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Active member of:

- **ASHRAE TC9.9** "*Mission Critical Facilities, Technology Spaces, & Electronic Equipment*"
- **ASHRAE SPC90.4** "*Energy Standard for Data Centers & Telecommunications Buildings*"
- **ASHRAE GPC-1.2** "*The Commissioning Process for Existing Buildings*"
- **ASHRAE SPC-127** "*Method of Testing for Rating Computer Room & Data Processing Room Unitary Air Conditioners*".

Terry is a Vice President with Primary Integration Solutions, Inc. and has over 30 years of progressive experience in Critical Facilities operations and management. Terry is a regular contributing writer for Mission Critical Magazine which publishes his bi-monthly column called *Sustainable Operations*. He has performed over 40 data center assessments in 20 countries and 5 continents over the last three years.

PI is an industry certified, independent 3rd party commissioning and facilities management consulting firm offering complete services from initial planning stages to design, through construction and ongoing operations of mission critical facilities.

- ANSI/ASHRAE Standards
- Brief History of ASHRAE Energy Standards
 - ASHRAE Std 90.1
 - ASHRAE Std 90.4
- What's Addressed (and What's Not)
- Why Should We Care
- When Will It Matter
- What Should You Do
 - Public Review & Comments
 - Plan for the Future (Compliance)

ANSI & ASHRAE Standards

- ANSI = American National Standards Institute
 - Founded in 1918
 - Facilitates development of American National Standards (ANS) by “Standards Developing Organizations” (SDOs)
 - ANSI accredits SDOs by auditing compliance with the *ANSI Essential Requirements: Due Process Requirements for ANS*
 - ANSI accredits proposed standards to be an ANS by auditing compliance:
 - Consensus by representatives from materially affected & interested parties
 - Standards are required to undergo public review and comments
 - Comments must be responded to in good faith
 - An appeals process is required

ANSI & ASHRAE Standards

- ASHRAE = American Society of Heating, Refrigeration & Air-Conditioning Engineers
 - Founded in 1894
 - “Global society advancing human well-being through sustainable technology for the built environment.”
 - Focus on building systems, energy efficiency, IAQ, refrigeration & sustainability
 - Sponsors and funds research, writes standards & guidelines, and promotes industry best practices through publications and continuing education
- ASHRAE is an ANSI accredited “Standards Developing Organization”
- ASHRAE develops “Standards” & “Guidelines”

ANSI & ASHRAE Standards

ASHRAE has many committees and sub-committees:

- TC = Technical Committee
- GPC = Guideline Project Committee
 - Guidelines are not standards – they are recommendations
- SPC = Standard Project Committee
 - Standards are written in “mandatory” and “code-intended” language suitable for incorporation into state/local code and enforceable by AHJs
- SSPC = Standing Standard Project Committee
 - Standards that are under “continual maintenance”
 - Can be modified at anytime by incorporation of addendums
 - Are periodically republished in their entirety (typ. every 3 years)

ANSI & ASHRAE Standards

- ASHRAE has Technical Committees (TC) associated with Mission Critical Facilities:
 - TC-9.9 Mission Critical Facilities, Data Centers, Technology Spaces & Electronic Equipment
 - Datacom Book Series, “Thermal Guidelines”, White Papers, etc.
 - TC-7.9 Building Commissioning
 - Guideline 0-2013 “The Commissioning Process”
 - Guideline 1.1-2007 “HVAC&R Technical Requirements for the Commissioning Process”
 - Proposed guideline (GPC) 1.2 “Technical Requirements for the Commissioning Process for Existing HVAC&R Systems and Assemblies”

ANSI & ASHRAE Standards

- ASHRAE also has Project Committees affecting Mission Critical Facilities:
 - SSPC-62.1 “Ventilation for Acceptable IAQ”
 - SPC-189.1 “Standard for the Design of High Performance Green Buildings”
 - SPC-127 “Method of Testing for Rating Air Conditioning Units Serving Data Center & Other Information Technology Equipment Spaces”
 - SSPC-90.1 “Energy Standard for Buildings Except Low-Rise Residential Buildings”
 - SPC-90.4P (Proposed) “Energy Standard for Data Centers”

History of ASHRAE Energy Standards

- Original standard 90.1 was published in 1975
- Revised and re-published in 1980, 1989, and 1999
- Placed into “continuous maintenance” in 1999
 - Updated several times each year by publication of approved addenda
 - Starting in 2001 published in its entirety in the fall of every 3 years (2004, 2007, 2010, 2013, etc...)
 - Had explicit exemptions for
 - Telephone Exchanges
 - Essential Facilities
 - Data Centers

History of ASHRAE Energy Standards

- ASHRAE 90.1-2010 included significant changes:
 - Goal to reduce energy cost by 30% compared to the 2004 version
 - Scope expanded so 90.1 “...could cover receptacles and process loads (e.g. data centers).”
 - Required higher equipment efficiencies, energy recovery in more applications, and “economizers are required in more climates, and more energy-conserving controls...”

History of ASHRAE Energy Standards

- TC9.9 and many data center owners, operators, designers, suppliers, and vendors objected amid concern that forcing data centers to comply with 90.1 would negatively impact:
 - Reliability (esp. due to risks associated with economizers)
 - Innovation (due to “prescriptive” requirements)
 - Costs (esp. for retrofits, expansions, and up-fits in existing facilities)
 - Installing even small data centers or computer rooms could trigger requirement to add economizers (air or water) to existing facilities
 - Applies to Hi-Rises, CRAHs/CRACs, etc.

History of ASHRAE Energy Standards

- TC9.9 formed working group to provide input and recommendation to SSPC-90.1 to mitigate data center industry concerns
- Various data center owners wrote letters of concern to ASHRAE Board of Directors
- TC9.9 submitted a letter challenging that SSPC-90.1 failed to follow ANSI processes and procedures required of Standards Developing Organizations (basically challenging the ANSI accreditation of 90.1)
- ASHRAE Board of Directors voted to approve creation of SPC-90.4 to draft an energy standard specifically for data centers with intent to extract data centers out of 90.1
 - SPC-90.4 was established in 2012
 - ASHRAE Std 90.1 will continue to cover data centers until ASHRAE Std 90.4 is approved
 - Std 90.4 will defer to Std 90.1 for typical office bldg aspects of data center buildings (envelope, lighting, office space, breakrooms, etc.)

Recent History of ASHRAE Energy Standards

- ASHRAE 90.1-2013 allowed for a “performance” compliance path (vs “prescriptive”) based on a maximum PUE
- SPC-90.4 began drafting the proposed Std 90.4P
 - Chair of SPC-90.4 committee is previous president of ASHRAE (Ron Jarnagin)
 - SPC-90.4 committee includes members of TC9.9, SPC-127, SSPC 90.1 Mechanical Subcommittee, NREL, and recognized data center industry experts (A&Es, GCs, vendors, etc.)

Current Status of Std 90.4 Energy Standard for Data Centers

- SPC-90.4 has held well over a dozen meetings (face-to-face and conference calls) since January 2013
 - Initial draft released for first “public review” on 2/15/2015 through 3/30/2015
 - Over 660 comments received
 - All comments were responded to and vast majority were incorporated or otherwise resolved in revised draft
 - Few comments were “rejected” (less than 10) such as:
 - 90.4 not needed – defer to 90.1
 - Limit 90.4 to mechanical systems only
 - Revised draft has been submitted to ASHRAE for approval to release for 2nd public review
 - **Goal is to have Std 90.4 approved as an American National Standard (ANS) by end of 2015**

What's Addressed & What's Not

- Organization of 90.4 mirrors 90.1 for ease of use and understandability esp. considering the two are intended to be used concurrently
- Most important section is Title, Purpose & Scope
 - “Telecommunications” was removed from original title
 - “The purpose...to establish the minimum energy efficiency requirements of data centers for:
 - Design, construction, and a plan for operation & maintenance
 - Utilization of on-site, or off-site renewable energy resources

What's Addressed & What's Not

- Most important section is Title, Purpose & Scope
 - The standard applies to (scope):
 - New data centers or portions thereof and their systems
 - New additions to data centers or portions thereof and their systems
 - Modifications to systems and equipment in existing data centers or portions thereof

What's Addressed & What's Not

The standard does NOT apply to:

- Telephone Exchanges (i.e., Telco Facilities)
- Essential Facilities:
 - Hospitals, fire, rescue, police
 - Earthquake, hurricane, & emergency shelters
 - Designated facilities required for emergency response
 - Power-generation, transmission, communication & other public utility facilities required as backup for other essential facilities
 - Structures containing highly toxic materials (above minimum quantities)
 - Aviation/air traffic control towers
 - Buildings/structures having critical national defense functions

What's Addressed & What's Not

You may think your data center is essential based on your mission (banks, insurance corps, commercial enterprise, etc.),

And, your data center may be essential to the survival of your business, organization, institution, etc.,

But, unless you are already exempt from Std 90.1 you will NOT be considered essential per the strict interpretation and you must comply!

What's Addressed & What's Not

Std 90.4 Table of Contents:

- Forward
- 1) Purpose
- 2) Scope
- 3) Definitions – (Very Important!)
- 4) Administration & Enforcement
- 5) Building Envelope*
- 6) Heating, Ventilation, and Air Conditioning
- 7) Service Water Heating*
- 8) Electrical
- 9) Lighting*
- 10) Other Equipment*
- 11) Guide to Compliance
- 12) Normative References – (compliance through references)
- Informative Appendix A - (references for convenience of users & acknowledge source documents)
- Informative Appendix B - (minimum electrical efficiency component & sample calculations)

* Denotes sections that refer back to Std 90.1

Why Should We Care?

- Most states adopt Std 90.1 through legislation directly or through incorporation of the IBC (which requires compliance with 90.1) as building code and enforces via Authorities Having Jurisdiction (AHJs)
- The data center industry has never had to comply with a “minimum energy efficiency” standard prior to ASHRAE 90.1-2010
- Compliance trumps
 - Reliability
 - Cost considerations
 - Can stifle innovation
- Most new “Greenfields” will easily exceed the minimum energy requirements, but impact on upgrades, expansions, and renovations of existing facilities could impact justification and in some cases may not even be feasible

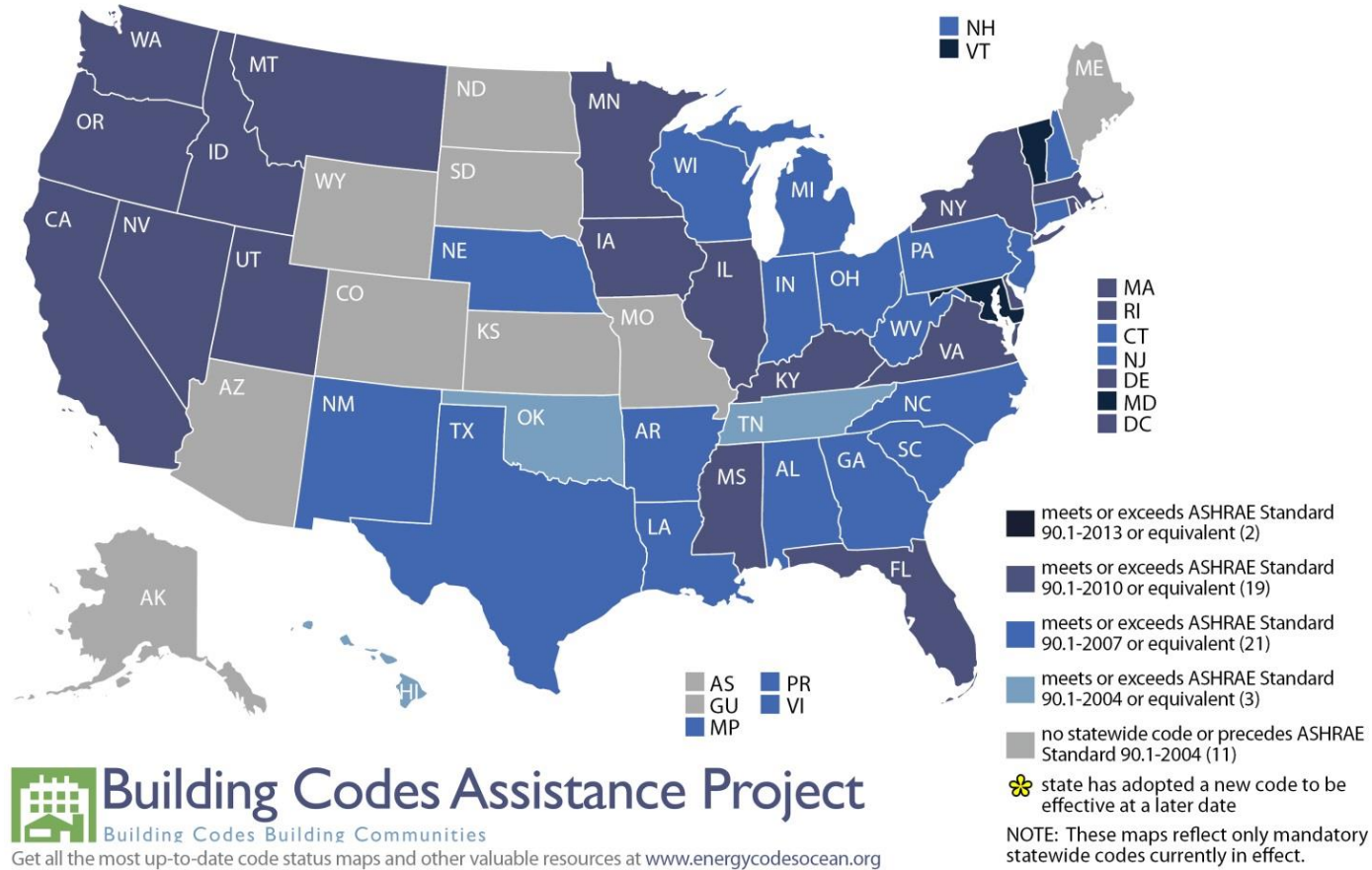
When Will it Matter?

- Most states lag behind in adopting new versions of standards including 90.1
- As of July 1, 2015:
 - 2 states use 90.1-2013 (Vermont and Maryland)
 - 19 states use 90.1-2010
 - 21 states use 90.1-2007 (**including NC & SC**)
 - 3 states use 90.1-2004
 - 11 states have no state code or one that precedes 90.1-2004
- Many states update their codes on a three (3) year cycle so many of those currently using 90.1-2007 (**including NC and SC**) could adopt 90.1-2010 in 2016!

When Will it Matter?

Commercial State Energy Code Status

AS OF JULY 1, 2015



 **Building Codes Assistance Project**
Building Codes Building Communities
Get all the most up-to-date code status maps and other valuable resources at www.energycodesocean.org

What Should You Do?

- Get familiar with Std 90.1 as well as proposed Std 90.4
- Consult with your Engineer-of-Record to determine what facilities, projects, expansions, etc. may be impacted and how
- Consult with your local Building Inspectors and Design Review Boards to understand what standards are in place today, and when they are scheduled to be updated
- Sign-up for ASHRAE electronic notification that Std 90.4P will be released for public review and submit comments and concerns

ASHRAE Standard 90.4
Energy Standard for Data Centers

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