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

ASHRAE Winter Conference 2020

Orlando

As members of ASHRAE or participants in ASHRAE committees, we pledge to act with honesty, fairness, courtesy, competence, integrity and respect for others in our conduct.

A. Efforts of the Society, its members, and its bodies shall be directed at all times to enhancing the public health, safety and welfare.

B. Members and organized bodies of the Society shall be good stewards of the world's resources including energy, natural, human and financial resources.

C. Our products and services shall be offered only in areas where our competence and expertise can satisfy the public need.

D. We shall act with care and competence in all activities, using and developing up-to-date knowledge and skills.

E. We shall avoid real or perceived conflicts of interest whenever possible, and disclose them to affected parties when they do exist.

F. The confidentiality of business affairs, proprietary information, intellectual property, procedures, and restricted Society discussions and materials shall be respected.

G. Each member is expected and encouraged to be committed to the code of ethics of his or her own professional or trade association in their nation and area of work.

H. Activities crossing national and cultural boundaries shall respect the ethical codes of the seat of the principal activity.

Who is ASHRAE?

- A nonprofit technical society formed in 1894 specializing in HVAC

- With over **56,000 members** from over 132 nations

- Almost **100 technical committees** with over 2,000 technical committee members

- Focused on maintaining an unbiased role within the industry

- Actively writes standards, guidelines, model codes, etc.

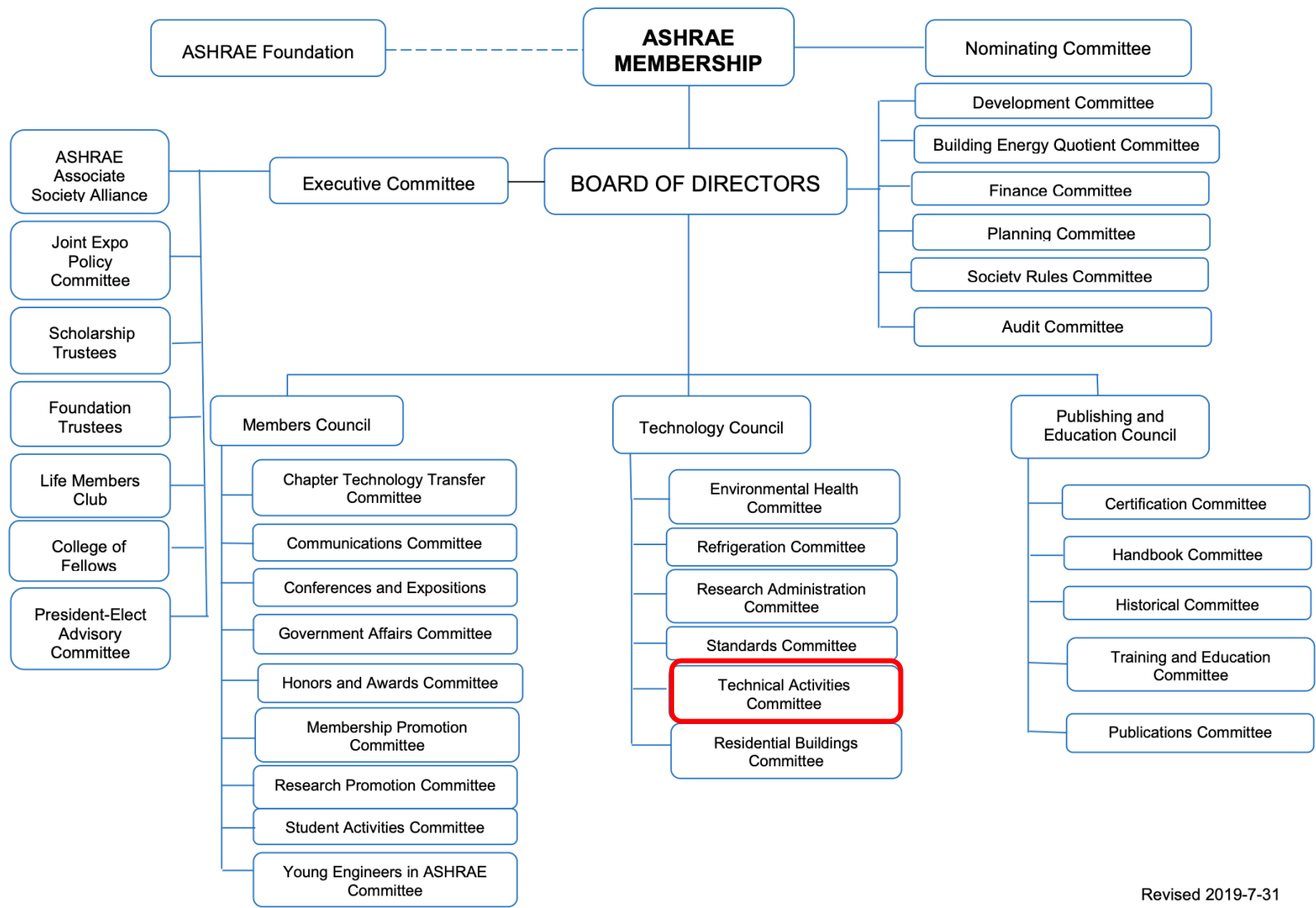- A creator of more than **125** standards and guidelines

Ice Cooled System
(Circa 1890)

General Electric Room Cooler
(Circa 1932)

Computer Room Air Conditioner
(Circa 1980)

ASHRAE Foundation

ASHRAE MEMBERSHIP

Nominating Committee

Development Committee

Building Energy Quotient Committee

Finance Committee

Planning Committee

Society Rules Committee

Audit Committee

ASHRAE Associate Society Alliance

Executive Committee

BOARD OF DIRECTORS

Joint Expo Policy Committee

Scholarship Trustees

Foundation Trustees

Life Members Club

College of Fellows

President-Elect Advisory Committee

Members Council

Chapter Technology Transfer Committee

Communications Committee

Conferences and Expositions

Government Affairs Committee

Honors and Awards Committee

Membership Promotion Committee

Research Promotion Committee

Student Activities Committee

Young Engineers in ASHRAE Committee

Technology Council

Environmental Health Committee

Refrigeration Committee

Research Administration Committee

Standards Committee

Technical Activities Committee

Residential Buildings Committee

Publishing and Education Council

Certification Committee

Handbook Committee

Historical Committee

Training and Education Committee

Publications Committee

Revised 2019-7-31

Title

- Mission Critical Facilities, Data Centers, Technology Spaces, and Electronic Equipment

Purpose

- To be recognized by ALL areas of the datacom industry as the UNBIASED engineering leader in HVAC and an effective provider of technical datacom information.

Scope

- All things datacom facilities: datacom refers to data processing and communication facilities. It includes rooms or closets used for communication, computers, or electronic equipment

Participants

- TC 9.9 is the largest and most active TC with over 375 members

Representatives

- Producers of Datacom Equipment: computing hardware, software, and services
- Producers of Facility Equipment: HVAC, software, DCIM, rack solutions
- Users of Datacom Equipment: facility owners, operators, managers
- General Interest: government agencies, utilities, consultants, academia, testing laboratories

Industry Volunteers Provide the Expertise

- Manufacturers, consultants, researchers, universities, utilities, regulators, contractors, and government

Areas of Influence

- Standards
- Research
- Handbook
- Programs (including paper reviews)
- Technical Activities: Books, White Papers, Education
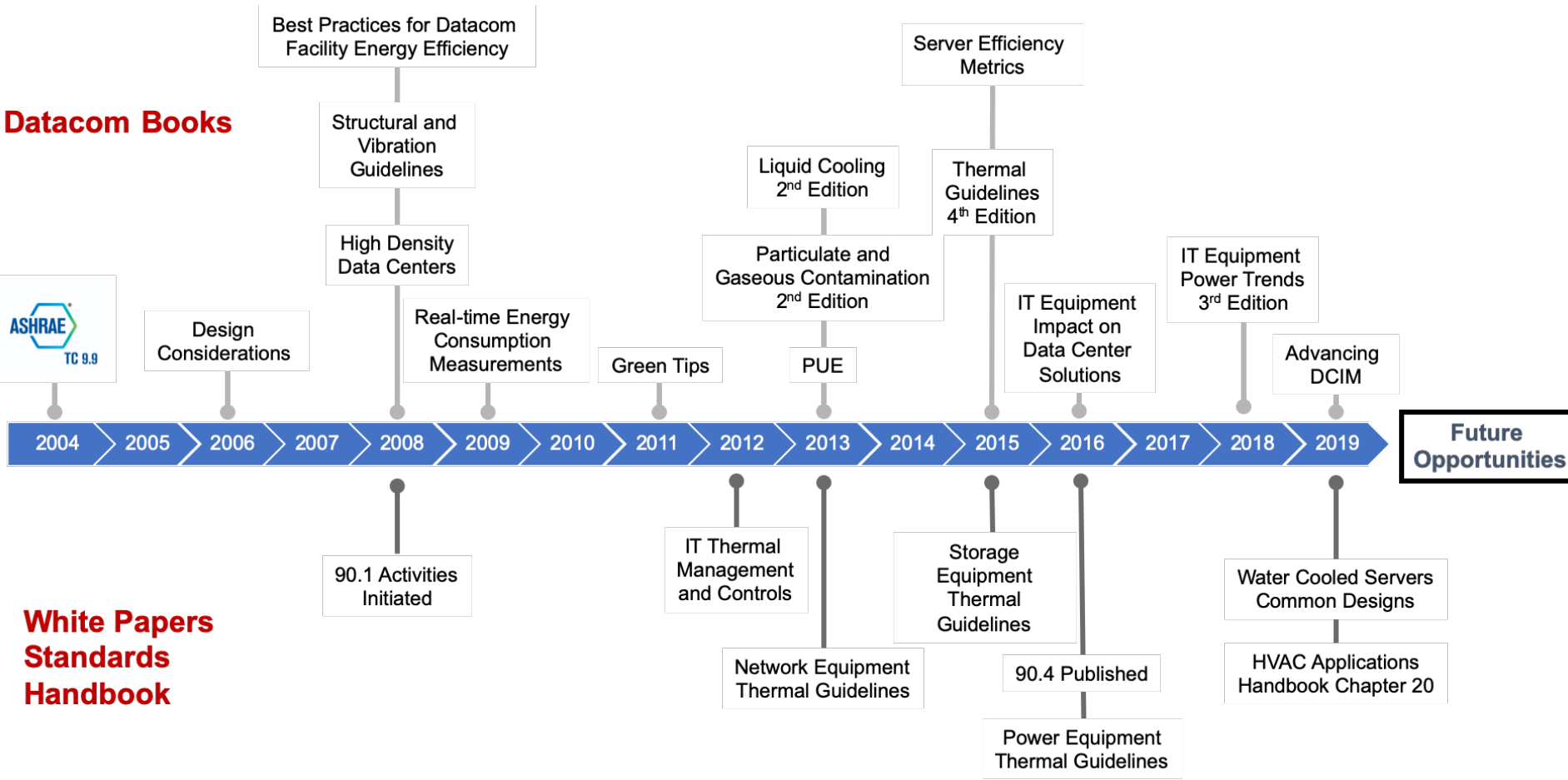
ASHRAE Handbook Series is the backbone resource of the HVAC Industry

Chapter 20, Data Centers and Telecommunication Facilities

Essentials of Data Center Design
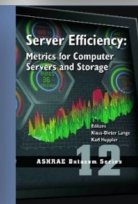
Establish a Baseline
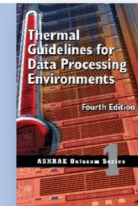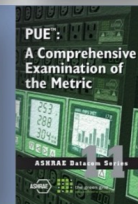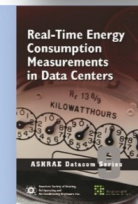
Target Forecasts and Trends
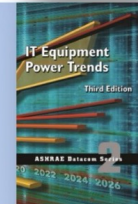
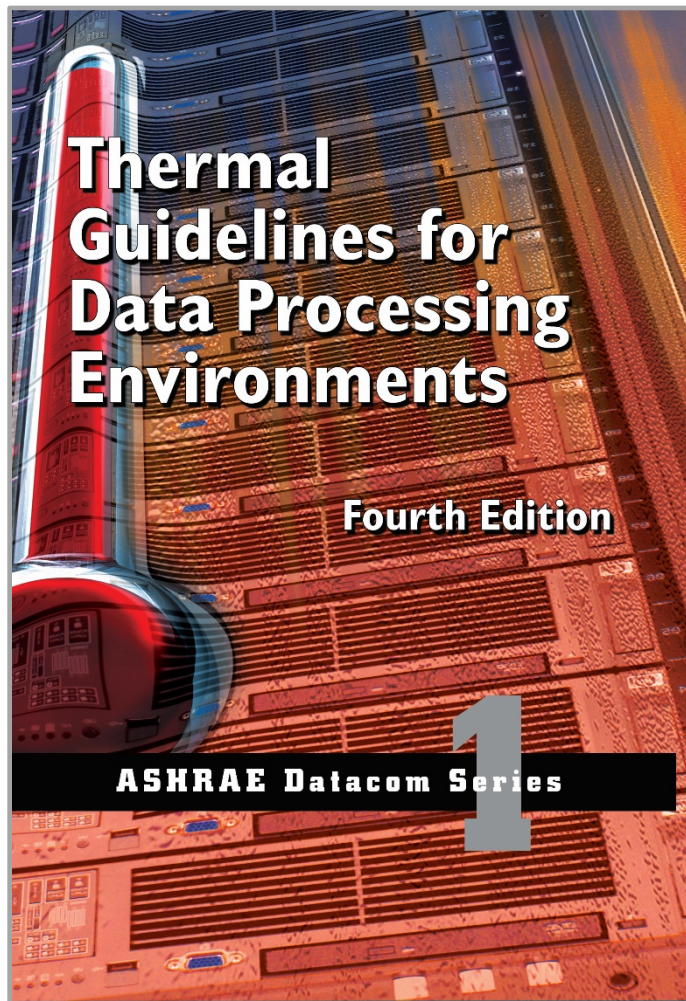Engage in Best Practices
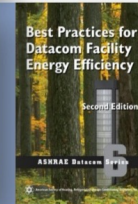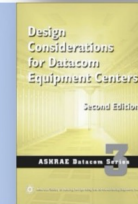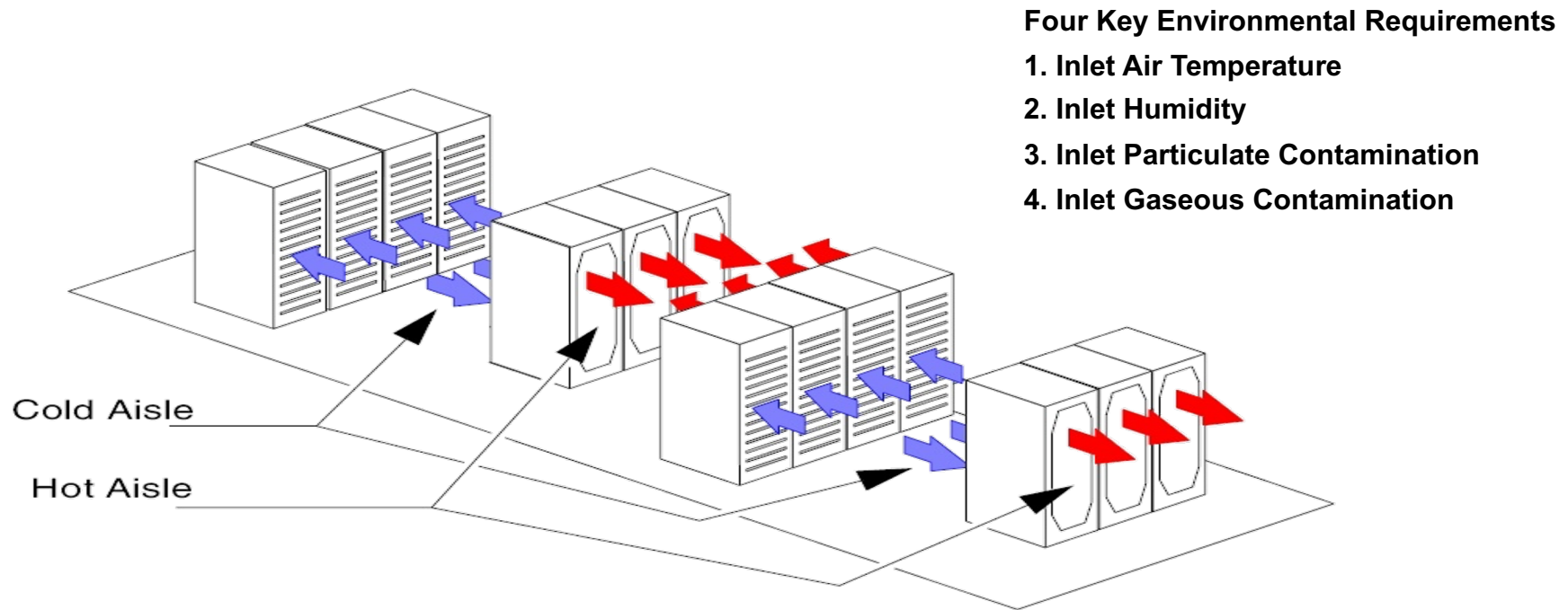
Prepare for Special Cases
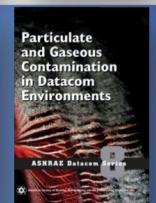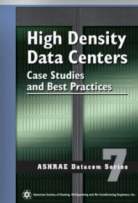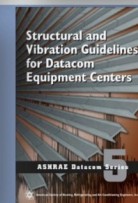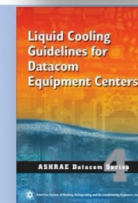
Measure Key Metrics
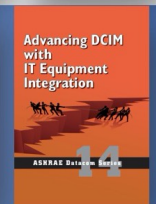
- The Foundation of the Datacom Series

  - IT Equipment temperature-humidity guidelines

  - Measurement locations

  - Reliability, power consumption and airflow implications of environmental settings

Four Key Environmental Requirements

1. **Inlet Air Temperature**
2. **Inlet Humidity**
3. **Inlet Particulate Contamination**
4. **Inlet Gaseous Contamination**

Cold Aisle

Hot Aisle

- AIR INLET to datacom equipment IS the important specification to meet.

- OUTLET temperature is NOT of concern to the datacom equipment (but is limited by safety and other concerns).

Recommended

- Guidance to data center operators for operating the datacom equipment for optimal performance, high reliability and lowest power consumption.

Allowable

- Limits within which the IT equipment is validated to function. Peak performance at upper extreme may not be guaranteed.

Practical Application

- Optimal range for a given data center based on operational goals including performance, power efficiency, compute efficiency, etc.

- ASHRAE research on electrostatic discharge enabled lower humidity limits in 4th Edition.

- Ongoing research is studying the impact of high humidity on corrosion and IT equipment reliability

- Potential for future expansion of the upper range of the humidity envelope
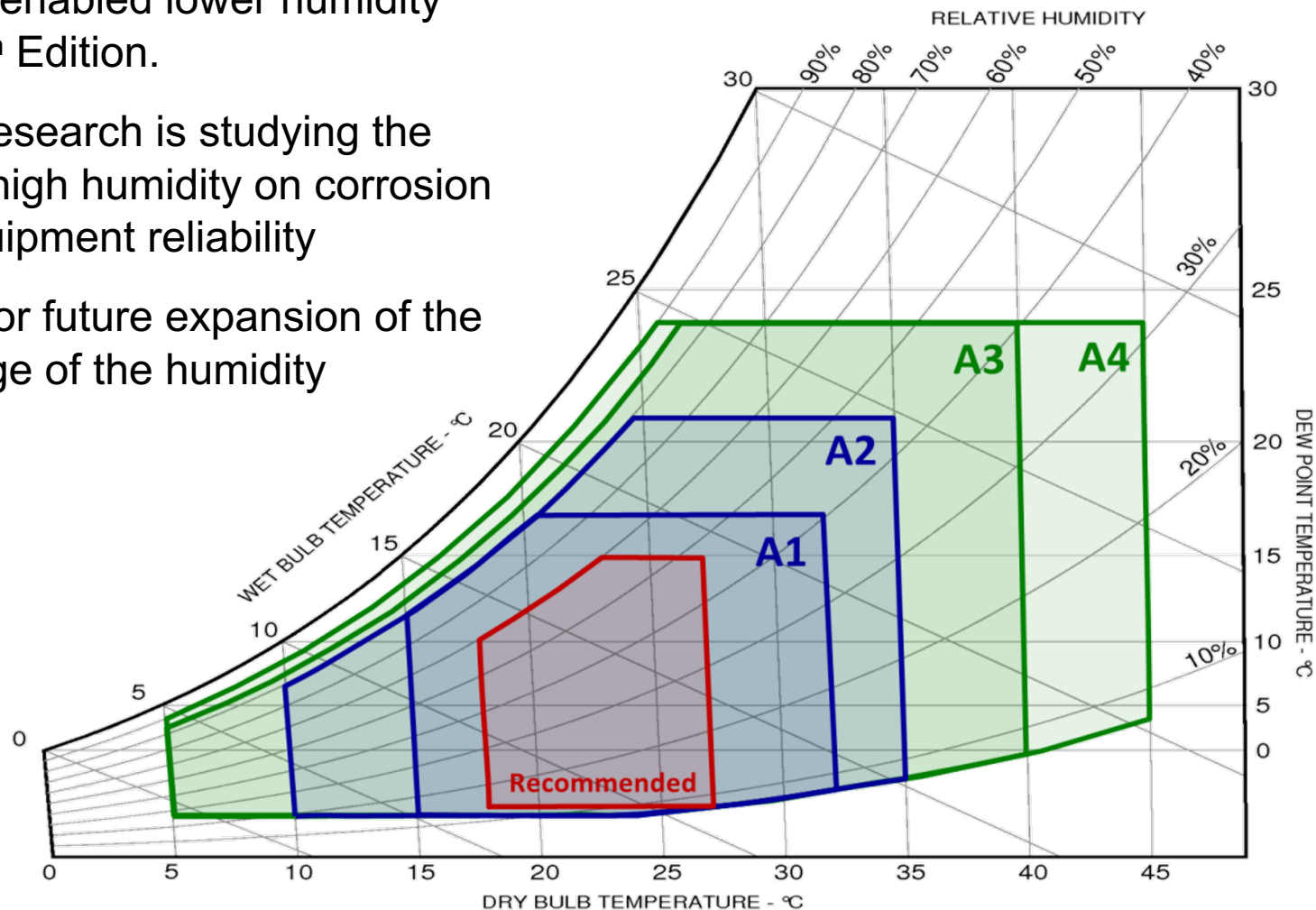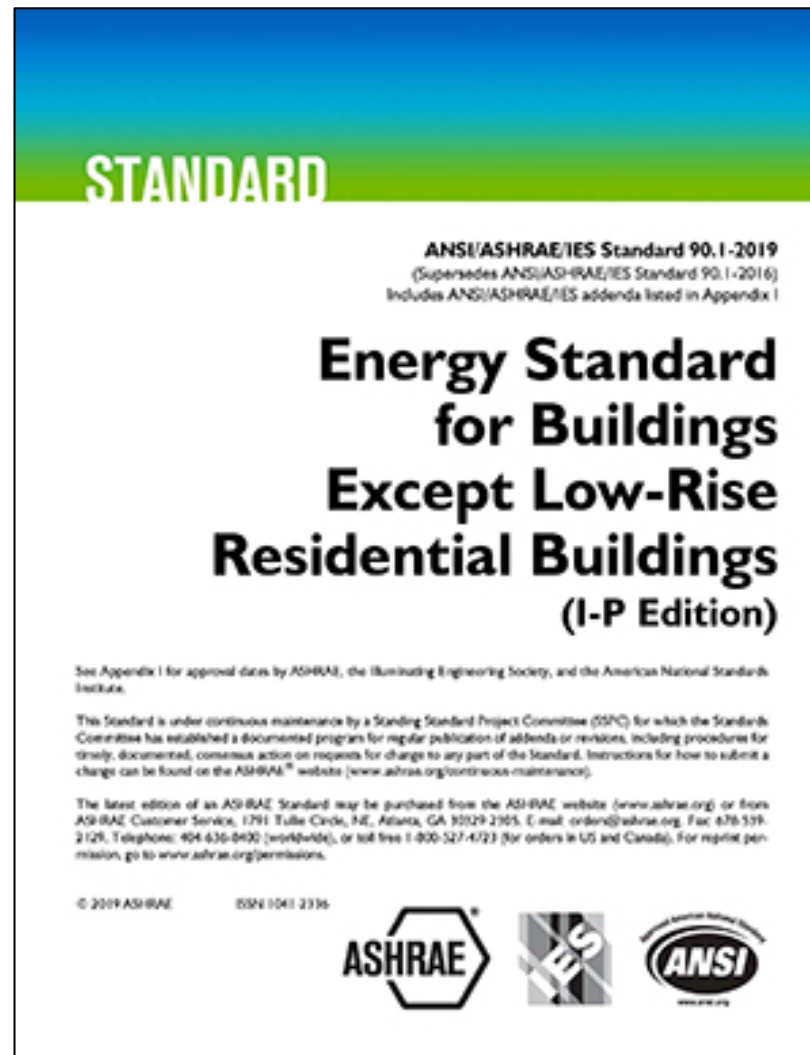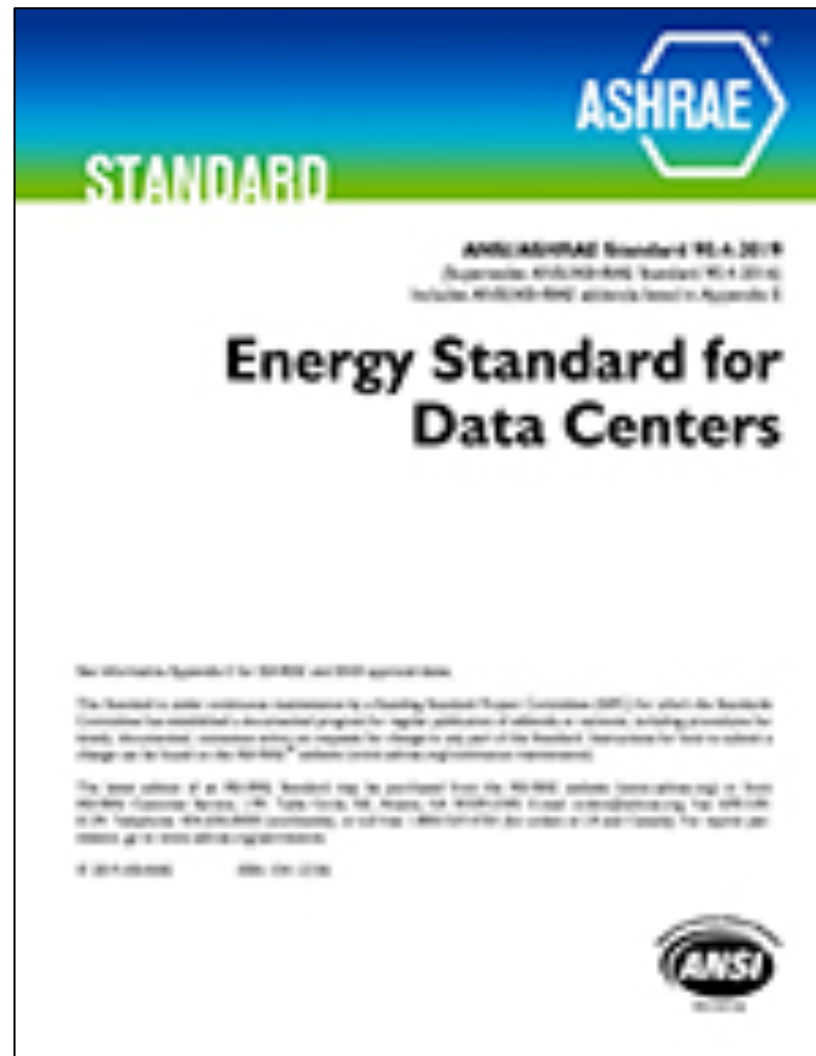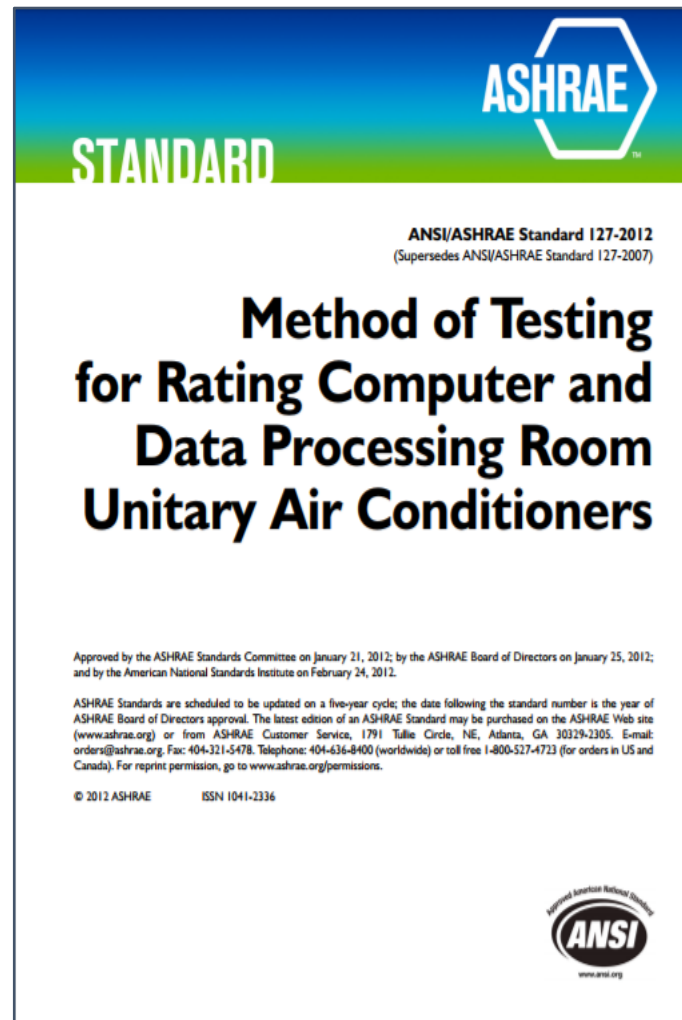
Latest TC Activities

If you would like to get involved in this TC's activities you can contact the appropriate Point of Contact in the **TC 9.9 Work Items listing**, attend the biannual meetings, or contact our committee chair at **tc0909@ashrae.net**.

- Datacom Series Books
  - Design Considerations for Datacom Equipment Centers, 2nd Edition
- Research
  - 1675-RP, Guidance for CFD Modeling of Data Centers
- White Papers
  - Cold Weather Shipping Acclimation and Best Practices
  - Liquid Cooled Solutions : What's New, Debunking the Myths, & Value Proposition
- Standards
  - SPC 127, Method of Testing for Rating Computer and Data Processing Room Unitary Air Conditioners
  - AHRI 1360, Performance Rating of Computer and Data Processing Room Air Conditioners

ASHRAE

Mission Critical Facilities, Data Centers, Technology Spaces and Electronic Equipment
ASHRAE Technical Committee 9.9

| Home | Membership | Meetings | Documents | Functions | More |

Agenda

Upcoming TC Meetings

Location: Orlando, FL

Sunday, 2/2/2020	Room
5:00 PM - 7:00 PM - Programs, Handbook and Research	TBD

Monday, 2/3/2020	
2:15 PM - 7:30 PM - Main Committee	TBD

TC 9.9 sponsored seminars, conference paper session, data center related topics, etc. will be posted for each conference in the **Meetings** section of this website.

See More

Minutes

TC0909 ASHRAE Kansas City Meeting Minutes 20190624
TC0909 ASHRAE Atlanta Meeting Minutes 20190130
TC0909 ASHRAE Houston Meeting Minutes 20180624
TC0909 ASHRAE Chicago Meeting Minutes 20180121
TC0909 ASHRAE Long Beach Meeting Minutes 20170626

See All

Committee Chair
Dustin Demetriou TC0909@ashrae.net

Committee Scope
TC 9.9 is concerned with all aspects of mission critical facilities, data centers, technology spaces, and electronic equipment/systems.
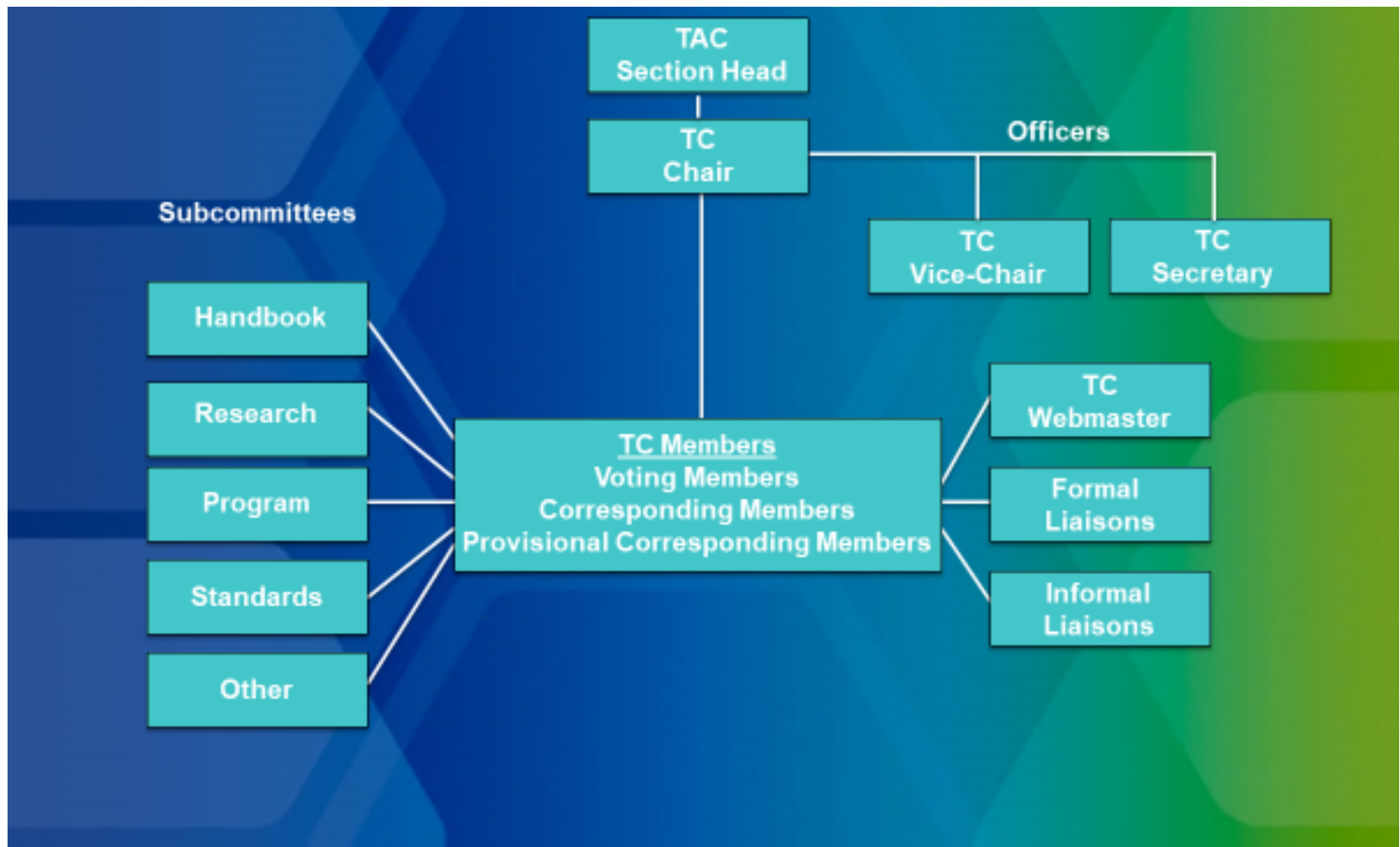
More

Upcoming Society Conferences
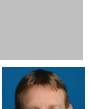
2020 Winter Conference
Feb 1-5, 2020
Orlando, FL

Conference Badges

ASHRAE TC 9.9 Officers & Membership
July 1, 2019 – June 30, 2020

Chair — Dustin Demetriou, *IBM*

Vice Chair — John Groenewold, *JP Morgan Chase*

Secretary — Matt Koukl, *Affiliated Engineers*

Research Subcommittee Chair — Mark Seymour, Future Facilities

ITE Subcommittee Chair — Dr. Roger Schmidt, *IBM Fellow Emeritus Syracuse University*

Standards Subcommittee Chair — Rick Pavlak, *Heapy Engineering*

Program Subcommittee Chair — Nick Gangemi, *Northern Air Systems*

Handbook Subcommittee Chair — Robert McFarlane, *Shen Milsom & Wilke, LLC*

Membership Subcommittee Chair — Jack Glass, *Citigroup retired*

Webmaster — Ecton English, *Department of Defense*

Marketing Subcommittee Chair — Paul Finch, *KAO Data*

- Standard 90.1: Rick Pavlak

- Standard 90.4: Dave Kelley

- Standard 127: John Bean

- International: Don Beaty

- MTG Cyber: Ecton English

Provisional Corresponding Members (58 as of 12/2019)

- Newly registered
- Implies participation in committee activities through correspondence or in-person involvement to become corresponding member
- Provisional corresponding members serves up to two, one-year terms
- Chair updates roster to move from provisional to corresponding
  - Roster update always due Tuesday following main meeting during Winter Conference
  - If the chair takes no action on a provisional member, they are dropped from the roster in two years
- Can not be voting members, but after provisional term, may be considered for future voting membership.'
- For purposes of committee assignments and other work "Provisional" status does not limit an individual's active involvement in the work of the committee

Corresponding Members (315 as of 12/2019)

- Full members
- Can be voting members
- Can be nominated/elected as an officer

Keep Your ASHRAE Profile Updated!

Voting Members (15)

- TC shall consist of approximately 12 Voting Members, with a minimum of six (6) and a maximum of eighteen (18)
- Shall be appointed annually by the chair for not more than four consecutive one-year terms
- Only one person from any employer, organization, university, or specific government agency may serve as a Voting Member on the same TC/TG/TRG at one time
- Voting Members should serve at least one term previously as an active Corresponding Member
- Quorum to conduct business at meetings is established when the number of voting members present is four (4) or exceeds 1/2 of the number of total voting members of the committee, whichever is larger.

1. Gerardo Alfonso, Ingeal
2. John Bean, Schneider Electric
3. Don Beaty, DLB
4. Lex Coors, Interxion Headquarters
5. Dave Kelley, Vertiv
6. Dustin Demetriou, IBM
7. Ecton English, DoD
8. John Gross, J.M. Gross Engineering
9. Matt Koukl, Affiliated Engineers
10. Dave Meadows, Stultz America
11. Dave Moss, Dell
12. Chris Muller, Purafil
13. Terry Rogers, Primary Integration
14. Roger Schmidt, Syracuse University
15. Vali Sorell, Sorell Engineering

Vote	Date	Approved
Water Cooled Servers Whitepaper	January	Yes
Atlanta Meeting Minutes	March	Yes
HDD Whitepaper	April	Yes
Cold Shipping RTAR	May	Yes
1755-RP PMS Recommendation	September	Yes
Kansas City Meeting Minutes	November	Yes

Thank You

TC 9.9 Website

tc0909.ashraetcs.org

Overview of ASHRAE TC 9.9 Datacom Series Books

Thermal Guidelines for Data Processing Environments

Fourth Edition

ASHRAE Datacom Series 1
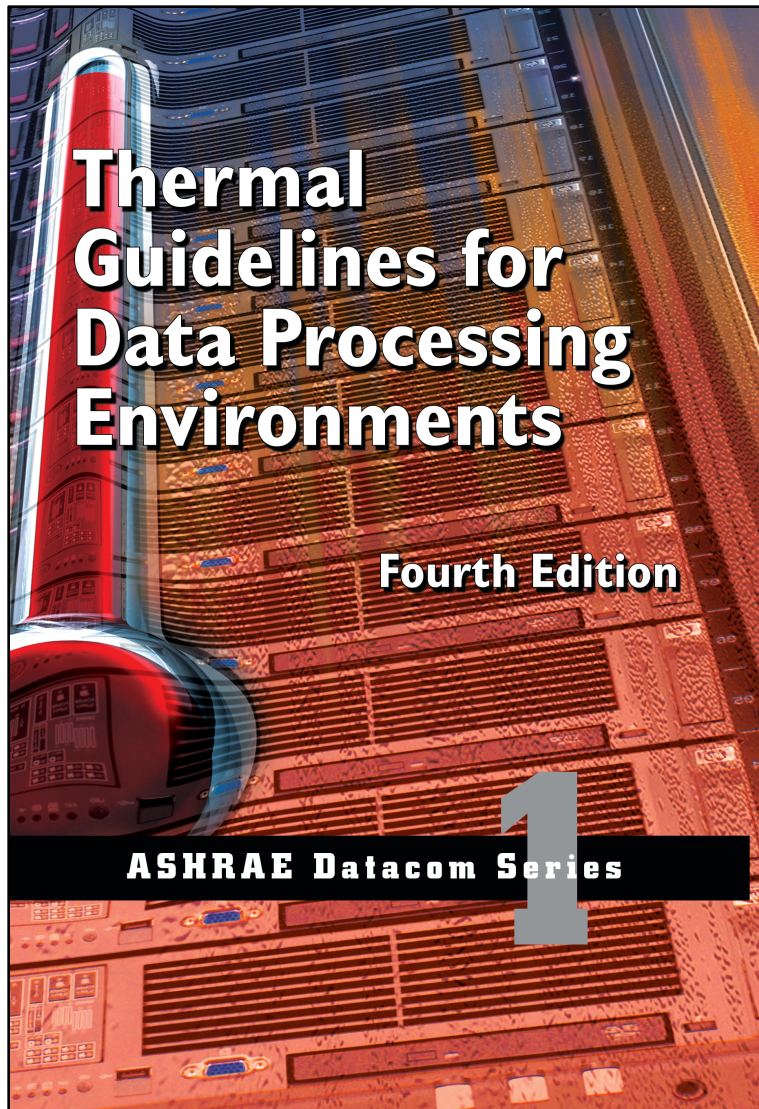
Chapter 1: Introduction

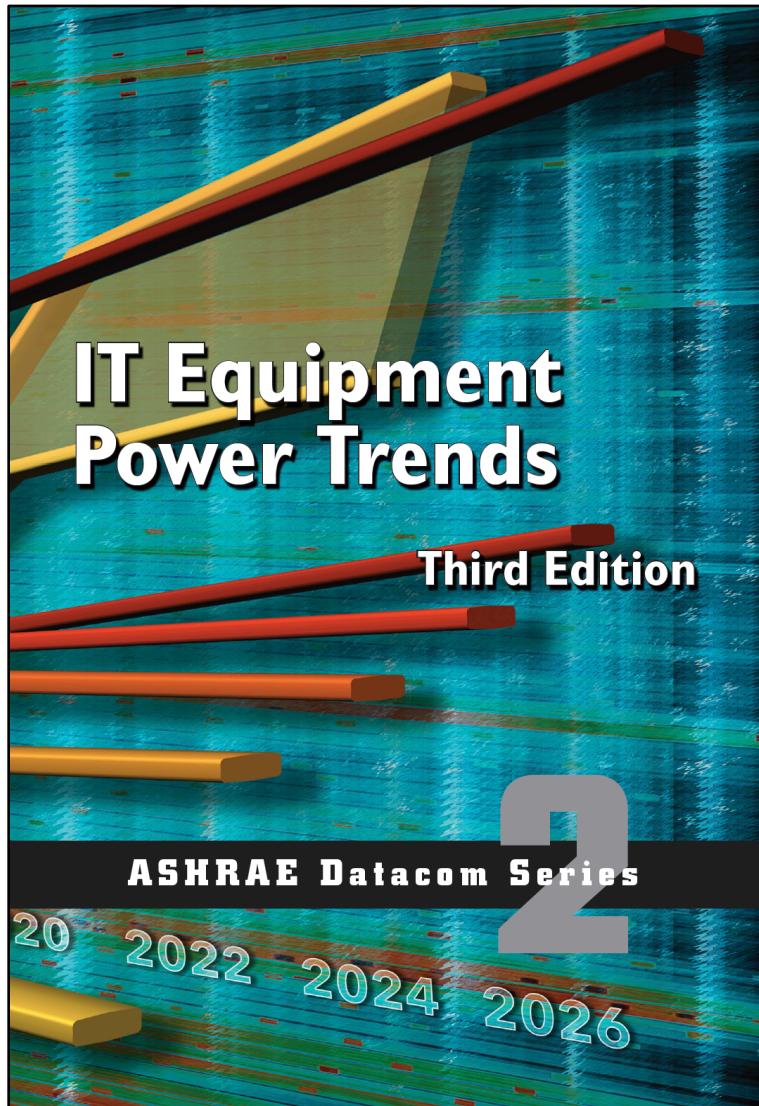Chapter 2: Environmental Guidelines for Air-Cooled Equipment

Chapter 3: Environmental Guidelines for Liquid-Cooled Equipment

Chapter 4: Facility Temperature & Humidity Measurement

Chapter 5: Equipment Placement & Airflow Patterns

Chapter 6: Equipment Manufacturers Heat & Airflow Reporting

Appendices A – L

Chapter 1: Introduction

Chapter 2: Background
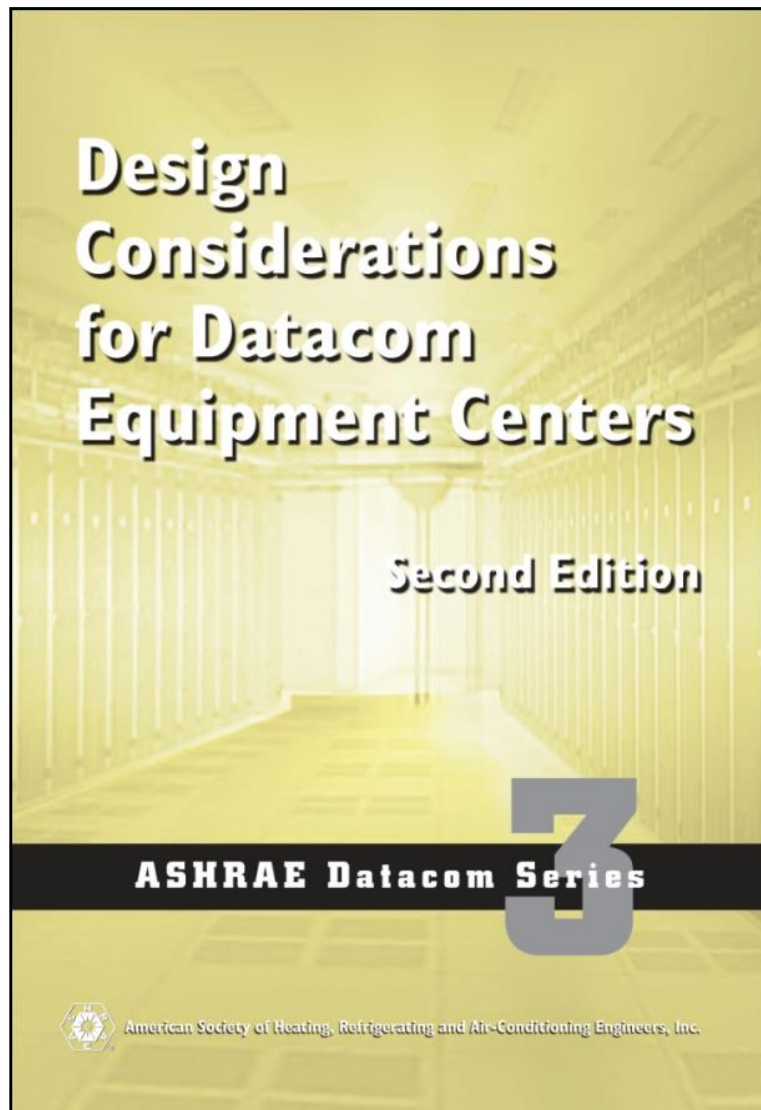
Chapter 3: IT Equipment and Components

Chapter 4: IT Equipment Workloads, Configurations, and Applications

Chapter 5: IT Equipment Rack Power Trends

Chapter 6: Datacom Facility Capabilities and Considerations

Chapter 7: Practical Examples

Chapter 1: Introduction

Chapter 2: Design Criteria

Chapter 3: HVAC Load Considerations

Chapter 4: Computer Room Cooling Overview

Chapter 5: Air Distribution

Chapter 6: Liquid Cooling

Chapter 7: Ancillary Spaces

Chapter 8: Contamination
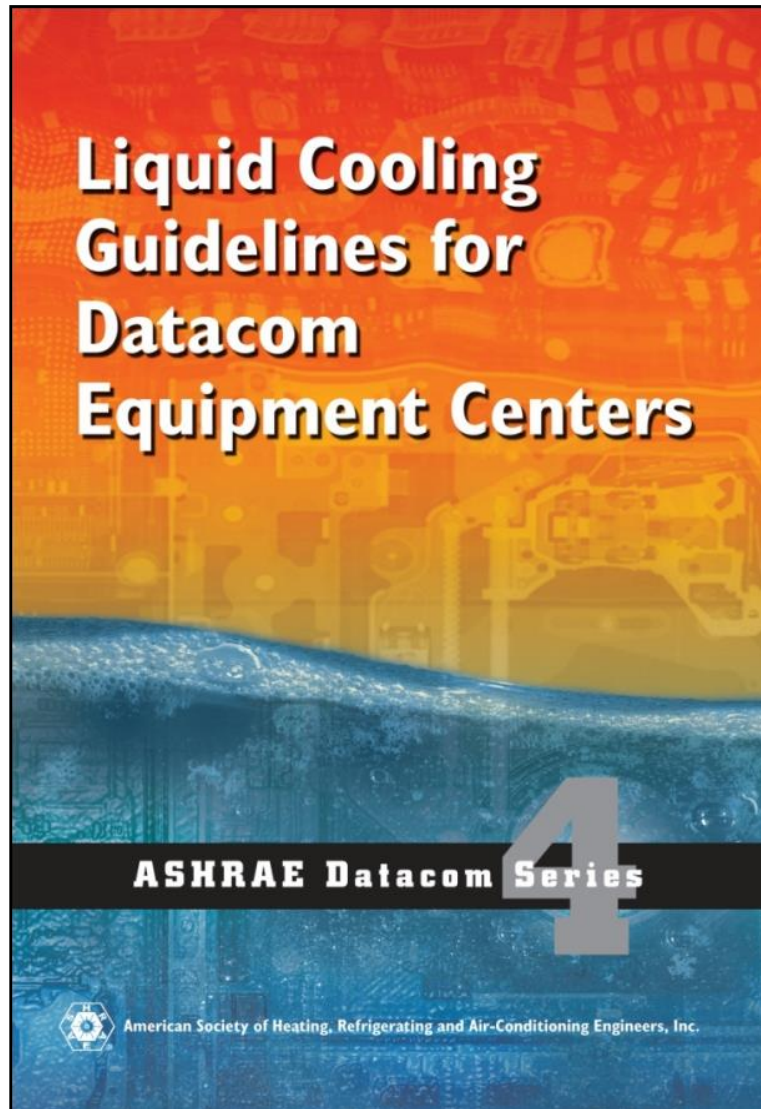
Chapter 9: Acoustical Noise Emissions

Chapter 10: Structural & Seismic

Chapter 11: Fire Detection & Suppression

Chapter 12: Commissioning

Chapter 13: Availability & Redundancy

Chapter 14: Energy Efficiency

Chapter 1: Introduction

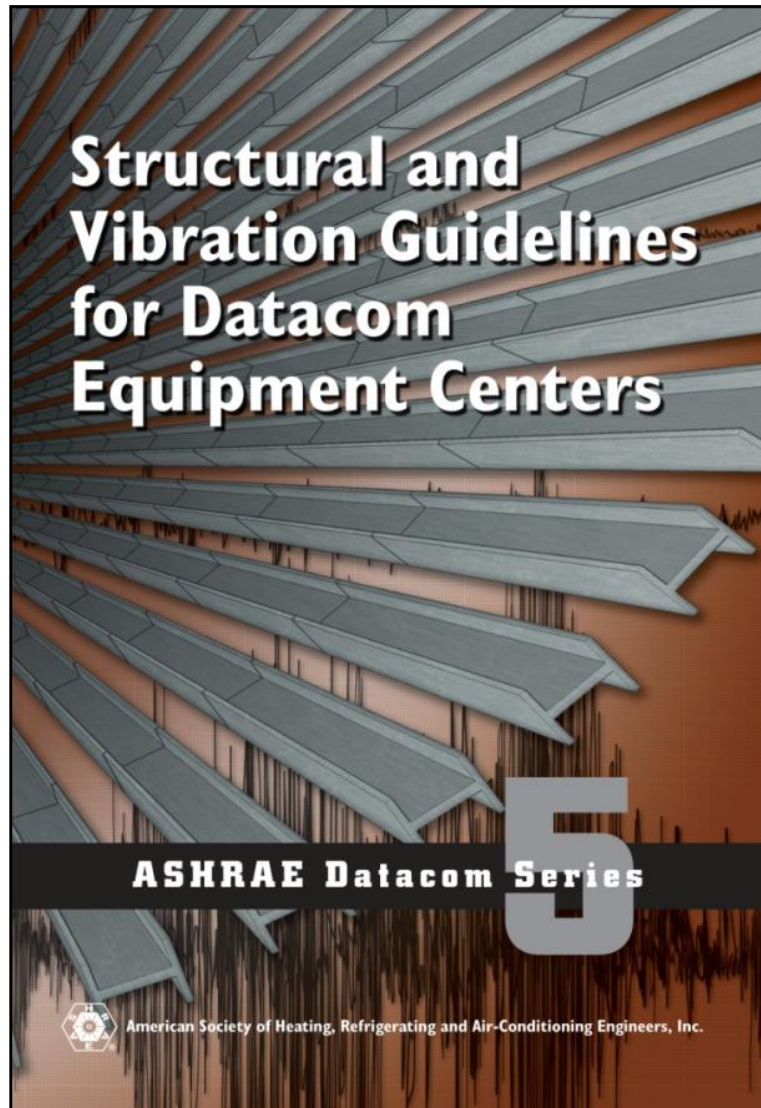Chapter 2: Facility Cooling Systems

Chapter 3: Facility Piping Design

Chapter 4: Liquid Cooling Implementation for Datacom Equipment

Chapter 5: Liquid Cooling Infrastructure Requirements for Chilled-Water Systems

Chapter 6: Liquid Cooling Infrastructure Requirements for Technology Cooling Systems

Appendix

Chapter 1: Introduction

Chapter 2: Best Practices

Chapter 3: Building Structures Overview

Chapter 4: New Structures

Chapter 5: Existing Structures & Additions

Chapter 6: Types of Building Structures

Chapter 7: Building Infrastructure Overview

Chapter 8: Structural Considerations for Infrastructure
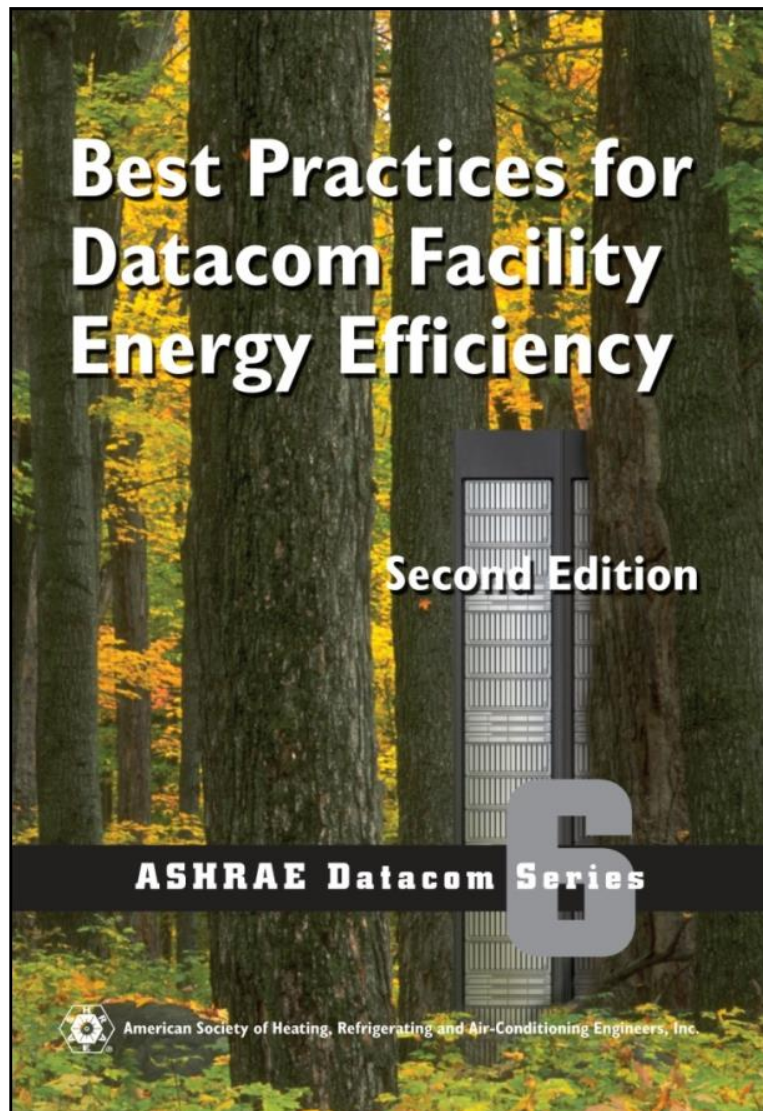
Chapter 9: Raised-Access Floor Systems

Chapter 10: Vibration Sources & Control

Chapter 11: Shock & Vibration Testing on Datacom Equipment

Chapter 12: Seismic Anchorage of Datacom Equipment

Chapter 13: Analysis of Datacom Equipment & Seismic Anchorage Systems

Chapter 1: Introduction

Chapter 2: Environmental Criteria

Chapter 3: Mechanical Equipment & Systems

Chapter 4: Economizer Cycles

Chapter 5: Airflow Distribution

Chapter 6: HVAC Controls & Energy Management
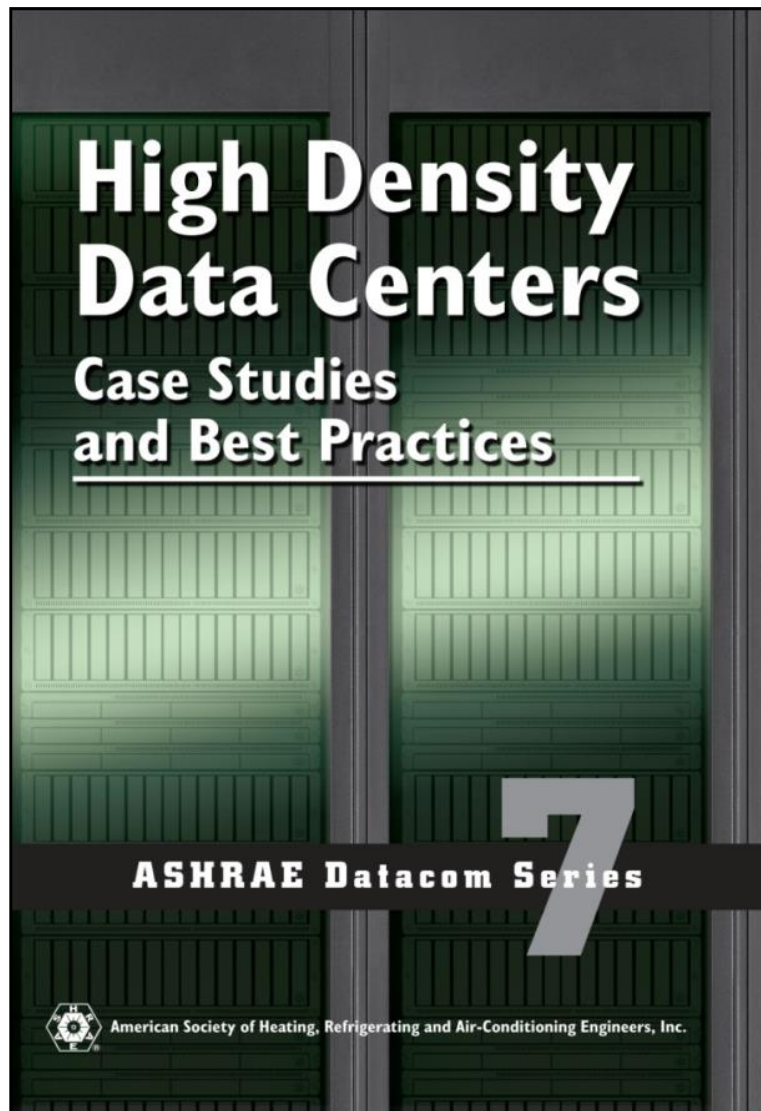
Chapter 7: Electrical Distribution Equipment

Chapter 8: Datacom Equipment Efficiency

Chapter 9: Liquid Cooling

Chapter 10: Total Cost of Ownership

Chapter 11: Emerging Technologies & Future Research
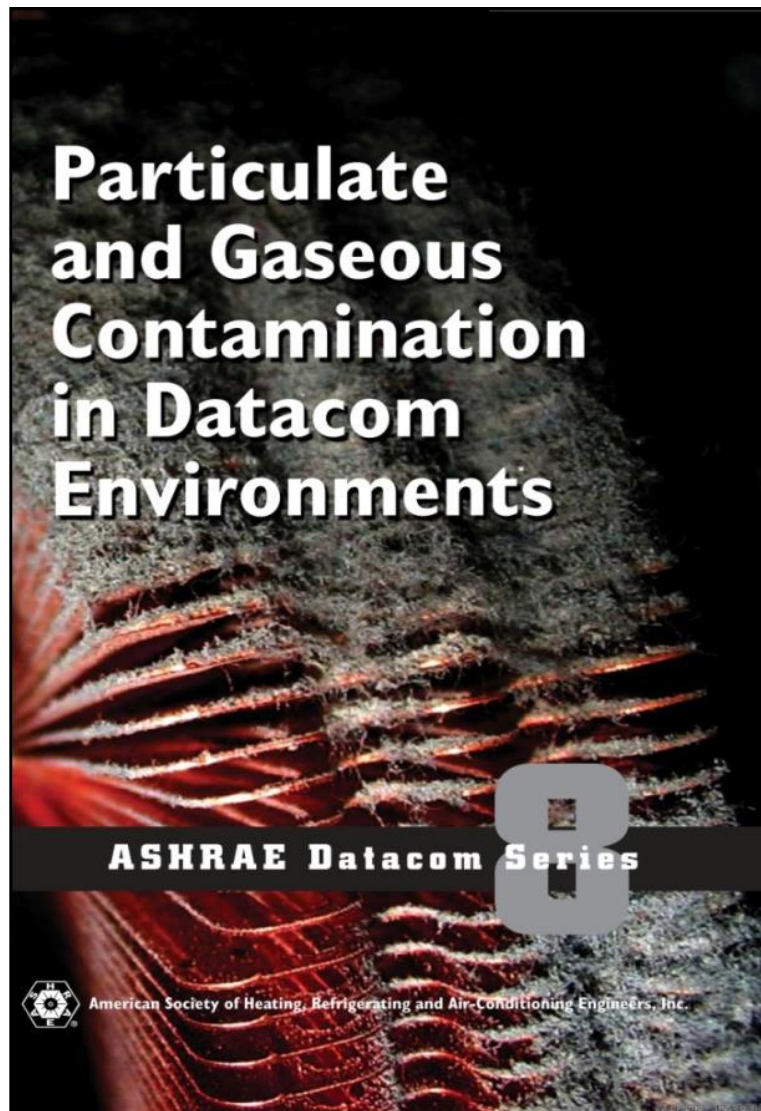
Appendices A - F

Chapter 1: Introduction

Chapter 2: Raised-Access Floor Case Studies

Chapter 3: Non-Raised-Access Floor Case Studies

Chapter 4: Best Practices

Chapter 1: Introduction

Chapter 2: IT and Datacom Equipment Vulnerability

Chapter 3: Industry Specifications & Guidelines

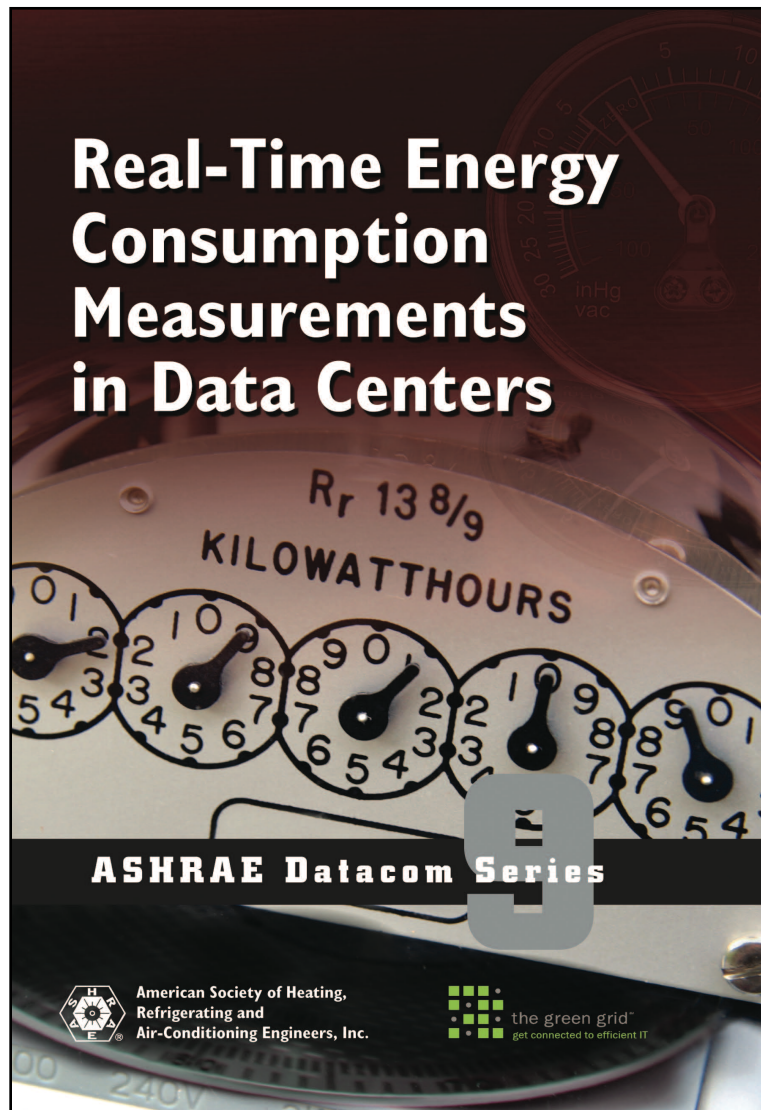Chapter 4: Contamination Monitoring and Analysis

Chapter 5: Contamination Prevention

Chapter 6: Contamination Control

Chapter 7: Air-Side Economizers

Appendices A - C

Real-Time Energy Consumption Measurements in Data Centers

ASHRAE Datacom Series 9

American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

the green grid™ get connected to efficient IT

Chapter 1: Introduction

Chapter 2: How, What, & Where To Measure

Chapter 3: Measurement Devices

Chapter 4: Measurement Collection Systems

Chapter 5: Air Handlers

Chapter 6: Computer Room Units

Chapter 7: Pumps

Chapter 8: Cooling Towers

Chapter 9: Chillers

Chapter 10: Heat Exchangers

Chapter 11: Introduction To Critical Power Distribution

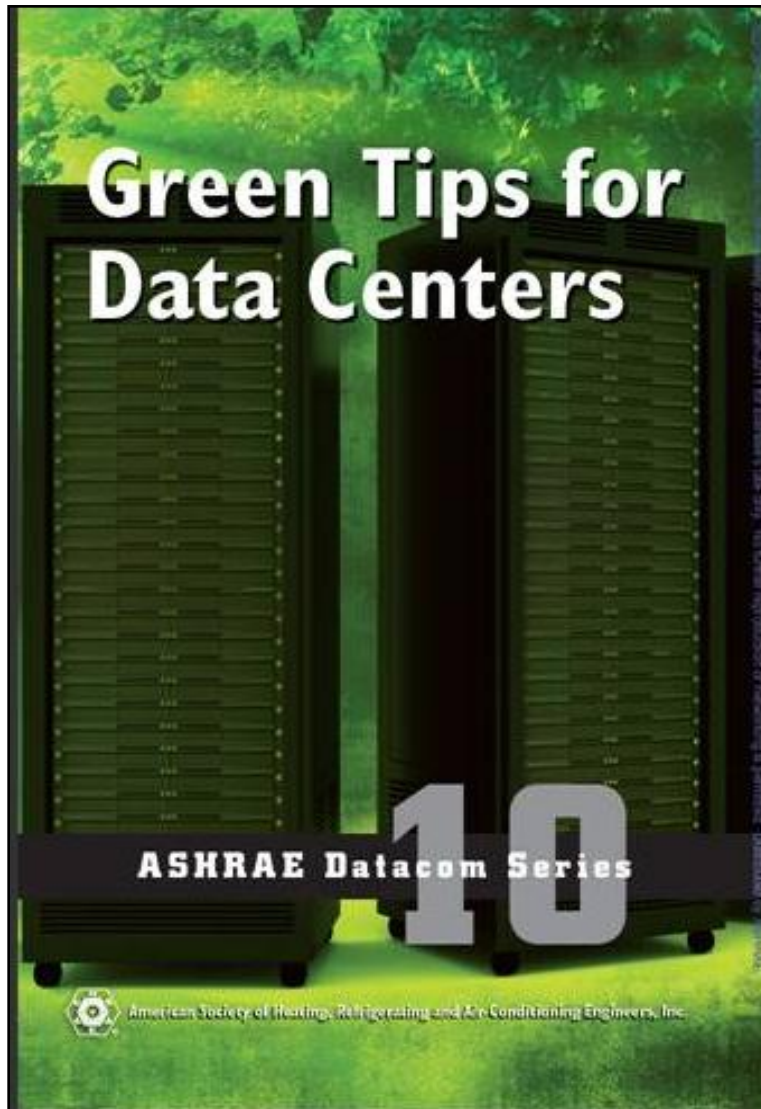Chapter 12: Upstream Critical Power Distribution

Chapter 13: Uninterruptible Power Supply
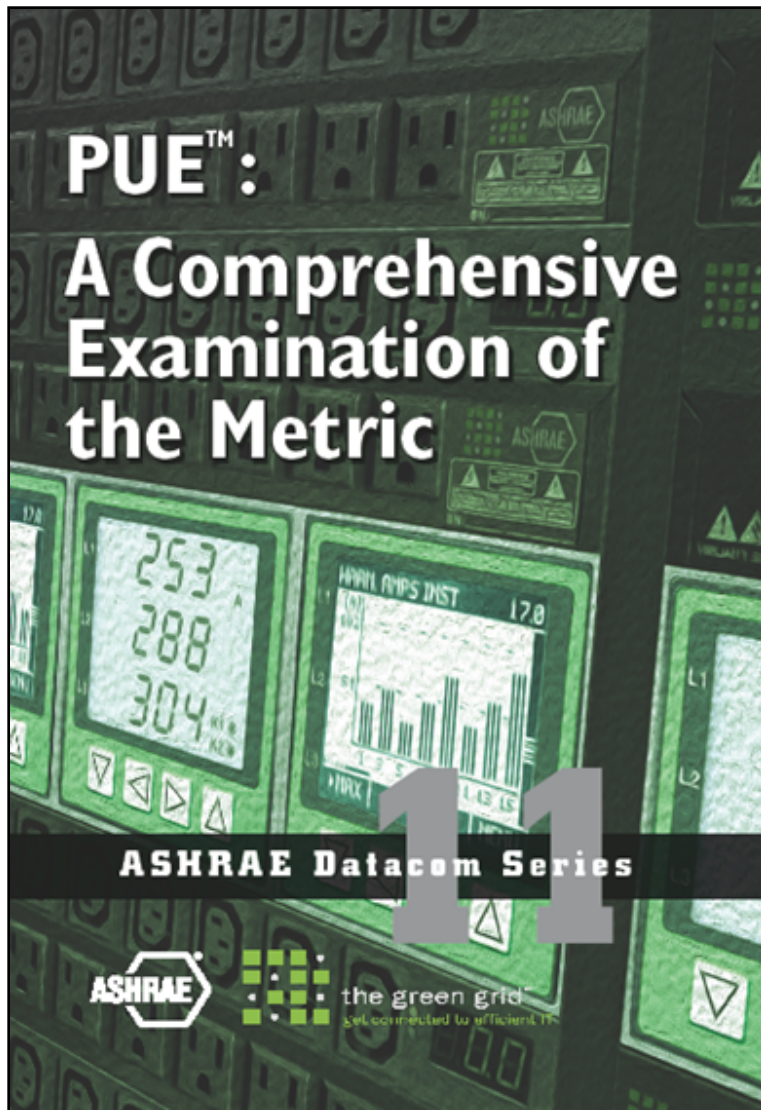
Chapter 14: Computer Room Transformer & PDU

Chapter 15: Compute & Storage Systems

Chapter 16: Networking Systems

Appendices A – F

Chapter 1: Energy Management

Chapter 2: Environmental Conditions

Chapter 3: Air Management

Chapter 4: Cooling Plant

Chapter 5: IT Power Distribution

Chapter 6: Lighting

Chapter 7: IT Equipment

Chapter 1: Introduction

Chapter 2: Metric List and Intended Use

Chapter 3: An Overview of PUE

Chapter 4: More About PUE

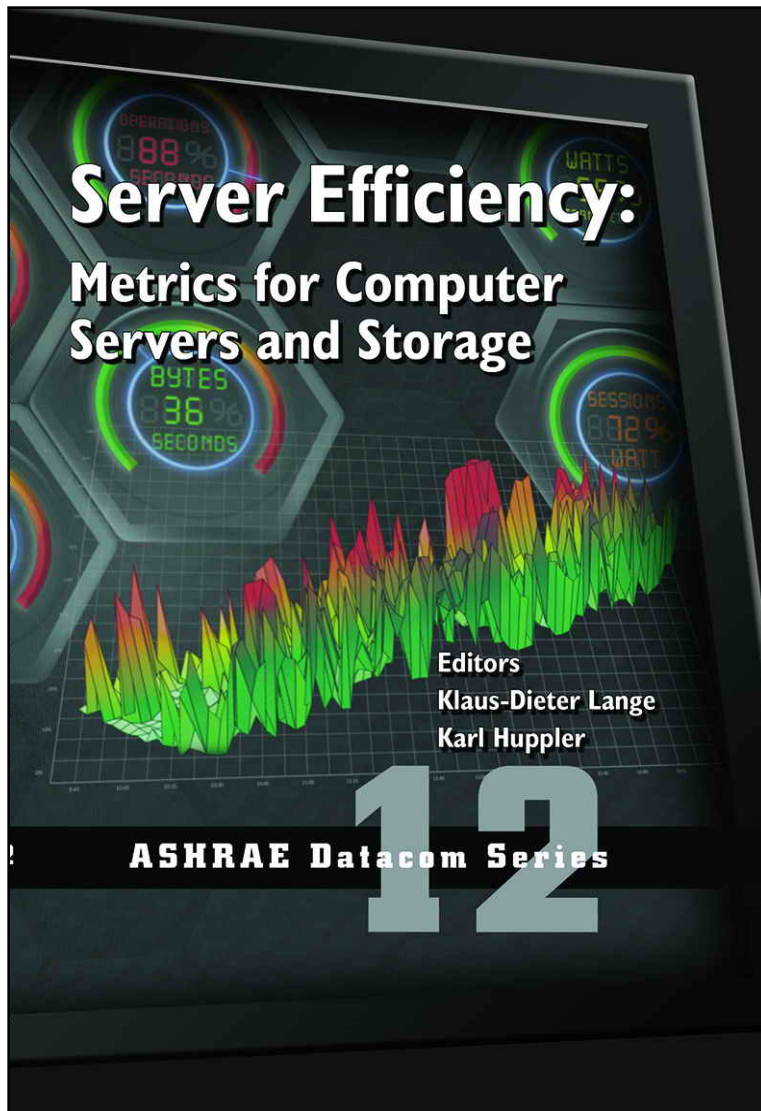Chapter 5: Example Calculations – How to Measure PUE

Chapter 6: How to Report PUE

Chapter 7: Partial PUE

Chapter 8: PUE Scalability and Statistical Analysis

Chapter 9: Conclusions

Chapter 1: Introduction

Chapter 2: SPEC Power and Performance Benchmark Methodology

Chapter 3: SPEC PTDaemon

Chapter 4: SPEC Benchmarks
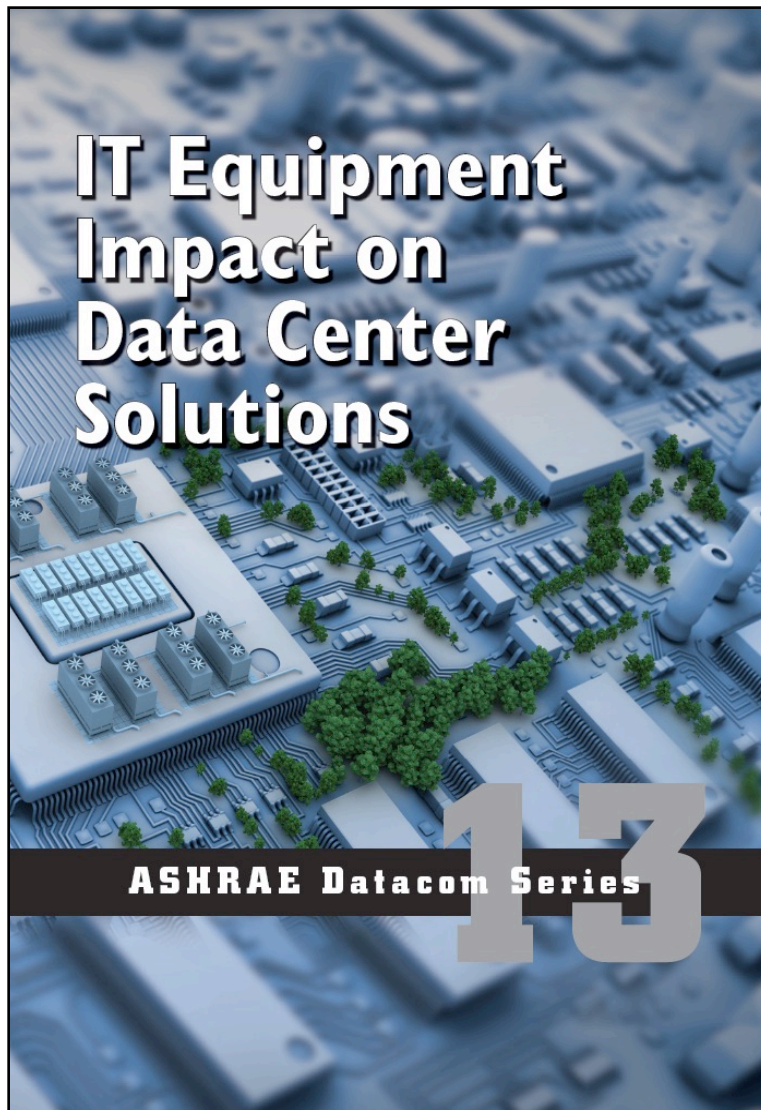
Chapter 5: TPC-Energy

Chapter 6: VMware Vmmark

Chapter 7: SAP Power Benchmarks

Chapter 8: Storage Energy Benchmarks

Chapter 9: Server Efficiency Rating Tool (SERT)

Chapter 10: Worldwide Regulatory and Standards Organizations

Appendix A - B

Chapter 1: Introduction

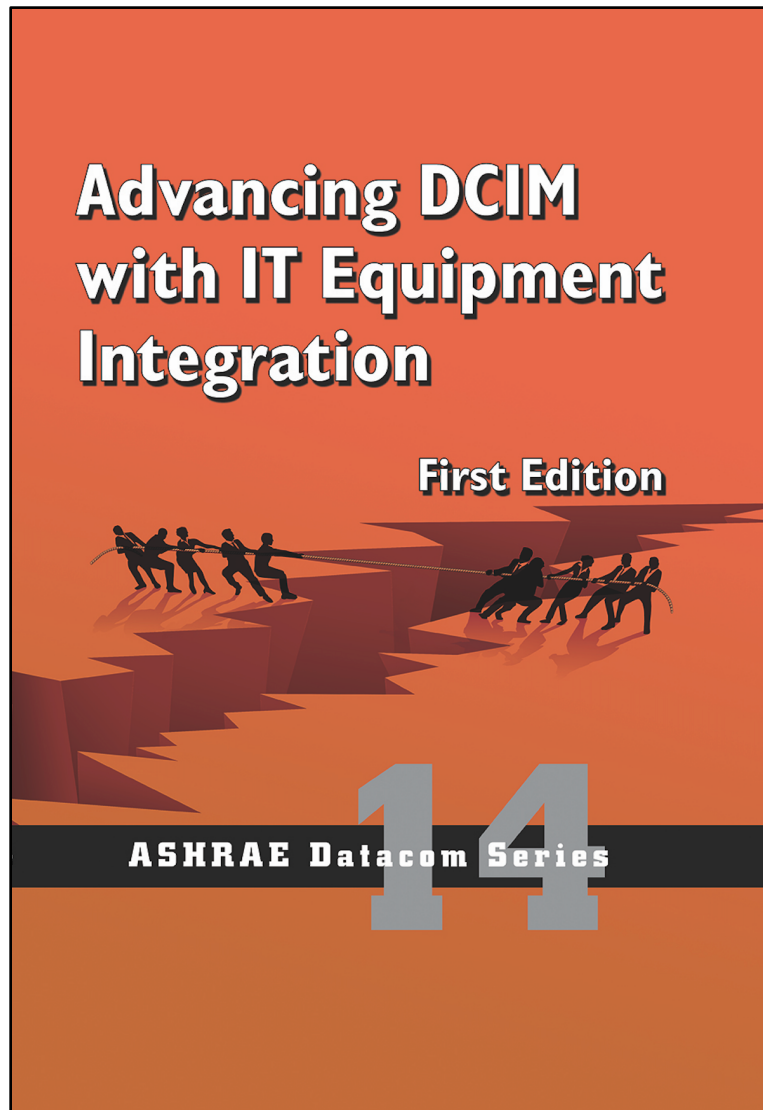Chapter 2: IT Equipment

Chapter 3: ITE Thermal Design

Chapter 4: Interactions between IT & the Data Center

Appendix A: Component Thermal Design

Appendix B: System Thermal Design

Appendix C: IT Telemetry Use Cases

Advancing DCIM with IT Equipment Integration

First Edition

ASHRAE Datacom Series

14

Chapter 1: Introduction

Chapter 2: DCIM Overview

Chapter 3: ASHRAE DCIM Compliance

Chapter 4: DCIM Connected Framework

Chapter 5: Using Measured and Model-Based Data

Chapter 6: DCIM Use Cases

Appendix A: DMTF Redfish Sensor Mapping for IT Equipment

Appendix B: Data Center Performance Metrics

Special Discount for Datacom Series

01 – 09 copies   No discount

10 – 99 copies   50% off list price

100+ copies   60% off list price

Special discount pricing applies to combination and single title purchases of the Datacom Series titles. To place your order, please contact the Inventory and Subscriptions Manager, Kimberly Gates:
- Phone: 678-539-1152(direct)
- Fax: 678-539-2152
- E-mail: kgates@ashrae.org

- 90577- Thermal Guidelines for Data Processing Environments, 4th   List- $59

- 90451- DataCom Equipment Power Trends and Cooling Applications, 2nd   List- $59

- 90445- Design Considerations for DataCom Equipment Centers, 2nd   List- $59

- 90564- Liquid Cooling Guidelines for DataCom Equipment Centers, 2nd   List- $59

- 90429- Structural and Vibration Guidelines for DataCom Equipment Centers   List- $59

- 90447- Best Practices for DataCom Facility Energy Efficiency, 2nd   List- $59

- 90441- High Density Data Centers   List- $59

- 90568- Particulate and Gaseous Contamination in Datacom Environments, 2nd   List- $59

- 90446- Real-Time Energy Consumption Measurements in Data Centers   List- $59

- 90554- Green Tips for Data Centers   List- $59

- 90282- PUE™: A Comprehensive Examination of the Metric   List- $59

- 90457- Server Efficiency—Metrics for Computer Servers and Storage   List- $59

- 90462- IT Equipment Design Impact on Data Center Solutions   List- $59