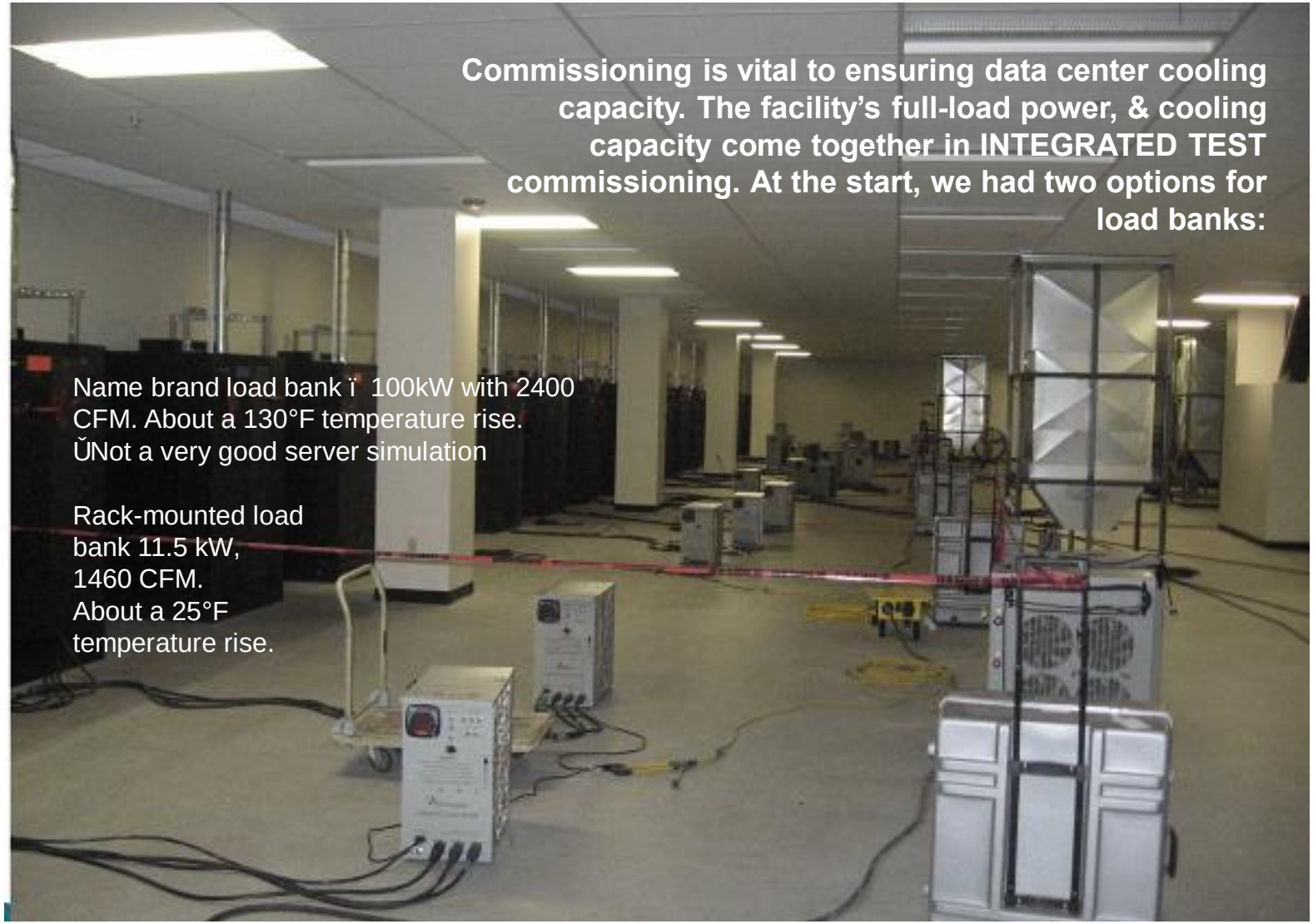
Similar savings are possible in UPS rooms with batteries:

Containment can be used with VAV cooling to supply air at the battery temperature of 75°F, while achieving a room temperature of 85°F or more.



UPS room battery cabinet containment (shown in green, here) can be achieved with hanging plastic ñfreezer curtainò strips.

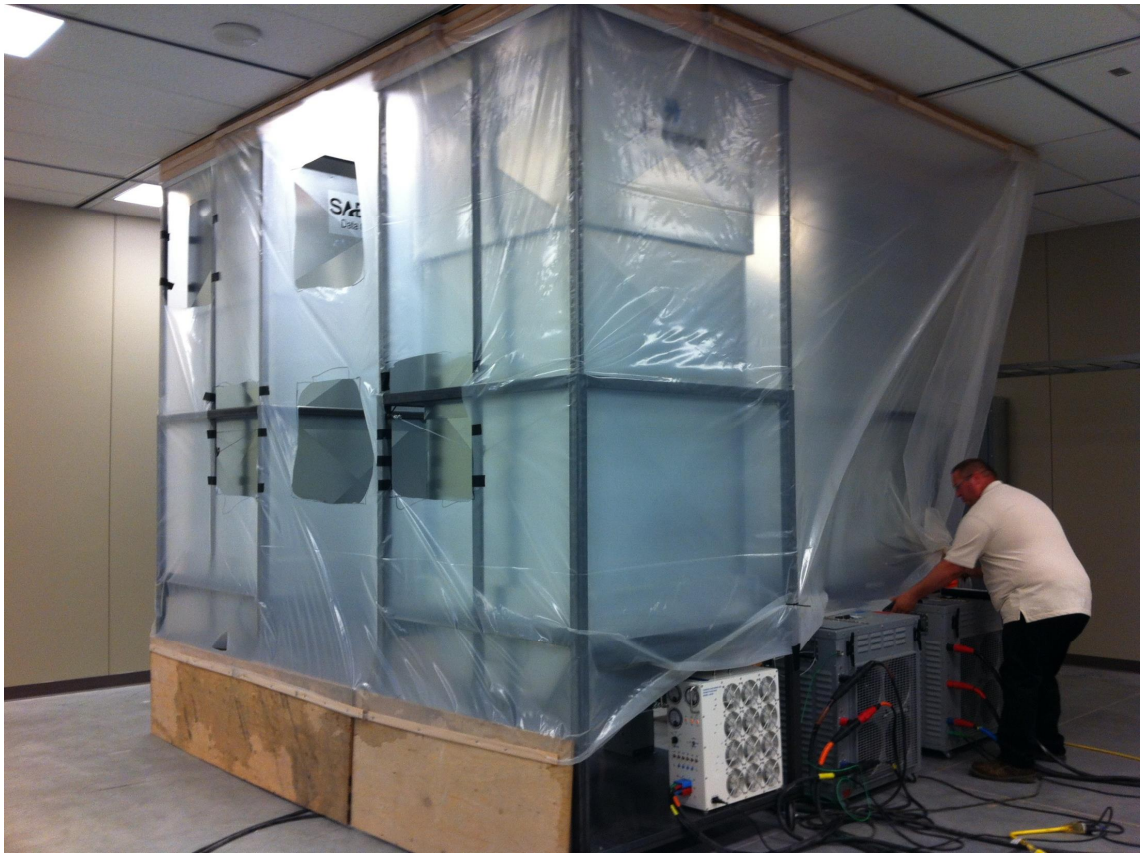
What are best practices to commission these energy-saving features:



What are best practices to commission these energy-saving features:

Commissioning is vital to ensuring data center cooling capacity. The facilityôs full-load power, & cooling capacity come together in INTEGRATED TEST commissioning.

Here is an early attempt to produce uniform return air temperature for this test:



At the Sabey Data Center (in Quincy WA);

These patented ñfan cartsòare now the standard method for integrated testing

The latest-version fan carts can readily produce the desired test AIRFLOW, with the desired test WATTAGE, using the facilities distributed 208V or 240V distributed power.

Other uses for these fan carts:
PUE prediction at multiple loading conditions
Simulation of high density cabinets
Sabey QC3B example ï 37kW racks
Uneven load testing
Airflow prediction ï spot testing

LEARN MORE AT energystar.gov

ENERGY STAR® Data Verification Checklist for Certification

100

ENERGY STAR ® Score[1]

Intergate Quincy, Building C

Primary Function: Data Center
Gross Floor Area (ft²): 139,518
Built: 2011

For Year Ending: 02/28/2015[2]
Date Application Becomes Ineligible: 06/28/2015

1. Score is on a scale of 1-100. Application must be submitted to EPA within 4 months of the Year Ending Date. Award is not final until
2. The ENERGY STAR Score is based on total source energy. A score of 75 is the minimum to be eligible for the ENERGY STAR.

Please use the *Licensed Professional's Guide to the ENERGY STAR ® fo Buildings* for reference in completing this checklist (http://www.energystar.gov/ia/business/evaluate_performance/pm_lp_guide.pdf).

As evidence of successful commissioning, the data center (now fully leased) has earned the highest national operating efficiency rating for the data center category!

Property & Contact Information

Property Address	Property Owner	Primary Contact
Intergate Quincy, Building C 2200 M Street NE Quincy, Washington 98848	Sabey Data Center Properties LLC 12201 Tukwila International Blvd 4th Floor Seattle, WA 98168 206-281-8700	John Sasser 12201 Tukwila International Blvd 4th Floor Seattle, WA 98168 206-277-5302 johnsas@sabey.com

Property ID: 4147797

1. Review of Whole Property Characteristics

Basic Property Information

This concludes The American Institute of Architects
Continuing Education Systems Course

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