



ASHRAE Y SU CONTRIBUCIÓN A LA INDUSTRIA DATA CENTER MUNDIAL

Laura Sánchez Ruiz

Tesorera y miembro BOG de ASHRAE Spain Chapter

MADRID
30 de Octubre 2023

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MISIÓN

Servir a la humanidad haciendo progresar las artes y las ciencias en materia de aire acondicionado, calefacción, ventilación, refrigeración e industrias asociadas.

VISIÓN

Entornos construidos saludables y sostenibles para todos.



CLAVES DE ASHRAE EN LA INDUSTRIA DATA CENTER

Desde el nacimiento de Internet

+25 años contribuyendo técnicamente e investigando para estar a la vanguardia

Tendencia en determinados criterios y bases para el diseño y la operación

Conjunción: IT – Infraestructura

Más allá HVAC → Energía, electricidad, comunicaciones...

Guía de referencia para datos y criterios de cálculo como UPTIME INSTITUTE

CON UN OBJETIVO

Ser reconocido como una asociación técnica

IMPARCIAL

líder en HVAC aportando conocimiento técnico en la
industria de DATA CENTERS.

Cientos de artículos, papers y trabajos de Investigación

ASHRAE Research Project Report

RP-1487

THE DEVELOPMENT OF SIMPLIFIED RACK BOUNDARY CONDITIONS FOR NUMERICAL DATA CENTER MODELS

Submission: February 2012
Approval: February 2012r

Contractor: University of Colorado
428 UCB, Room EOCCE 441
Boulder, CO 80309-0428

Principal Investigator: John Zhai

Authors: Knud Hermansen, University of Colorado
Salah Al-Saadi, University of Colorado

Sponsoring Committee: TC 4.10, Indoor Environmental Modeling

 Shaping Tomorrow's
Built Environment Today

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DATA CENTER

Column

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Standards 90.1 and 90.4

Meeting Data Center Energy Compliance

by DAVID GILKE, P.E., MEMBER ASHRAE

Data centers are unique among commercial buildings because a specific energy standard dedicated to this classification of building. In response to industry requests, I developed and published ANSI/ASHRAE Standard 90.4, *Energy Standard for Data Centers*, in 2016 to create new methods and metrics for demonstrating energy compliance for data center system designs. This column examines some of the platform complexities associated with Standard 90.4 and Standard 90.1.

Both ANSI/ASHRAE Standards 90.1, *Energy Efficiency for Low-Rise Residential Buildings*, and 90.4, *Energy Standard for Data Centers*, rely heavily on means of demonstrating compliance since data centers in the 2010 edition. (For details see the 2010 edition of ASHRAE Standard 90.1 Reference 1.) Standard 90.1-2010 used the Ratio effectiveness (PUE) metric to demonstrate; however, that metric was developed utilizing methods of measurement, not design, as data center's being operational. As of the 2013 Standard 90.1, Standard 90.1 is directly tied as an alternative compliance path, allowing loads to be adopted by code (International Mechanical Code [IMC]) and referenced within the International Energy Conservation Code (IECC). The 2016 (for earlier) versions of the standards live in most U.S. jurisdictions, both the 2016 versions are discussed and compared here.²

Compliance Paths with Standard 90.1

Standard 90.1-2016 lists several compliance paths. Per paragraph 6.2.1, Compliance, all projects must show compliance with Sections 6.2, General; 6.7, Submittals; 6.8, Minimum Equipment Efficiency Tables; and one of the following:

- Section 6.3, Simplified Approach Option of HVAC Systems;
- Section 6.4, Mandatory Provisions and 6.5, Prescriptive Paths;
- Section 6.4, Mandatory Provisions and 6.6, Alternative Compliance Path.

Among the above options, Section 6.5, Prescriptive Path, Paragraph 6.5.3 Economizers, is a prescriptive path that has introduced new challenges to many designers and has often been avoided to minimize operational risk experienced from consumers.³ This topic has been discussed by experts in the data center industry

TECHNICAL FEATURE

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Alternative Water Cooling Sources for Data Centers

by JOHN TROSTEN, P.E., MEMBER ASHRAE

With the expansion of cloud computing and growing demands for online services, the number of data centers continues to increase worldwide. As the need for energy to support these data centers rises, the need to find and use efficient cooling sources will also increase. Generating cooling on site using electricity from power plants is less efficient than planning ahead and using more localized cooling sources. To reach the energy saving goals, designers need to broaden their choices to find the most beneficial options available. Using our natural resources in a more direct way can bypass inefficient cooling steps.

The first deep lake water cooling system in the U.S. started in 2000 in Ilwaco, N.Y., and serves over 70 MW of cooling. This system is premixed here for lake water use. A data center in Ilwaco, Finland, is reviewed for using seawater. The potential efficiencies, comparisons of savings of equipment and other advantages and disadvantages are also illustrated. For data centers and other critical facilities, the additional requirement to meet higher reliability standards will also be evaluated.

Water Sources: Rivers, Lakes, Oceans

Water is the best medium for moving and rejecting heat for most cooling and heat transfer applications. Moving heat out of a data center is no different in this regard and getting water closer to the heat source improves the efficiency of the overall facility.¹ Water can move more heat per unit (gallons or liters) than most other liquids, and is far more efficient than air systems.

John Trosten, P.E., is a mission-critical program manager at ASHRAE and a member of ASHRAE TC 9.3R, Mission Critical Facilities, Data Centers, Telephony Space and Electrical Equipment.

ASHRAE JOURNAL | ashrae.org | JANUARY 2012

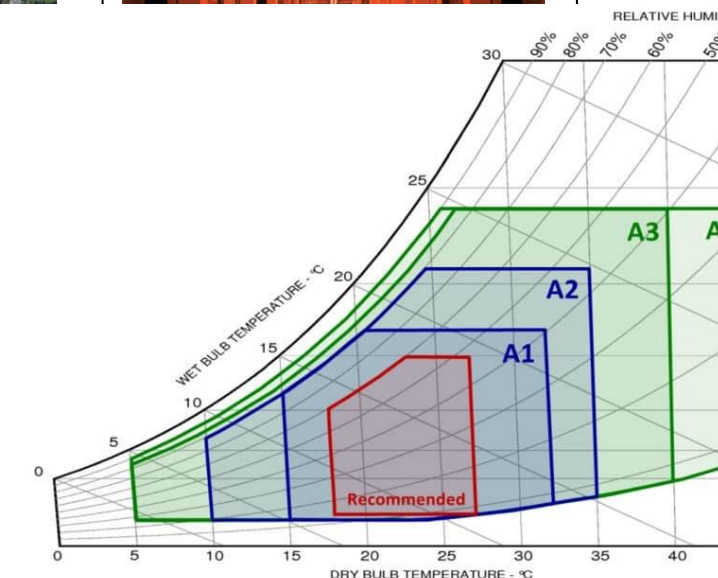
David Gilke, P.E., is a managing principal at DSG and past chair of TC 9.3R.

24 ASHRAE JOURNAL | ashrae.org | NOVEMBER 2012

ASHRAE
JOURNAL
THE JOURNAL OF MECHANICAL REFRIGERATION AND APPLICATION

Water Cooling Source
Data Center

Performance Metrics for Commercial Buildings | Cooling With
Heat Recovery Chillers and Large Campus Systems | Resilient



Constant utilities com- pare environ- ment from and to	Class A2 in Duke Edition	A2	With some control of environmental parameters.
	N/A	A3	Similar to Class A2, but with a water- sensitive control that will likely allow for child-less cooking with a water-cooled heat rejection system in most climates
	N/A	A4	Similar to Class A3, but with a water- sensitive control that will likely allow for child-less cooking with an outdoor air- cooled system in most climates
	N/A	H1	High density air-cooled systems (see Table 1)

relative and absolute) and are displayed chrometric charts in the guidelines.

The recommended range is likely the most important range for center design and operators. It should be designed and operated to target the recommended range for most hours of the year.

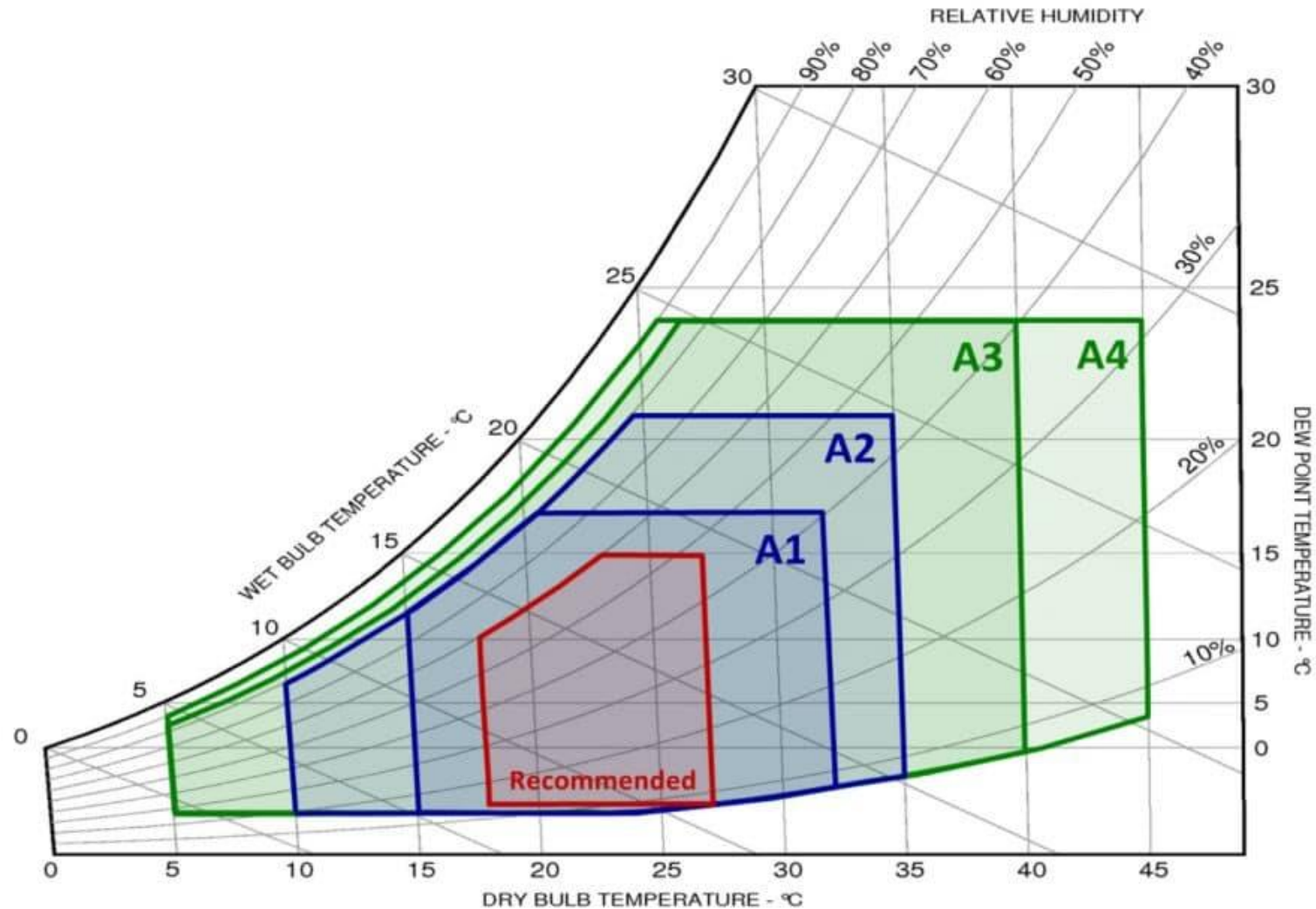
TI, on the other hand, should be designed to target the extremes of the range for environmental classes. Figure 1 provides an example chart for the 5th Edition; it shows both the recommended allowable conditions for Environmental Classes A and B under conditions with low gaseous pollutants and with typical TC correction potential.¹⁴ As a second example, Figure 2 shows the recommended and allowable envelopes for the new high-density IR air-cooled class envelopes for the high-density IR air-cooled class envelopes. The maximum recommended relative humidity (RH) is lowered from 70% to 50%. Similar changes are available in the guideline for all classes with low and high levels of gaseous pollutants, in both SI and US units.

Environmental Class Definitions

As shown in Figures 1 and 2, not all TEs fit all environmental classes. The 5th Edition defines the environmental classes (i.e., the allowable envelopes). Several classes of environmental en-

CONOCIMIENTO TÉCNICO

Thermal Guidelines



COMITÉ TÉCNICO TC 9.9

Mission Critical Facilities, Data Centers, Technology Spaces, & Electronic Equipment

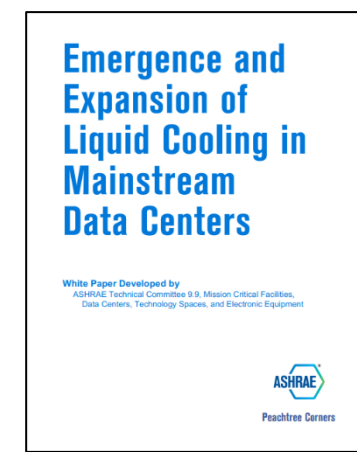
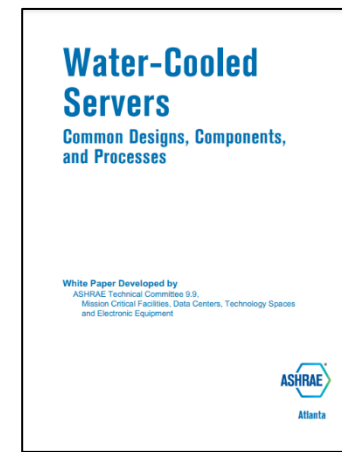
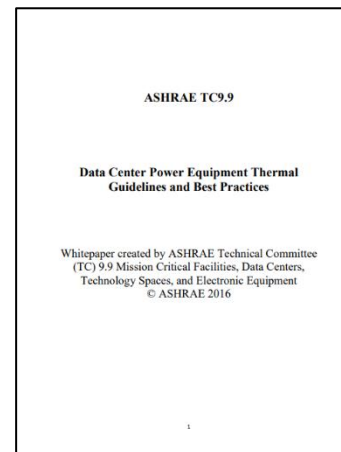
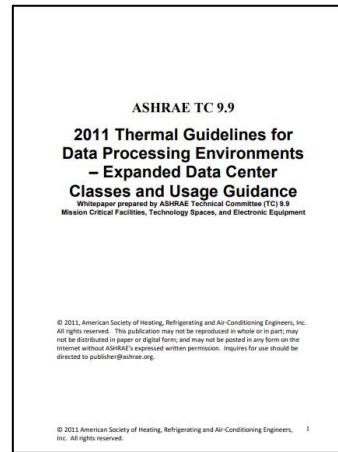
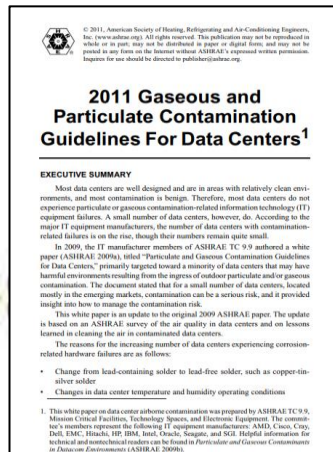
Fomentar un mejor alineamiento entre fabricantes de equipos IT, diseñadores de data centers y responsables de operaciones

Diseño, operaciones, mantenimiento y uso eficiente de la energía en los data center

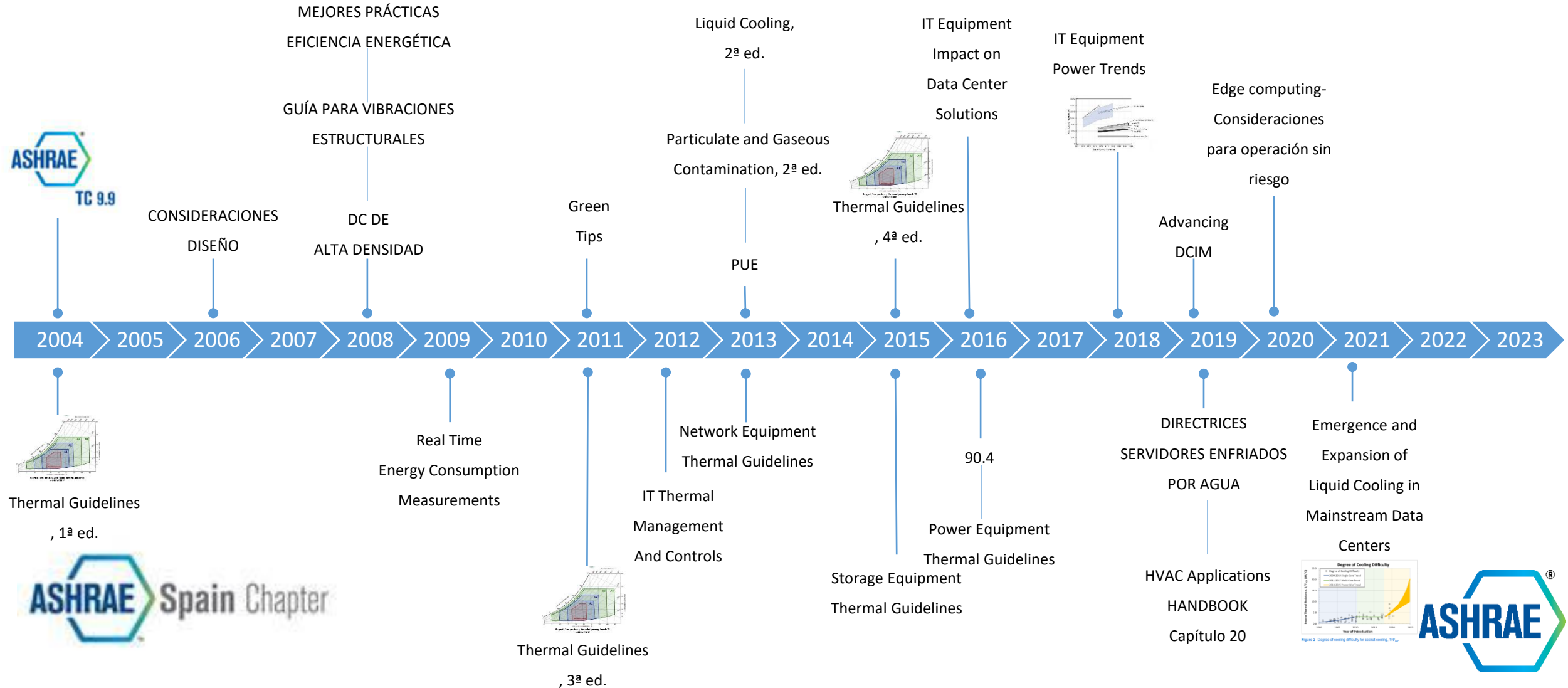
Composición multidisciplinar: fabricantes de equipos, ingenieros consultores, operadores de DC...

Identificar y difundir las mejores prácticas

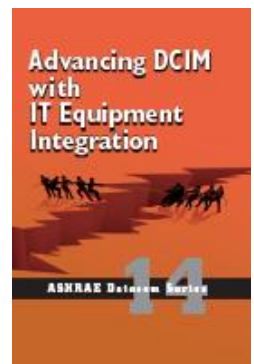
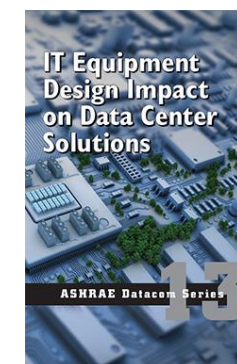
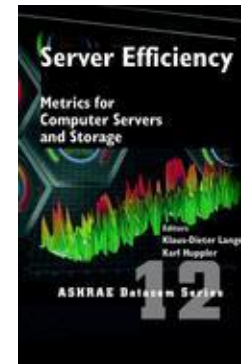
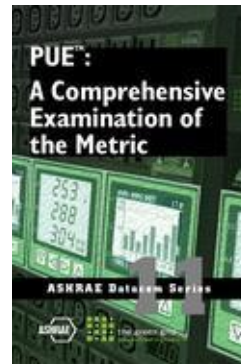
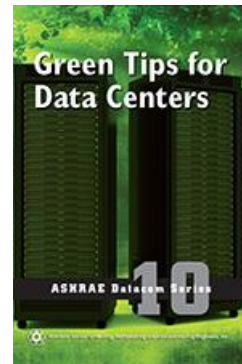
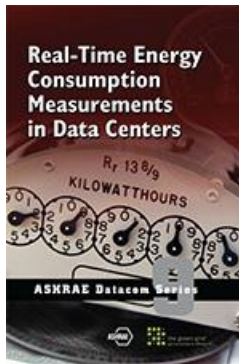
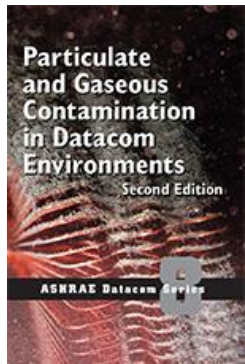
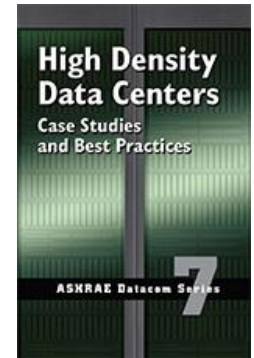
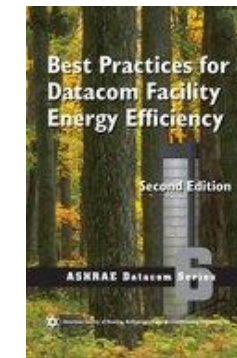
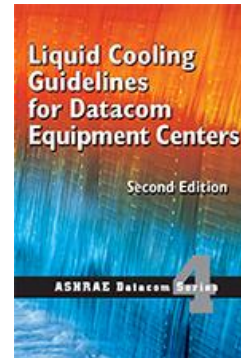
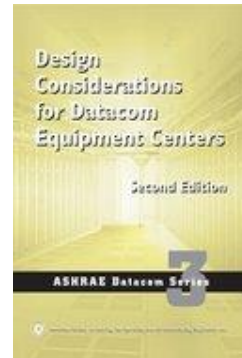
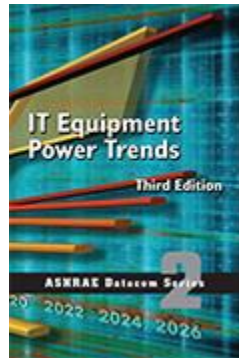
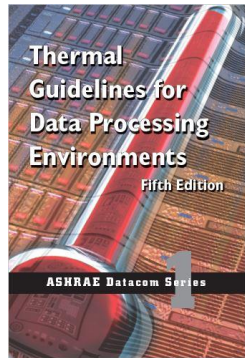
Join TC 9.9



TC 9.9: Historia y contribución a la industria DATACENTER mundial



14 LIBROS SERIE DATACOM DE ASHRAE

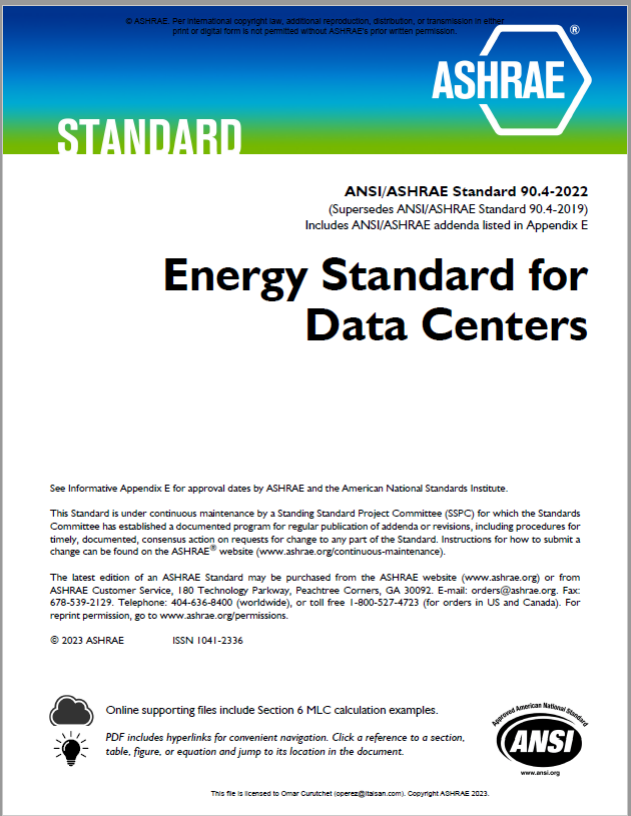


CURSOS DATA CENTER PRESENCIALES Y ONLINE



Curso Data Centers en MADRID, impartido por dos importantes Instructores, reconocidos especialista DC a nivel Mundial: **Mark Seymour** (Candence Design) & **Dustin Demetriou** (IBM Systems)

STANDARD ASHRAE 90.4-2022.-Energy Standard for Data Centers



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ANSI/ASHRAE Standard 90.4-2022 Energy Standard for Data Centers

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> Standard 90.4 MLC HVAC Calculation Examples: www.ashrae.org/90.4-2022	



STANDARD ASHRAE 90.4-2022.- Beyong

Desarrollado específicamente para data centers

Establece requerimientos para alcanzar la eficiencia energética mínima para el diseño, construcción y operación de los data centers

Demarca que no todas las salas con equipamiento IT son data centers

En breve disponible su traducción al castellano

Realizada por el ASHRAE Spain Chapter

STANDARD ASHRAE 90.4-2022.- Beyond

Introduce 2 simples métricas de diseño:

MLC (Mechanical Load Component) & **ELC** (Electrical Loss Component)

...que pueden emplearse independientemente.

- If Project is Mechanical Only, Calculate: $\boxed{\text{MLC}} \leq \text{Table Figures}$
- If Project is Electrical Only, Calculate: $\boxed{\text{ELC}} \leq \text{Table Figures}$

Valores calculados sobre MLC y ELC se comparan con valores máximos permitidos según zonas climáticas.

Permitiendo compensaciones

If Combined, MLC + ELC Must Be $\leq$ Compliance Numbers

- Allows Tradeoffs Between MLC and ELC

$$\boxed{\text{MLC}} + \boxed{\text{ELC}} \leq \text{Table Figures}$$

PERSPECTIVA GLOBAL DE LA INDUSTRIA

Pacto de Centros de Datos Climáticamente Neutrales (2021)

European Climate Neutral Data Center Pact (CNDCP)

Creado en 2021 por los organismos de la industria CISPE y EUDCA



Marco de auditoría para la UE

Certificación "iniciativa de autorregulación" (SRI)

Según estándares: CEN – CENELEC / ISO/EIC / Código de conducta UE

Estándares ASHRAE y ANSI/ISA

Evaluar el cumplimiento de los compromisos establecidos
con una visión GLOBAL



RETO: DESCARBONIZACIÓN

ashrae.org/decarbchallenge



**DESAFÍO
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Afrontar la Crisis Climática



CONFERENCIA INTERNACIONAL



**ASHRAE International Building
Decarbonization Conference 2024**

April 17-19, 2024

 **Madrid, Spain**



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GRACIAS