Welcome!

Welcome to the ASHRAE TC 9.9 Hybrid In-Person/Virtual Meeting!

No need to say hello, we will begin promptly at 2:30 pm CDT

High Level Agenda

- Welcome
- Hybrid Meeting Etiquette
- Introductions
- Membership
- Title, Purpose & Scope
- Liaison Reports
- Research
- IT Subcommittee
- Encyclopedia Work Session

Housekeeping

Audio

- Attendees are muted upon entry
- Do not un-mute your line
- If you are joining via computer and phone line, ensure both are muted

Video

- We encourage you to keep your video off
- If you do enable your video, be mindful that you are on display! Turn off your video when needed.

Q&A

- Use the chat function to ask questions
- Our moderator will share questions throughout the presentation with the speaker to answer.
- If you need to speak, please use the Raise Hand button and the moderator will enable your microphone.

Attendance

- Please complete the attendance form found at the URL at the bottom of this slide or use the QR code below.

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

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

ASHRAE Summer Conference 2024
Main Meeting
Hybrid In-Person/Virtual

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

Agenda

Topic		Time	Presenter(s)	In-Person or Virtual
Welcome	Welcome, Agenda Review, Hybrid Meeting Etiquette	5	Matt Koukl	IP
Introductions	Introductions of All In-Person Attendees, Officers, Voting Members and Subcommittee Chairs	10	Matt Koukl	IP
TC Activity	Status of Voted on Topics	5	Matt Koukl	IP
Membership	Details of TC 9.9 Membership	5	John Groenwold	IP
	Special Topic	5	Matt Koukl/Ben Dolcich	IP
Handbook	Handbook Update	10	Robert McFarlane/ Jonell Watson	IP
Liaison Reports				
	Standard 90.1	5	Rick Pavlak	IP
	SPC-127 / AHRI 1360	5	David McGlocklin	IP
	Decarbonization Task Force	5	Lixia Wu	IP
	International	5	Don Beaty	IP
Webmaster	Website	10	Ecton English	IP
Research	Research Update	10	Mark Seymour	IP
Break		20		
IT Subcommittee	Liquid Server Thermal Template	15	Dustin Demetriou	IP
	S-Class Definition and Addition of S20/25	15	Paul Artman	IP
	Thermal Guidelines Tech Brief	10	Mark Seymour/ Dustin Demetriou	IP
	IT Equipment Power Trends	10	Mark Steinke	IP
	Chip BC for Cold Plate	5	Mark Steinke	IP
Publications	ASHRAE TC 9.9 Data com Encyclopedia	30	Dustin Demetriou	IP
	Encyclopedia Worksession	60	All	IP
	Total Time:	245	Minutes	

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

Virtual Meeting Etiquette

- Do not share your video due to the high number of virtual participants.
- Prior to speaking individuals should state their name so that others know who is speaking and speak into a microphone.
- Virtual participants should keep yourself muted unless giving permission to speak by the Host via chat.
- Please do not attempt to share your screen without being asked to do so by the Host or Co-Host.
- In-person participants are discouraged from joining the virtual meeting due to wireless bandwidth constraints.

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

Virtual Meeting Housekeeping

Virtual Host: Vice Chair - Mark Steinke

- Monitor the chat thread for questions and comments.
- Mute and Unmute Virtual Participants and Guests.
- Manage discussions and voting.
- Manage screen-sharing and in-person presentation

Virtual Co-Host: Secretary - John Gross

- Monitor time and keep the meeting on schedule.
- Record the event.
- Produce meeting minutes.
- Will repeat the attendance link multiple times during the meeting and upon chat request.
- Respond to audio problems.

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

In Person Setup

- Video projector that displays the presentation being shared virtually.
- Be aware that chat comments sent to the Host may be seen by those in-person in addition to general chat comments.
- There are audio speakers in the room but unmuted virtual commentators may not be immediately connected. Please be patient.

Attendance

ASHRAE TC 9.9 Attendance Record

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

2024 Summer Meeting

Programs, Research, & Publications
Hybrid Event Timing: Sunday June 23, 2024; 6:00-8:00 pm EDT
Event Address: https://www.microsoft.com/microsoft-teams/join-a-meeting
Meeting ID: 282 351 545 380
Passcode: h7fwVb
Physical Meeting Room: Indianapolis Marriott, Indiana E (1)

Main Meeting
Hybrid Event Timing: Monday June 24, 2024 ; 2:30 - 7:00 pm EDT
Event Address: https://www.microsoft.com/microsoft-teams/join-a-meeting
Meeting ID: 279 454 711 503
Passcode: DqcYw7
Physical Meeting Room: Indianapolis Marriott, Indiana ABC (1)

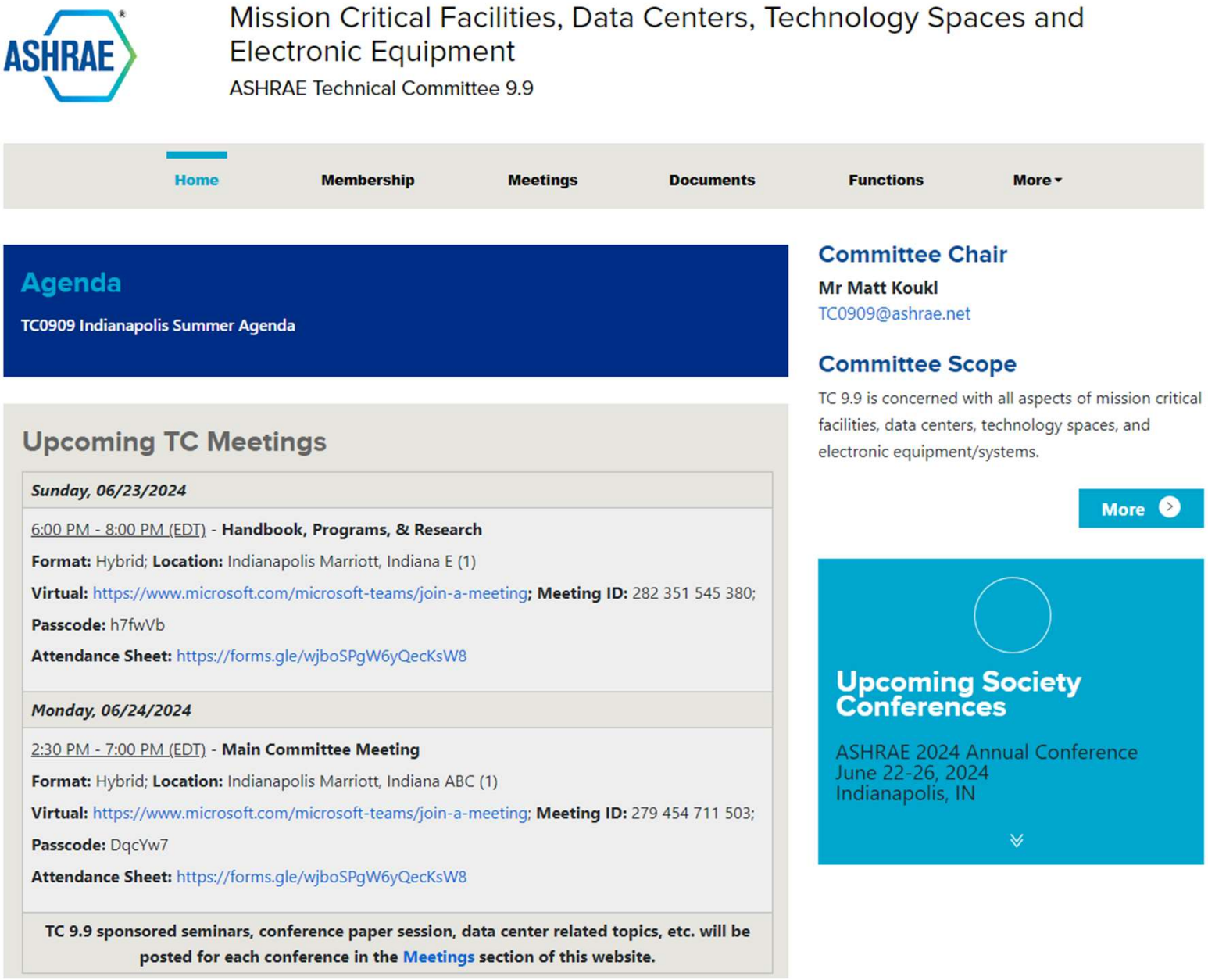
Contact us at tc99chair@gmail.com
Technical Committee Website: http://tc0909.ashraetcs.org

Attendance is being recorded using a Google Form. Please make sure you complete the form at:

https://forms.gle/tD3sKPS83kAZpgwAA

Or use the QR Code below:

TC 9.9 Webpage



http://tc0909.ashraetcs.org

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

ASHRAE TC 9.9 Overview

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

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

Introductions

- In Room Only
  - Name
  - Business Title
  - TC Membership Status:
    - Voting Member
    - Corresponding Member
    - Provisional Corresponding Member
    - Guest
  - TC Leadership & Subcommittee Membership
    - Subcommittee Chair
    - Liaison
    - Subcommittee membership

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

Join TC 9.9

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

ASHRAE Technical Committee 9.9

Home | Membership | Meetings | Documents | Functions | More

Member Roster

Join TC 9.9

Current as of 6/23/2024

If you want to become a provisional corresponding member of this TC, click on the "Join TC" button above. You will be automatically added to the roster and will receive all TC communications.

Committee members can download a copy of the complete roster in any of three formats by logging in to their ASHRAE member account, clicking on my account and selecting Committees.

A provisional corresponding member is a two year appointment. Once you demonstrate your engagement by participating in one or more of our subcommittees your membership will be changed to corresponding member. Once a corresponding member, based on your level of interest, participation, and engagement you can be considered for becoming a voting member of TC 9.9

http://tc0909.ashraetcs.org/membership.php

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

Join TC 9.9

Technical Committees
Provisional Corresponding Member Registration

If you do not have an ASHRAE ID, not applying for ASHRAE membership, and are applying for a position that requires an ASHRAE bio to be on file, please click here to request an ASHRAE ID. You may also use this link if you already have an ASHRAE ID as a non-member, but you no longer have a record of your number.

Please enter BOTH of the following:

ASHRAE ID

AND

Email Address Used In Bio

Get My Info

My Info

Name

Address

City State Zip

Committee Selection (You may select up to 3 Committees to serve on)

Available Committees

Committee Description

Scope

Add Selected

My Selections

Once you have added the committees you wish to join, please select the "Join Now" button below and you will immediately be appointed as a Provisional Corresponding Member.

The acceptance of provisional corresponding membership implies participation in committee activities through correspondence or in-person involvement. Provisional corresponding members serve 2 year terms. Although provisional corresponding members are not voting members, at the end of your term and based on participation in the committee, you may be considered for future voting membership.

Some of your information may be made publicly available, such as name and company name. Please review the ASHRAE Privacy Policy before joining. Questions regarding your privacy may be sent to GDPR@ashrae.org

Notification of acceptance to a TC is emailed upon completion.

Join Now

https://eweb.ashrae.org/eweb/TS_ProvisionalSignup.html

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

Membership

- Provisional Corresponding Members
  - Additions to Roster between roster update cycles.
  - Roster update always due Tuesday following main meeting during Winter Conference.
  - Usually at the request of someone wanting to participate.
  - If no action by TC leadership dropped from Roster after 2 years.
- Corresponding Members
  - Expected to participate in TC activities.
  - Attend Meetings when possible.
  - May serve as Vice-Chair or Secretary of TC if they attend meetings regularly.
  - Can be Voting Members.
  - Can serve as a subcommittee chair.

Keep Your ASHRAE Profile Updated!

TC 9.9 Officers and Subcommittee Chairs

Chair
Matt Koukl
Affiliated Engineers, Inc.

Vice-Chair
Mark Steinke
NVIDIA

Secretary
John Gross
J. M. Gross Engineering

Publications Chair
Don Beaty
Retired Founder/CEO of DLB Assoc.

Research Chair
Mark Seymour
Cadence

ITE Subcommittee Chair
Dr. Roger Schmidt
IBM Fellow Emertius & Syracuse U.

Standard Subcommittee Chair
Rick Pavlak
Heapy Engineering, Retired

Programs Chair
Eric Yang
Vantage Data Centers

Handbook Chair
Robert McFarlane
Shen Milsom & Wilke, LLC

Webmaster
Ecton English
U.S. Department of Defense

Marketing Subcommittee Chair
Paul Finch
KAO Data

Membership Chair
John Groenewold
Vantage Data Centers

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

Voting Members

1. Matt Koukl, Affiliated Engineers, Inc.
2. Nick Gangemi, Microsoft
3. Rick Pavlak, Heapy- Retired
4. Mark Steinke, NVIDIA
5. Paul Finch, KAO Data
6. Mark Seymour, Cadence Design Systems
7. Jason Matteson, Iceotope Technologies
8. David Quirk, DLB Associates
9. Joe Prisco, IBM
10. Bob McFarlane, Shen Milsom & Wilke
11. Lixia Wu, Cushman & Wakefield

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

2024 Votes

Vote	Date	Approved
Vote on TC 9.9 sponsoring a research topic titled “RTAR - Data Center Direct-to-Chip Liquid Cooling Resiliency”	03/14/24	Yes
Vote on RP-1956: Compact CFD Modeling Guidance for Thin Flow Resistances	03/14/24	Yes

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

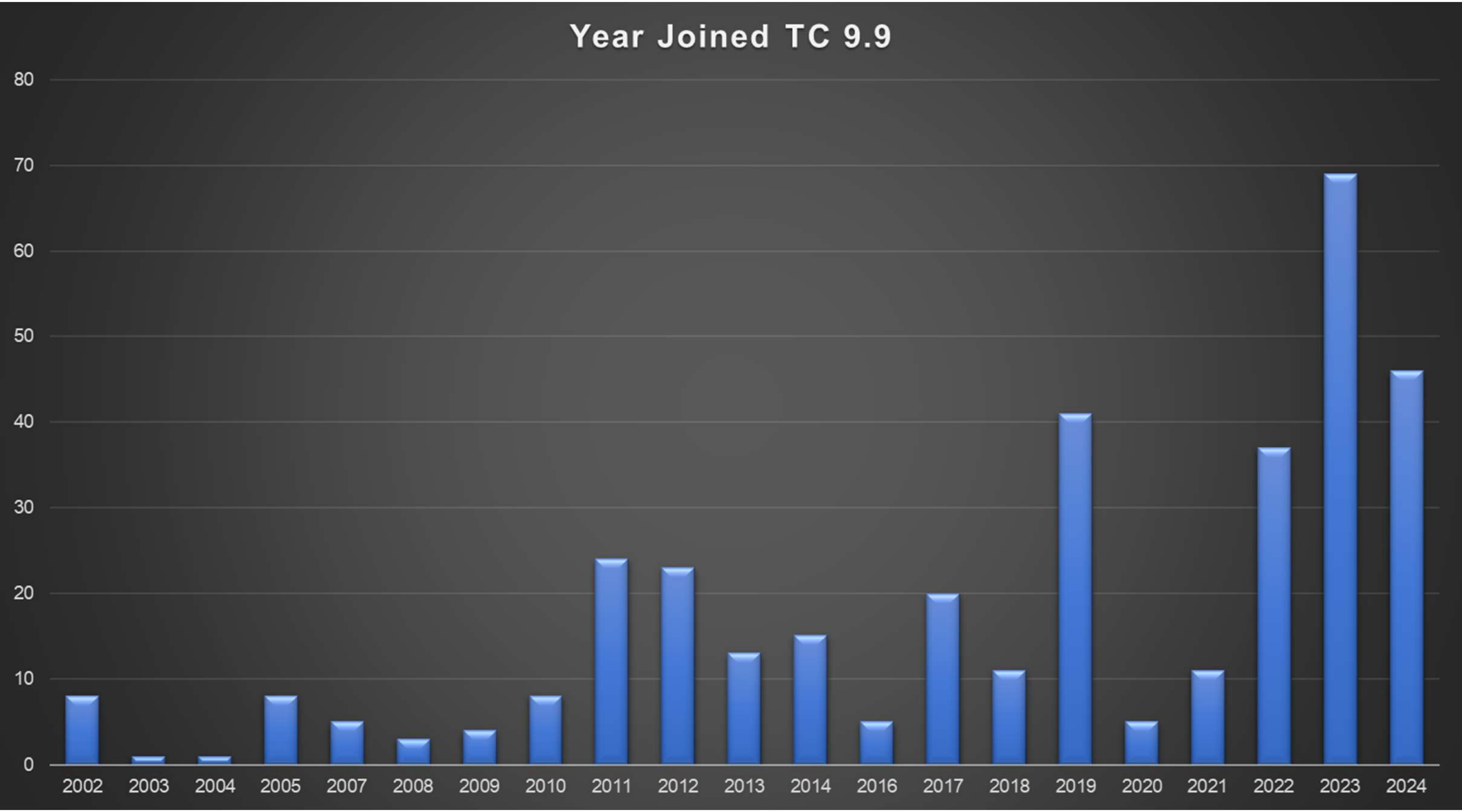
Membership

UPDATE

Membership	Quantity
Board & Chairs	14
Corresponding Members	365
Provisional Corresponding Members	139
Total	518
YEA	67

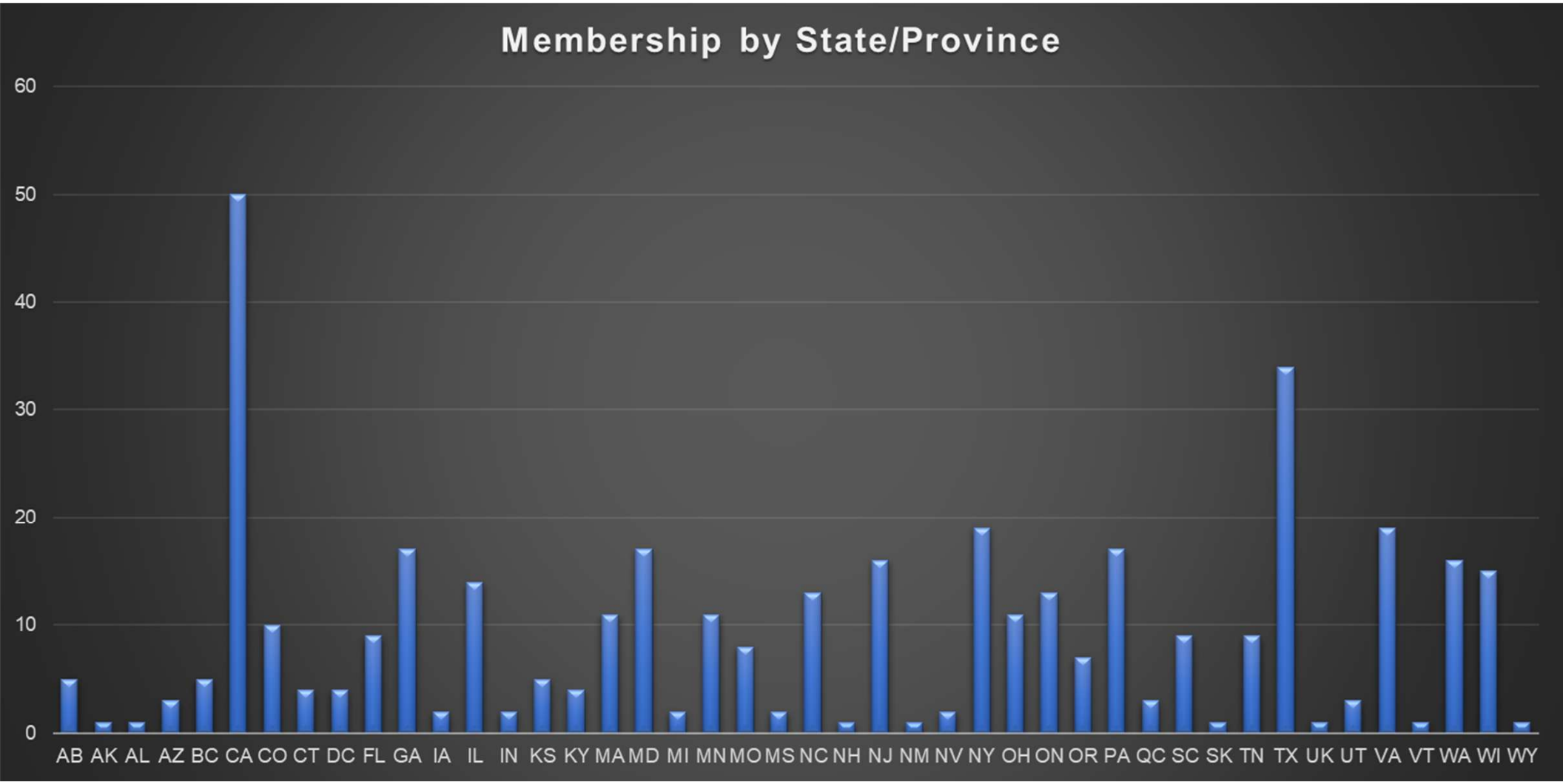
Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

Membership- Year Joined TC 9.9



Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

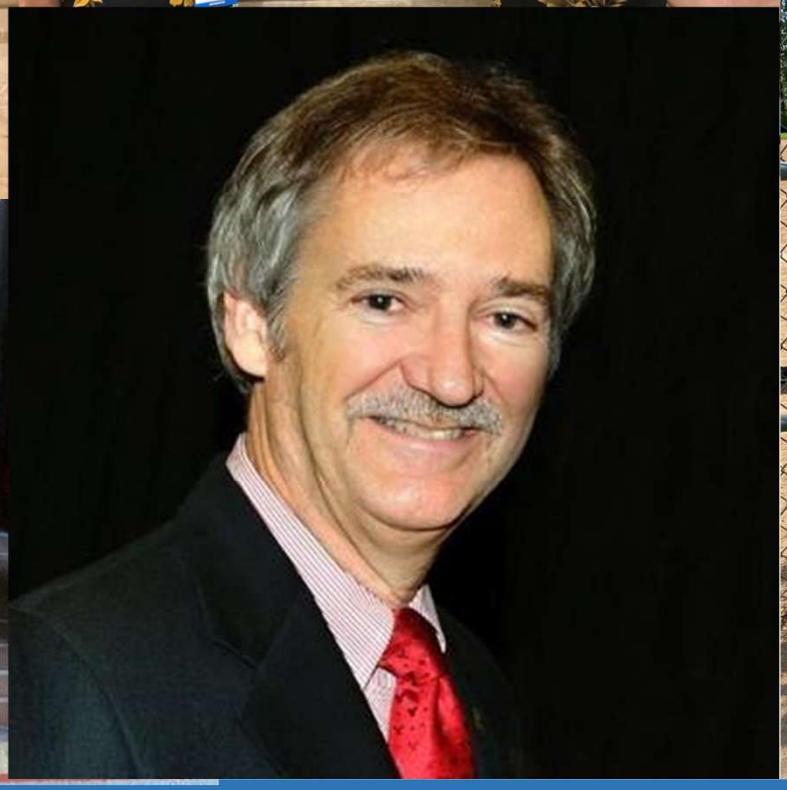
Membership- Member Location



International	121

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

IN MEMORY OF DAVE KELLEY



Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

Dave Kelley Fun Facts

2 daughters / 1 granddaughter

The Ohio State University

Unequivocal / Unapologetic Disney Aficionado

Softball Extraordinaire

40+ years at Liebert/Emerson/Vertiv as Application Engineering Manager and Marketing Director

Chairman, AHRI Datacom Product Group

ASHRAE SPC 90.4 Charter Member

90.4 Marketing Working Group Chair

Special Topic

David Forest Kelley

September 13, 1949 — June 9, 2024

David F. Kelley, 74, passed peacefully at Kobacker House on Sunday, June 9th, 2024.

He is survived by his wife of 46 years, Sandy, his two daughters Courtney, Whitney (Joey) Mayo, his granddaughter Reagan, and his sister Denise (Guy) Edington.

Dave graduated from Ohio State University with a degree in mechanical engineering. He worked at Liebert (Vertiv) for more than 35 years. He was admired, commended and honored in his field of work.

Dave was an avid Disney, softball, classic car and racing fan. He had a heart of gold and was always taking care of others. He will be greatly missed by those who knew him.

Please join us for a service from 2-3 pm and a celebration of Dave's life from 3-6 pm, July 21st at the Church of the Messiah in Westerville.

Donations may be made in his name to Glioblastoma Foundation or Kobacker House - Columbus, Ohio.

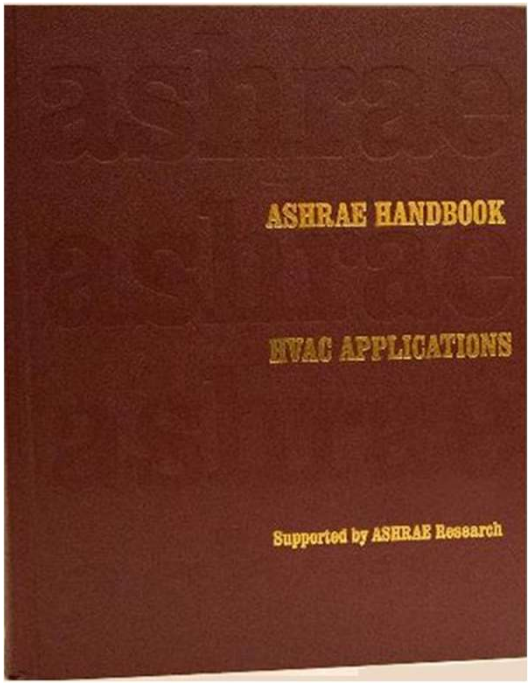
To order memorial trees in memory of David Forest Kelley, please visit our tree store.

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

ASHRAE Handbook “Applications”

Chapter 20

“Data Centers & Telecommunication Facilities”



Background

- ASHRAE's Handbooks - Four Publications
    - Fundamentals
    - Refrigeration
    - **Applications**
    - HVAC Systems and Equipment
  - Published on four-year cycle
- TC9.9's Responsibility: Chapter 20 of "Applications"
  - "*Data Centers and Communications Facilities*"
- All revisions on a volunteer basis through TC9.9

Current Status

- The Applications Handbook last published 2023
- The Handbook revision cycle has already started!
- **Draft Revisions due April 1, 2026 to prep for 2027 Edition**

(It Will Come Faster Than You Think!)

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

Review Plan

1) Sign-up Sheet #1:
   - **Cross-check Ch. 20 content with other Handbook chapters**
     - ASHRAE Wants To Reduce Duplication & Book Sizes
     - Coordinate With Other TC's to Ensure Proper Coverage

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

Sample Sign-up Sheet #1: Cross-check Ch. 20 Against Handbooks

Ch20 content listed in chronological order

Section to write in which Handbook, Chapter, and governing TC are relevant

Describe how other Handbook Ch content is related

Include your name and contact to volunteer as a reviewer

APPLICATIONS HANDBOOK CH 20 HANDBOOK COMPARISON SIGN-UP SHEET

	OTHER LOCATIONS			REVIEWS	REVIEWERS	
TOPICS	BOOK	CHAPTER	TC	COMMENTS**	NAME	EMAIL
1. OVERVIEW & DEFINITIONS						
OVERVIEW						
DEFINITIONS						
2. DATACOM EQUIPMENT, POWER TRENDS, AND ENVIRONMENTAL GUIDELINES						
2.1 DATACOM EQUIPMENT WORKLOAD						
Load Characterization						
2.2 DATACOM EQUIPMENT RACKS						
2.3 DATACOM EQUIPMENT (HARDWARE)						
Server Classifications						
Datacom Equipment Airflow						
Liquid-Cooled Datacom Equipment						
Contamination						
Environmental Guidelines for Air-Cooled Equipment						
Controlling Temp. & Moisture in Datacom Environment for High Reliability						
Environmental Guidelines for Liquid-Cooled Equipment						
Datacom Equipment Nameplate Ratings and Manufacturers' Heat Release						
Power Trends						

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

Review Plan

1) Sign-up Sheet #2:
   - **Need Primary Reviewers for Each Topic**
   - Each Topic in Each Chapter Section Has Been Listed
     - Topics Already Covered Have Been Greyed-out
     - Includes Figures, Tables, References, Definitions, and Bibliography
   - **Goal #1: Identify Extent of Probable Revisions**

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

Sample Sign-up Sheet #2: Review Existing Ch.20 Content

Ch20 content listed in chronological order

Suggestions for updates to the content (if any)

Include your name and contact to volunteer as a primary (SME) or secondary (support) reviewer

APPLICATIONS HANDBOOK CH 20 CONTENT REVIEW SIGN-UP SHEET

ITEM NO.	TOPICS	v2027 Comments	VOLUNTEER REVISORS	
			PRIMARY	SECONDARY
1	**1. OVERVIEW & DEFINITIONS**			
2	**OVERVIEW**	Review		
3	**DEFINITIONS**	Review		
4	**2. DATACOM EQUIPMENT, POWER TRENDS, AND ENVIRONMENTAL GUIDELINES**			
5	**2.1 DATACOM EQUIPMENT WORKLOAD**	Review		
6	Load Characterization	Review		
7	**2.2 DATACOM EQUIPMENT RACKS**	Review: Change title to Racks & Cabinets?		
8	**2.3 DATACOM EQUIPMENT (HARDWARE)**	Review Intro		
9	Server Classifications	Update?		
10	Datacom Equipment Airflow	Add discussion wrt TOR Switch Extensions? (reverse installation of TOR switch for airflow configuration)		
11	Liquid-Cooled Datacom Equipment	Review		

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

How to Volunteer

1. Sign-Up on the Topic Spreadsheet in-person
2. Also Accessible via http://tc0909.ashraetcs.org/ under "*TC 9.9 2024 Summer Meeting Presentations & Information*"
3. Email us directly:
   - Select Review Topics **by Spreadsheet Line Number**
     - rmcfarlane@smwllc.com
     - Jonell.watson@accenture.com
   - Include Name, Company, and Email Address

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

Who Are These Volunteers

- Michael@entropic.ie
- baron@greencomm-
- alkeshsolanki@icloud.com

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

ADDITIONAL QUESTIONS?

- Please advise Bob McFarlane or Jonell Watson
  - rmcfarlane@smwllc.com
  - Jonell.watson@accenture.com

- QUESTIONS?

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

TC 9.9 Liaisons and Liaison Reports

- Standard 90.1: Rick Pavlak
- Standard 127: David McGlocklin
- AHRI 1360: David McGlocklin
- Decarbonization Task Force: Lixia Wu

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

90.1 Liaison Report

Rick Pavlak

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

90.1 Liaison Report

energycodes.gov — Private

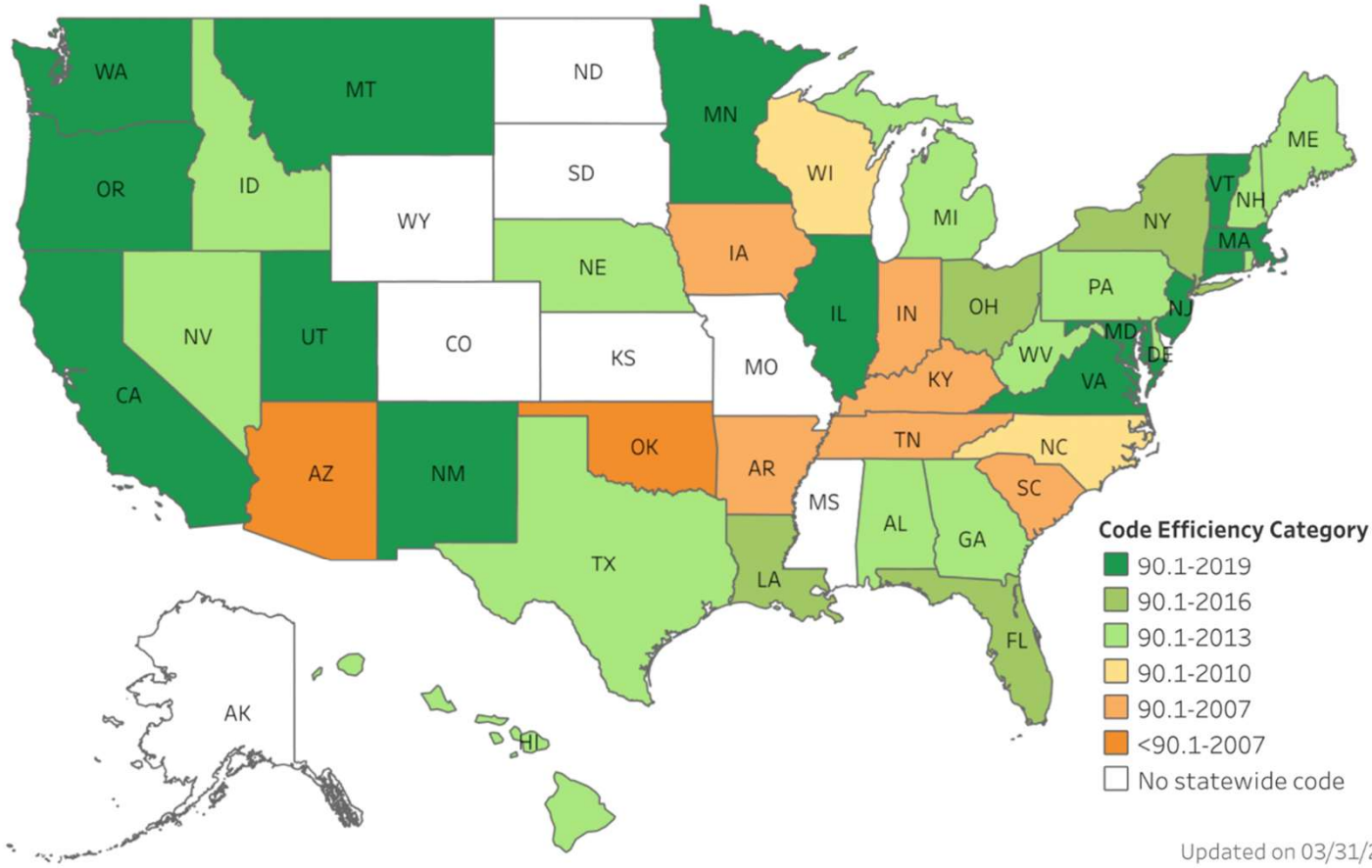
national model energy codes to characterize each state at a specific code equivalency.

Residential Portal | Commercial Portal

Commercial Buildings

State

(All)



Updated on 03/31/24

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

90.1 Liaison Report

energycodes.gov — Private

Table 1. Status of State Energy Code Adoption Map Summary - Commercial

State	Current Commercial Code	Commercial Code Efficiency Category
Alabama	90.1-2013	90.1-2013
Alaska	None statewide	No statewide code
Arizona	Home rule	<90.1-2007
Arkansas	2009 IECC and 90.1-2007	90.1-2007
California	2022 Building Energy Efficiency Standards	90.1-2019
Colorado	Home rule	No statewide code
Connecticut	2021 IECC and 90.1-2019	90.1-2019
Delaware	2018 IECC and 90.1-2016	90.1-2013
District of Columbia	90.1-2013^	90.1-2019
Florida	2021 IECC and 90.1-2019^	90.1-2016
Georgia	2015 IECC and 90.1-2013^	90.1-2013
Hawaii	Home rule	90.1-2013
Idaho	2018 IECC and 90.1-2016	90.1-2013
Illinois	2021 IECC and 90.1-2019	90.1-2019
Indiana	90.1-2007	90.1-2007
Iowa	2012 IECC and 90.1-2010	90.1-2007
Kansas	Home rule	No statewide code
Kentucky	2012 IECC and 90.1-2010	90.1-2007
Louisiana	2021 IECC and 90.1-2019^	90.1-2016
Maine	2015 IECC and 90.1-2013	90.1-2013
Maryland	2021 IECC and 90.1-2019^	90.1-2019
Massachusetts	2018 IECC and 90.1-2016^	90.1-2019
Michigan	2015 IECC and 90.1.2013^	90.1-2013
Minnesota	90.1-2019^	90.1-2019
Mississippi	None statewide	No statewide code
Missouri	Home rule	No statewide code
Montana	2021 IECC and 90.1-2019	90.1-2019
Nebraska	2018 IECC and 90.1-2016	90.1-2013
Nevada	2018 IECC and 90.1-2016	90.1-2013

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

90.1 Liaison Report

energycodes.gov — Private

New Hampshire	2018 IECC and 90.1-2016^	90.1-2013	
New Jersey	90.1-2019	90.1-2019	
New Mexico	2021 IECC and 90.1-2019^	90.1-2019	
New York	2018 IECC and 90.1-2016^	90.1-2016	
North Carolina	2015 IECC and 90.1-2013^	90.1-2010	
North Dakota	Home rule	No statewide code	
Ohio	2021 IECC and 90.1-2019^	90.1-2016	
Oklahoma	2006 IECC and 90.1-2004	<90.1-2007	
Oregon	90.1-2019	90.1-2019	
Pennsylvania	2018 IECC and 90.1-2016	90.1-2013	
Rhode Island	2018 IECC and 90.1-2016^	90.1-2013	
South Carolina	2009 IECC and 90.1-2007	90.1-2007	
South Dakota	Home rule	No statewide code	
Tennessee	2012 IECC and 90.1-2010	90.1-2007	
Texas	2015 IECC and 90.1-2013	90.1-2013	
Utah	2021 IECC and 90.1-2019^	90.1-2019	
Vermont	2018 IECC and 90.1-2016^	90.1-2019	
Virginia	2021 IECC and 90.1-2019^	90.1-2019	
Washington	2018 Washington State Energy Code	90.1-2019	
West Virginia	90.1-2013	90.1-2013	
Wisconsin	2015 IECC and 90.1-2013^	90.1-2010	
Wyoming	Home rule	No statewide code	

*A review of the codes in place in jurisdictions across the state indicates that 86% (Hawaii) and 82% (Arizona) of the population is covered by codes at this level.

**The Washington State Energy Code is based on the 2018 IECC but with significant amendments.

^ When an amendment impacting energy efficiency can be quantified using DOE Prototype Building Models, they were captured in the analysis.

Note:

A home rule state is one where codes are adopted and enforced at the local level. Some home rule states will have a mandate that jurisdictions can go above code but also have to meet a certain minimum code. In general terms, the idea of home rule is defined as the ability of a local government to act and make policy in all areas that have not been designated to be of statewide interest through general law, state constitutional provisions, or initiatives and referenda.

States with extensively different baseline codes for which conducting custom analysis would be cost prohibitive and out of scope of this analysis.

For states adopting both IECC and 90.1, the IECC code is usually analyzed as the state current code in this study except for states with

SSPC 127 & AHRI 1360

David McGlocklin

SSPC 127

Method of Testing for Rating Cooling Equipment Serving Data Center and Other Information Technology Equipment Spaces

Purpose: The purpose of the standard is to establish a uniform method of test requirements for rating cooling equipment that is applied in data center (DC) and other information technology facilities, spaces, and equipment..

Scope: This standard applies to classes of cooling equipment that are used to remove thermal loads in data center (DC) and other information technology facilities, spaces, and equipment.

2024 June Update & Plans:

We have formed and have been operating as new subcommittees:

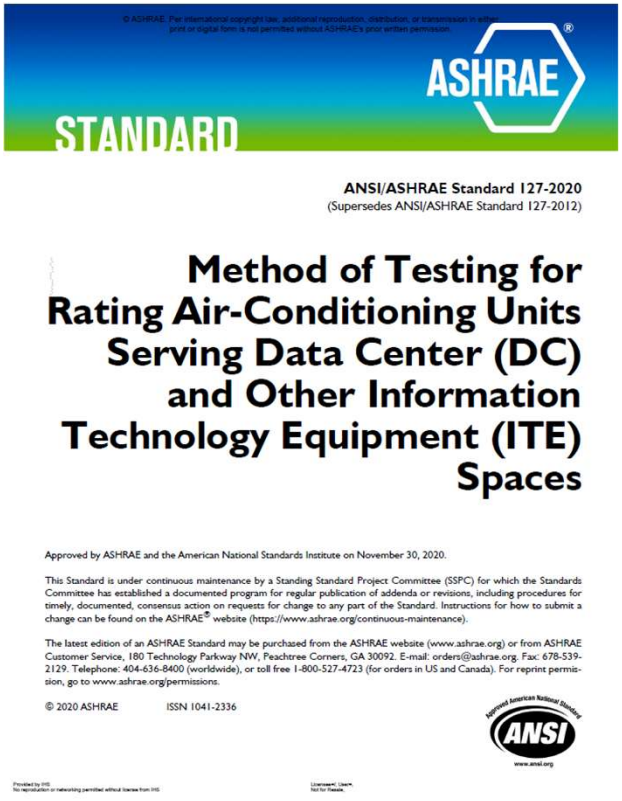
- Air Subcommittee – Chair Dave McGlocklin, Secretary Dave Meadows

- Liquid Subcommittee - Chair Dr. Tim Shedd, Vice Chair John Gross, Secretary Dustin Demetriou

Air Sub has continued to hold joint meetings with AHRI1360 committee and are continuing with our work on the overall harmonization of 127 with AHRI 1360 standard, and ASHRAE 37 – making very good progress.

Liquid Sub has made good progress focusing on the MoT for a Liquid to Liquid CDU and will continue to work on this during the SSPC 127 meeting here in Indy. We are working towards putting something out for public review in the coming months. We will look to enable workgroups to focus on other topologies.

Meeting Tuesday Jun. 25th 8am-12pm (JW Marriott – White River C (1st floor))



Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

AHRI 1360

Performance Rating Standard for Datacom Air-Conditioning Units

Purpose: To establish for Computer and Data Processing Room Air Conditioners (CDPR): definitions; classification; test requirements; rating requirements; minimum data requirements for Published Ratings; marking and nameplate data; and conformance conditions.

Scope: This standard applies to all CDPR units and is intended for the guidance of the industry, including manufacturers, engineers, installers, contractors, users, and regulators.

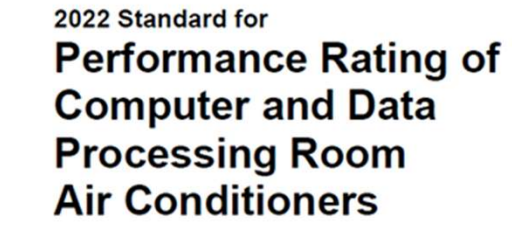
Chair – Dave Kelley **Program Engineer** – Panos Fykas

2024 June Update & Plans:

Committee has had some joint meetings with SSPC 127 Air Subcommittee as we continue to work on harmonization of 127 and AHRI1360 along with ASHRAE 37.

We have completed harmonization work through revisions of AHRI 1360-2022 and are now working on revisions of 127-2020.

We are also committed to working with SSPC127 Liquid Sub on liquid cooling ratings when the sub is ready.



Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

Decarbonization Building Task Force

Lixia Wu

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

Research Update

Mark Seymour

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

Research Updates

- WS -1913 : Study of the Corrosion Impact on Information Technology Equipment in Data Centers Located in Coastal Regions with High Sea Salt Concentration
  - WS-1913 was conditionally approved subject to updates / clarification of the work statement at the winter meeting of RAC
  - Updates were made and submitted to the section 9 research liaison
  - Research liaison believes that WS-1913 is ready for bid and will confirm at RAC meeting
- RTAR-1972/1972-WS Data Center Direct-to-Chip Liquid Cooling Resiliency – Failure Modes and IT Throttling Impacts

Development Options

- Volume Calculations for ITE Cooling Appliances Using ATLs
  - Evaluate the effectiveness of the dilution of the refrigerant charge specified in ASHRAE Standard 15-2022
- Guidelines for Data Center External Airflow CFD Modeling
- TC 4.10 CFD Modeling Guidance For Flow Resistance (TC 9.9 Co- Sponsor)
  - Determine thickness and strength distribution of the momentum source for a thin-resistance compact model to produce best agreement with reality
- Flow Velocity Limits for Erosion Control
  - Develope a current guideline for flow velocity limits to prevent corrosion

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

RTAR-1972/1972-WS Update

- RTAR-1972 Data Center Direct-to-Chip Liquid Cooling Resiliency – Failure Modes and IT Throttling Impacts
- RTAR-1972 Status/ Timeline (written and vetted in Q4 2023, Q1 2024)
- TC9.9 Vote 12-0-0 Yes-12 No-0 Not Returned-0 (Main Sponsor)
- TC4.10 Indoor Air Modeling Yes-9 No-0 Not Returned-2 (Co-sponsor)
- TC7.6 Building Energy Performance Yes-8 No-0 Not Returned-0 (Co-sponsor)
- March 15, 2024 RTAR Submitted to MORTS (RAC)
- May 13, 2024 RTAR Accepted for further development into Work Statement, positive feedback provided

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

RTAR-1972/1972-WS Objectives

- Research failure system design for air/liquid hybrid and liquid cooled equipment using computer models and empirical data
- Examine ITE power and thermal capacitance impact on rate-of-rise and IT Throttling Time
- Look at impact of liquid cooling S-classes on IT throttling time
- Look at impact of secondary loop delta t on IT throttling time
- Look at impact of liquid cooling percentage on IT throttling time
- Look at impact of percentage of secondary loop failure on IT throttling time
- Conduct a comprehensive analysis (modeling + testing) of 30+ combinations
- Look at energy impact of specific liquid cooling systems and S-classes vs. air cooled baseline (metrics to include: MLC, ELC, PUE, and TUE)

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

1972-WS

- Proposed Work Statement (WS) Timeline
  - Now to June 28: Continue review at author/ TC research subcommittee level
  - July 1 -3: Updates to WS
  - July 5 – 19: Review by TC9.9 RAC Research Liaison
  - July 22 – 25: Further Updates to WS
  - July 26 - Aug 9: Review & votes by TC9.9, TC4.10, TC7.6
  - Aug 10 – 14: Minor changes as needed to accommodate TC's
  - Aug 15: Submit to MORTS (RAC)
- Entirety of timeline: Solicit corporate co-sponsorship

Website Update

Ecton English

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

Website Update

All Users | Add comparison +

Pages and screens: Page title and screen class

Add filter +

Views by Page title and screen class over time

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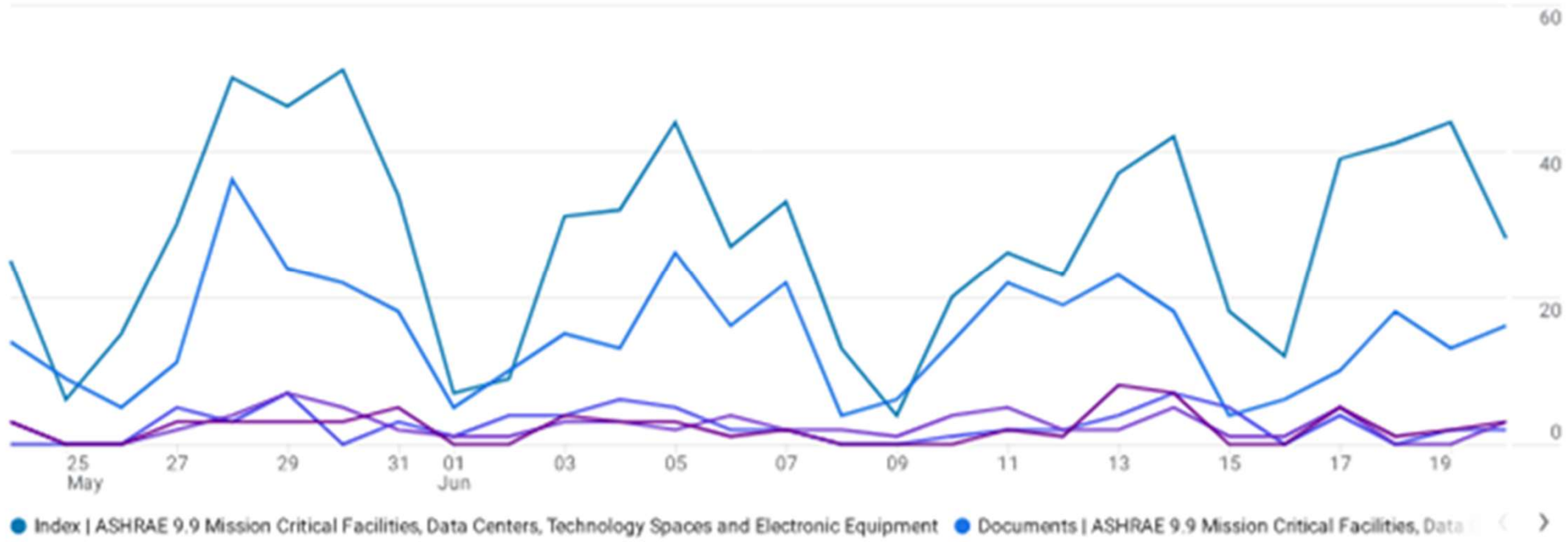

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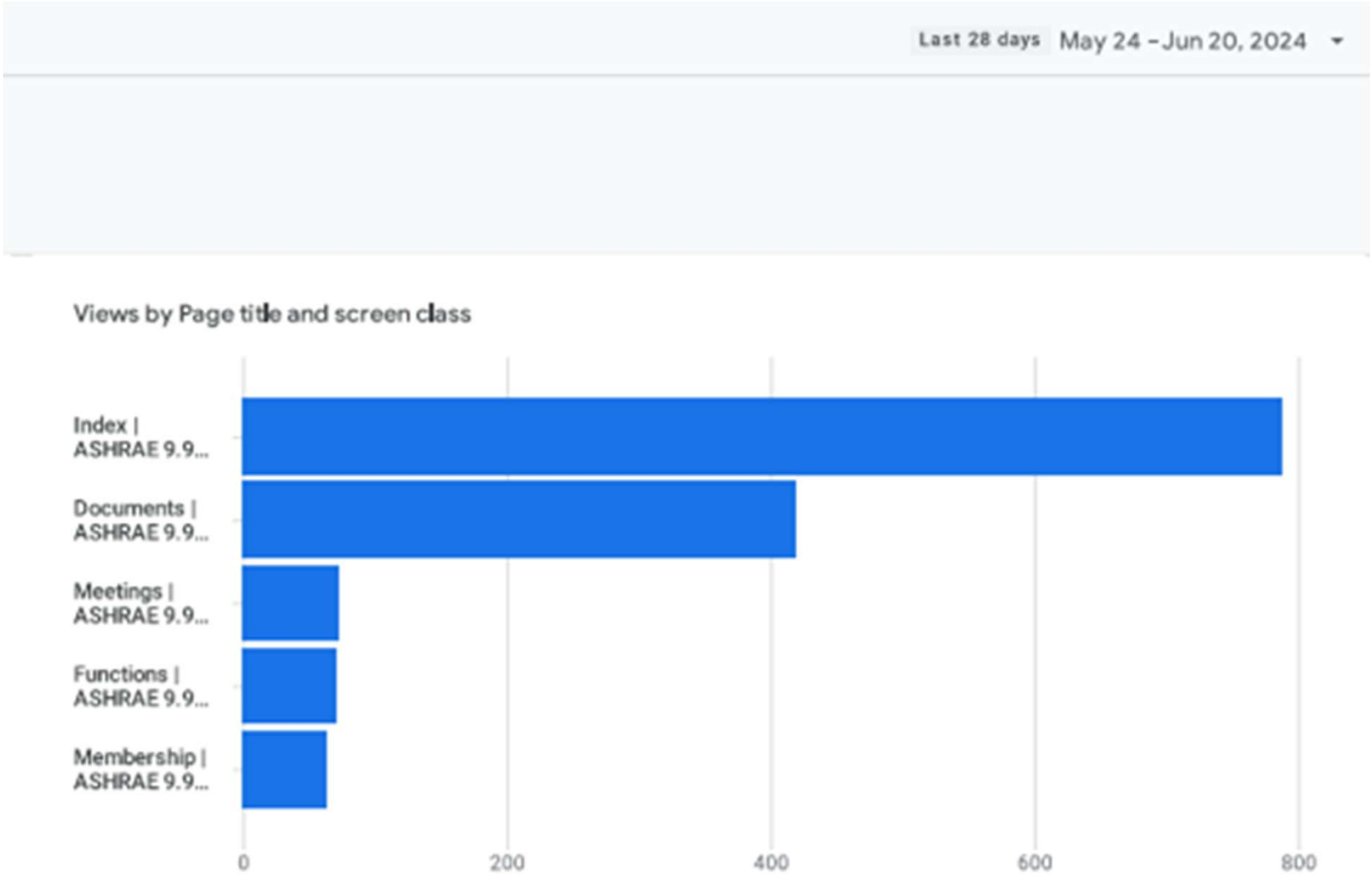
Website Update



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Website Update

9.9

Rows per page: 10

	Page title and screen class	Views	Users	Views per user	Average engagement time	Event count All events
		1,410 14.35% of total	801 21.36% of total	1.76 Avg -32.82%	44s Avg -14.79%	4,848 15.41% of total
1	Index | ASHRAE 9.9 Mission Critical Facilities, Data Centers, Technology Spaces and Electronic Equipment	787	564	1.40	33s	2,816
2	Documents | ASHRAE 9.9 Mission Critical Facilities, Data Centers, Technology Spaces and Electronic Equipment	419	335	1.25	24s	1,430
3	Meetings | ASHRAE 9.9 Mission Critical Facilities, Data Centers, Technology Spaces and Electronic Equipment	71	44	1.61	57s	174
4	Functions | ASHRAE 9.9 Mission Critical Facilities, Data Centers, Technology Spaces and Electronic Equipment	70	54	1.30	39s	217
5	Membership | ASHRAE 9.9 Mission Critical Facilities, Data Centers, Technology Spaces and Electronic Equipment	62	48	1.29	1m 07s	182
6	ListServe Instructions | ASHRAE 9.9 Mission Critical Facilities, Data Centers, Technology Spaces and Electronic Equipment	1	1	1.00	35s	3
7	Indeks | ASHRAE 9.9 Fasilitas Kritis Misi, Pusat Data, Ruang Teknologi dan Peralatan Elektronik	0	1	0.00	1m 14s	2
8	Indice : ASHRAE 9.9 Installations critiques, centres de données, locaux technologiques et matériel électronique	0	1	0.00	31s	1
9	Inhaltsverzeichnis | ASHRAE 9.9 Geschäftskritische Einrichtungen, Rechenzentren, Technologieräume und elektronische Geräte	0	2	0.00	41s	4
10	Reuniões | ASHRAE 9.9 Instalações de missão crítica, data centers, espaços tecnológicos e equipamentos eletrônicos	0	1	0.00	24s	1

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

Attendance

ASHRAE TC 9.9 Attendance Record

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

2024 Summer Meeting

Programs, Research, & Publications
Hybrid Event Timing: Sunday June 23, 2024; 6:00-8:00 pm EDT
Event Address: https://www.microsoft.com/microsoft-teams/join-a-meeting
Meeting ID: 282 351 545 380
Passcode: h7fwVb
Physical Meeting Room: Indianapolis Marriott, Indiana E (1)

Main Meeting
Hybrid Event Timing: Monday June 24, 2024 ; 2:30 - 7:00 pm EDT
Event Address: https://www.microsoft.com/microsoft-teams/join-a-meeting
Meeting ID: 279 454 711 503
Passcode: DqcYw7
Physical Meeting Room: Indianapolis Marriott, Indiana ABC (1)

Contact us at tc99chair@gmail.com
Technical Committee Website: http://tc0909.ashraetcs.org

Attendance is being recorded using a Google Form. Please make sure you complete the form at:

https://forms.gle/tD3sKPS83kAZpgwAA

Or use the QR Code below:

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

ASHRAE Summer Conference
2024
IT Subcommittee
Hybrid In-Person / Virtual

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

ASHRAE TC 9.9 Datacom Encyclopedia

Dustin Demetriou

The [ASHRAE TC 9.9 Datacom Encyclopedia] evolved in 2024 from the longstanding ASHRAE Datacom Series, a series of print books that provides information on data center-related subjects.

The Datacom Encyclopedia offers **updated, previously unpublished content** formerly covered by the Datacom Series books *Thermal Guidelines for Data Processing Environments*, ***Design Considerations for Datacom Equipment Centers***, and ***Liquid Cooling Guidelines for Datacom Equipment Centers***, as well as **PDFs of every edition of the 14 books in the ASHRAE Datacom Series** for historical reference. Over time, the pertinent information from all the books will transition to be housed in this online encyclopedia.

Subscribe today to access the ASHRAE TC 9.9 Datacom Encyclopedia. Access is granted via payment of an annual fee ($33 list price per year / $24 Member price per year).

To enable and disable access to the encyclopedia, visit https://datacom.ashrae.org/ and click Manage Subscription in the top blue bar. Users can review ASHRAE's privacy policy at www.ashrae.org/privacy-policy.

Updates Available on the TC 9.9 Datacom Encyclopedia

Design Considerations for Datacom Equipment Centers

The content previously covered in *Design Considerations for Datacom Equipment Centers* has been almost entirely rewritten to reflect the current trends in the data center industry. Every chapter has had major revisions. The content included on this site provides expanded and new information covering the following topics:

- Design criteria, HVAC loads, HVAC equipment, facility fluid distribution systems, air distribution, liquid cooling, ancillary spaces, contamination, acoustics, structural and seismic design, fire suppression, commissioning, availability and reliability, energy efficiency, and economizers.

Liquid Cooling Guidelines for Datacom Equipment Centers

The content previously covered in *Liquid Cooling Guidelines for Datacom Equipment Centers* has been almost entirely rewritten to include the most current industry thinking and consensus on the need for further guidance on liquid cooling. The content included on this site provides expanded and new information, including the following:

1. A discussion on the IT component power trends that are driving the need for liquid cooling to support the next generation of IT workloads.
2. Introduction of a new set of environmental classes (S Classes) for the supply temperature of the Technology Cooling System (TCS) coolant.
3. Expanded treatment of the differences in fluid quality requirements for the TCS and FWS loops.
4. Details on the design characteristics of conductive cold-plate and immersion cooling systems.
5. Design guidance for air-cooled facilities that are being upgraded to support liquid-cooled IT equipment.

https://datacom.ashrae.org

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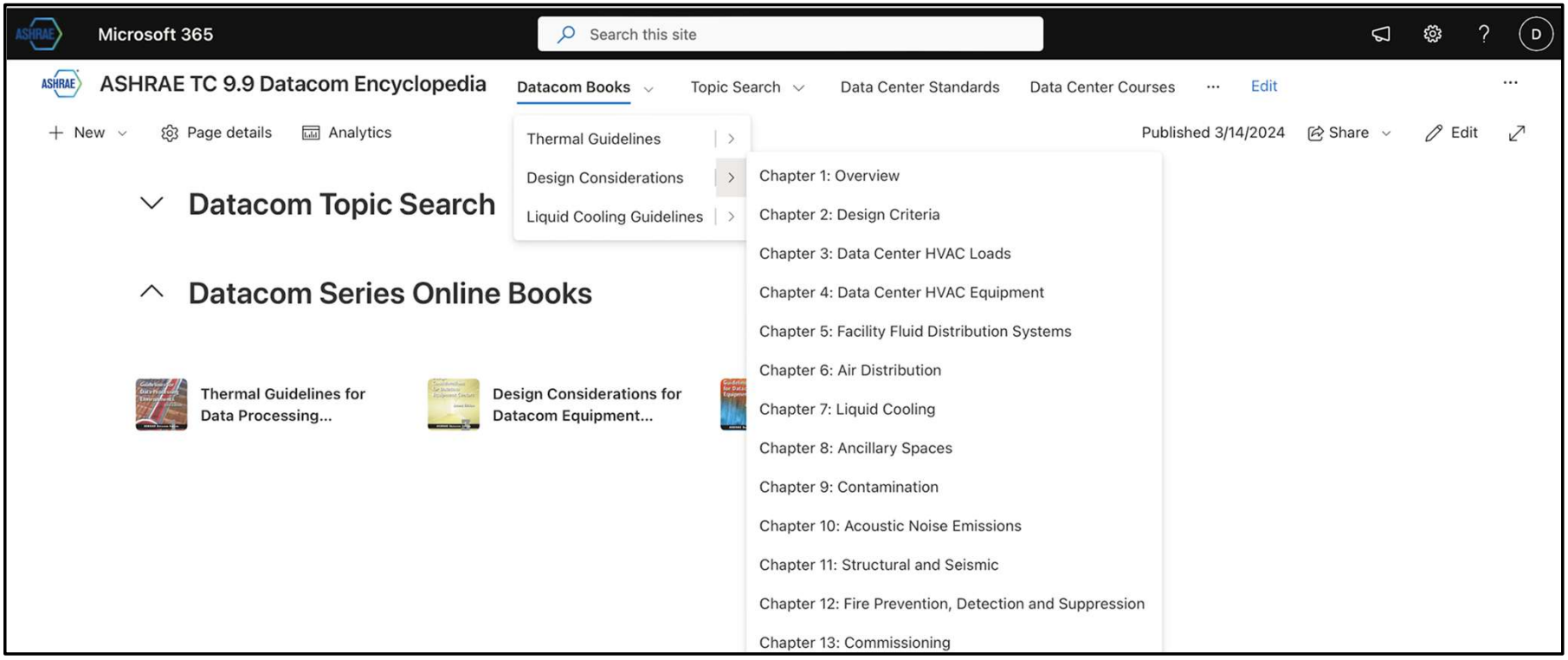
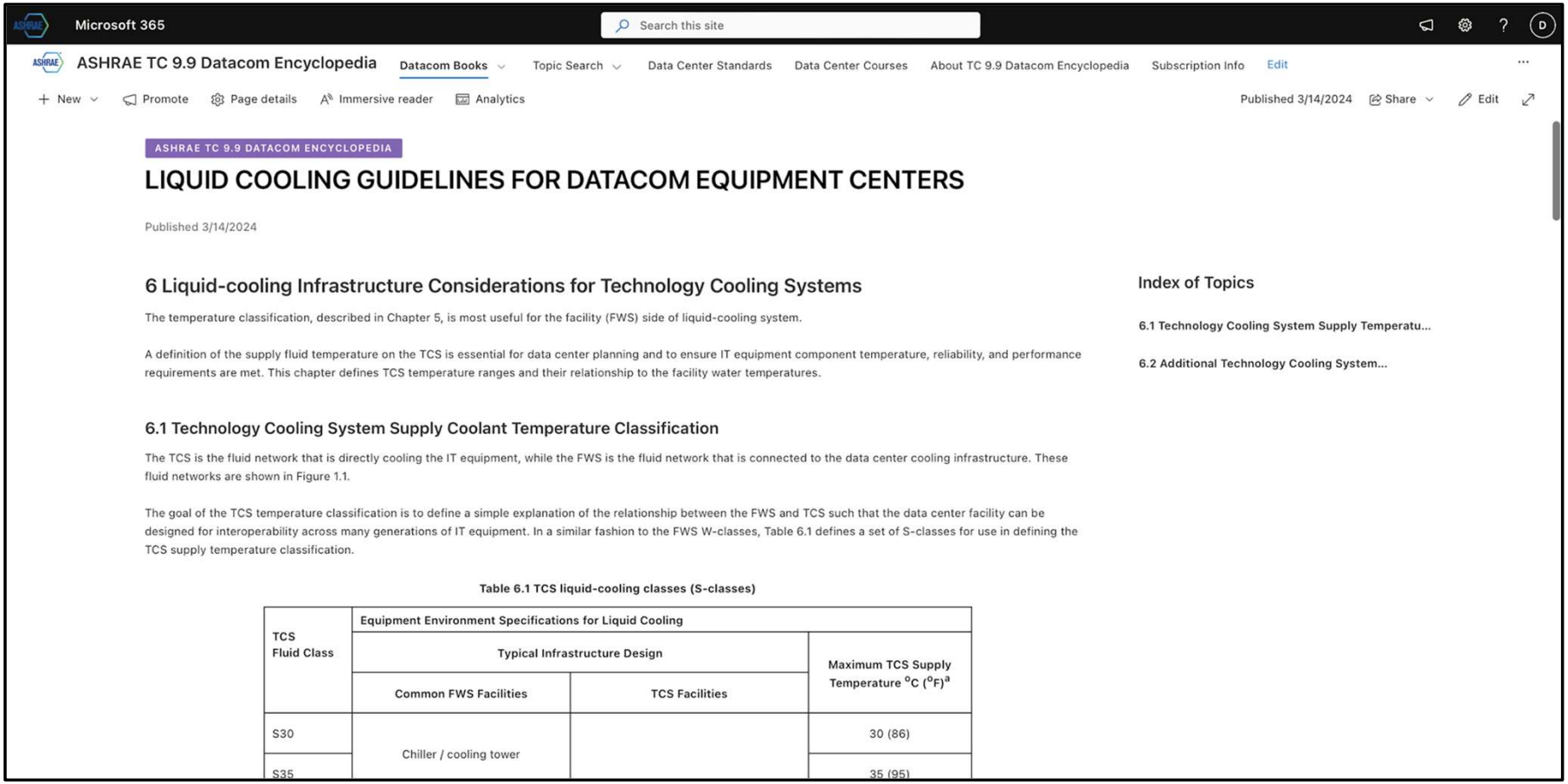


- **Complete, online edition of the three main publications: Thermal Guidelines 5th Edition, Liquid Cooling Guidelines, Design Considerations**



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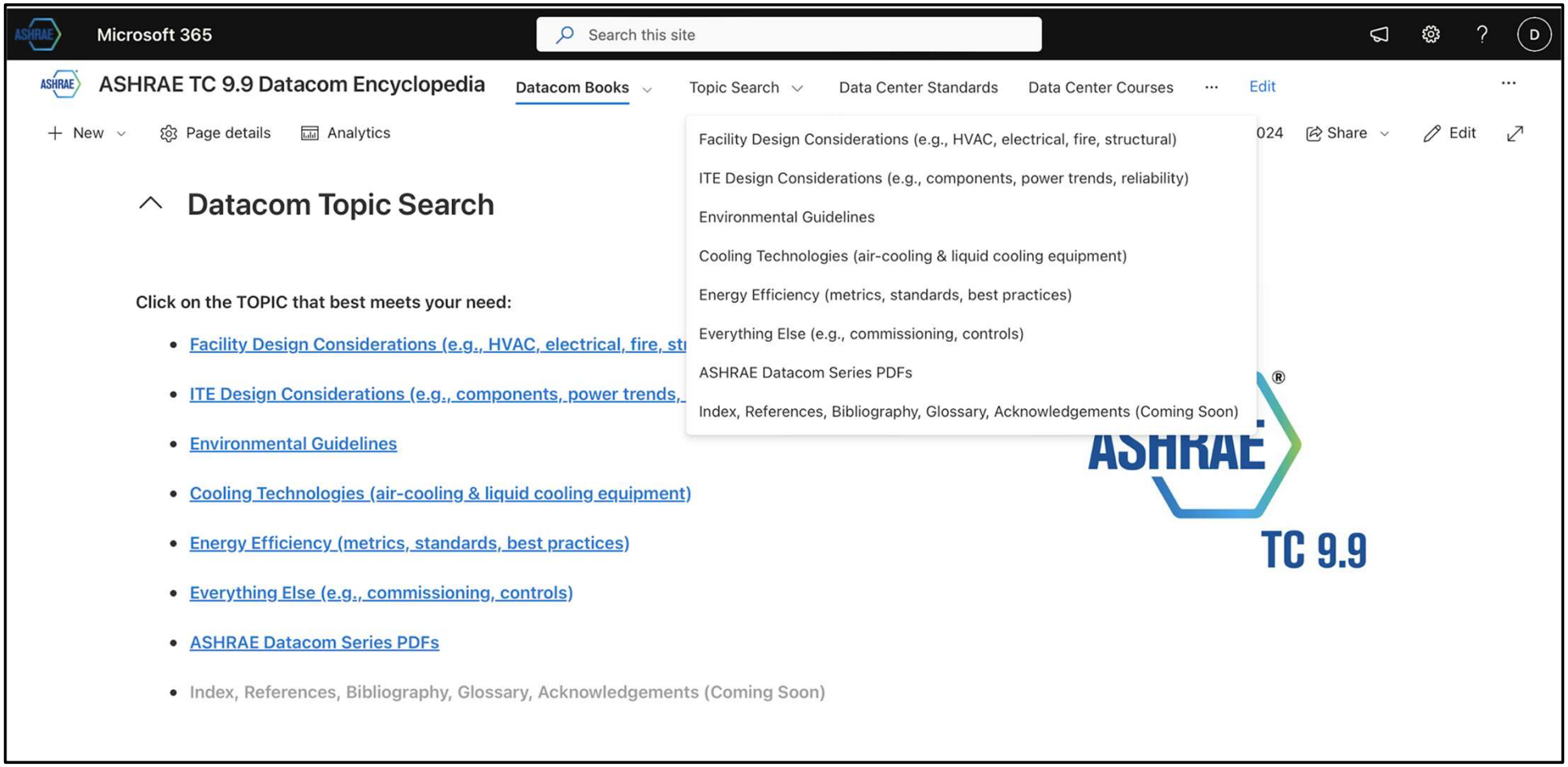
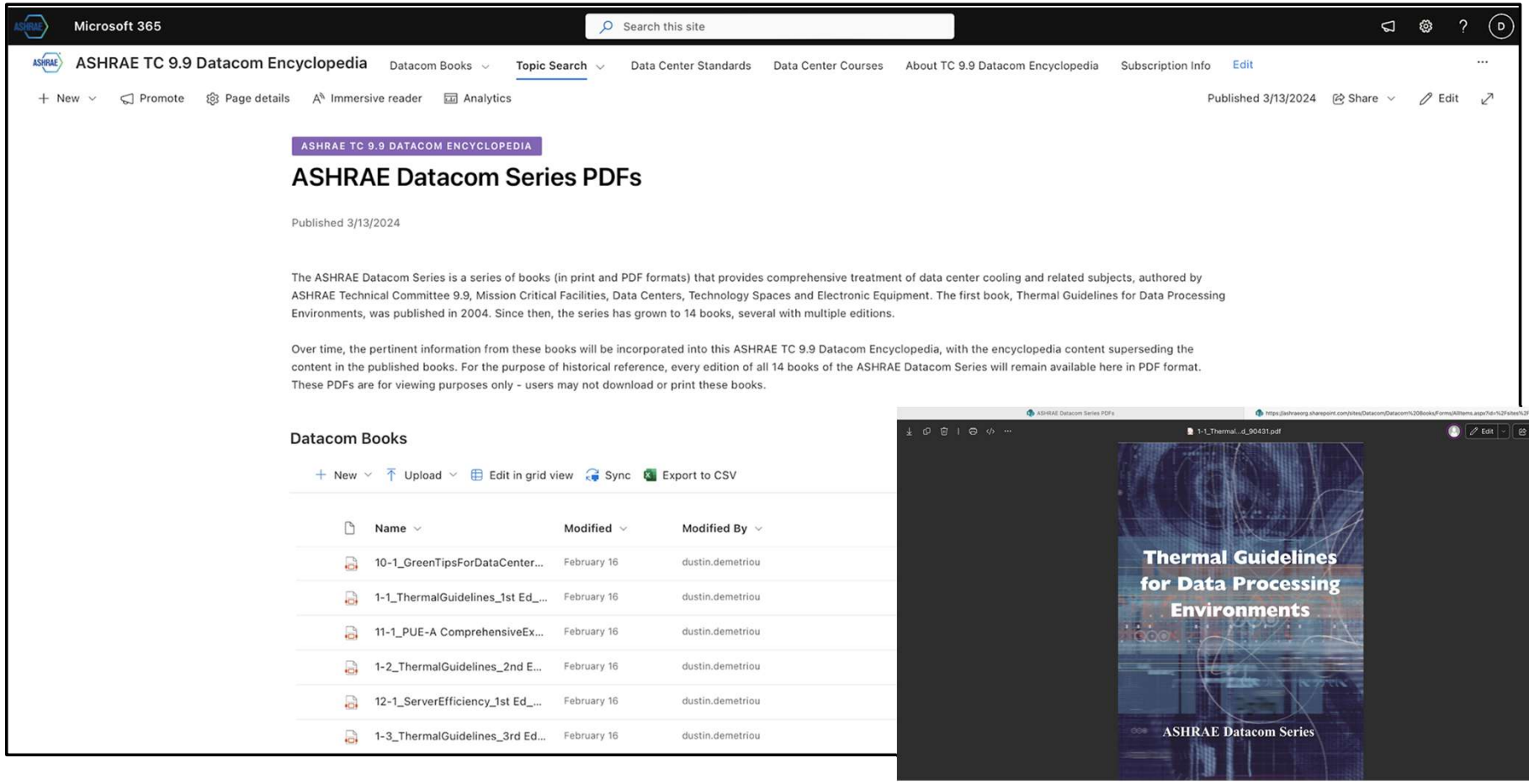


- **Topic search provides a quick navigation to most relevant material within the Thermal Guidelines, Design Considerations, and Liquid Cooling.**
- **These are the topics we developed during the working session at the Winter conference.**

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA



- **Online, read-only versions of all TC 9.9 Datacom Books and White Papers available.**
- **PDFs of every edition of the 14 books in the ASHRAE Datacom Series for historical reference. Over time, the current content from all the books will transition to be housed in this online encyclopedia.**

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Vision for the Encyclopedia

•TC 9.9 Datacom Encyclopedia, TC 9.9 has developed a central hub for providing on-demand access to frequently updated datacom-related content anytime, on any device, anywhere.

•In time, this site will evolve to incorporate the pertinent information from all of the existing TC 9.9 Datacom Series books, white papers, and technical bulletins, and the books will go out of print.

Timeline[1]:

• This timeline is being provided for informational purposes only. The dates and content are subject to change.

March 2024	TC 9.9 Datacom Encyclopedia is launched with updates to Design Considerations for Datacom Equipment Centers & Liquid Cooling Guidelines for Datacom Equipment Centers.
Now	Process is introduced and approved by TC 9.9 for providing content updates and version tracking.
2024	TC 9.9 Datacom Encyclopedia is transitioned to an encyclopedia format that incorporates Thermal Guidelines for Datacom Equipment Centers, Design Considerations for Datacom Equipment Centers
	TC 9.9 Datacom Encyclopedia begins to incorporate existing material from other Datacom Series book, white papers, and technology briefs.
	Transition of Datacom Series books complete.
	Quarterly updates, approved by TC 9.9, begin.

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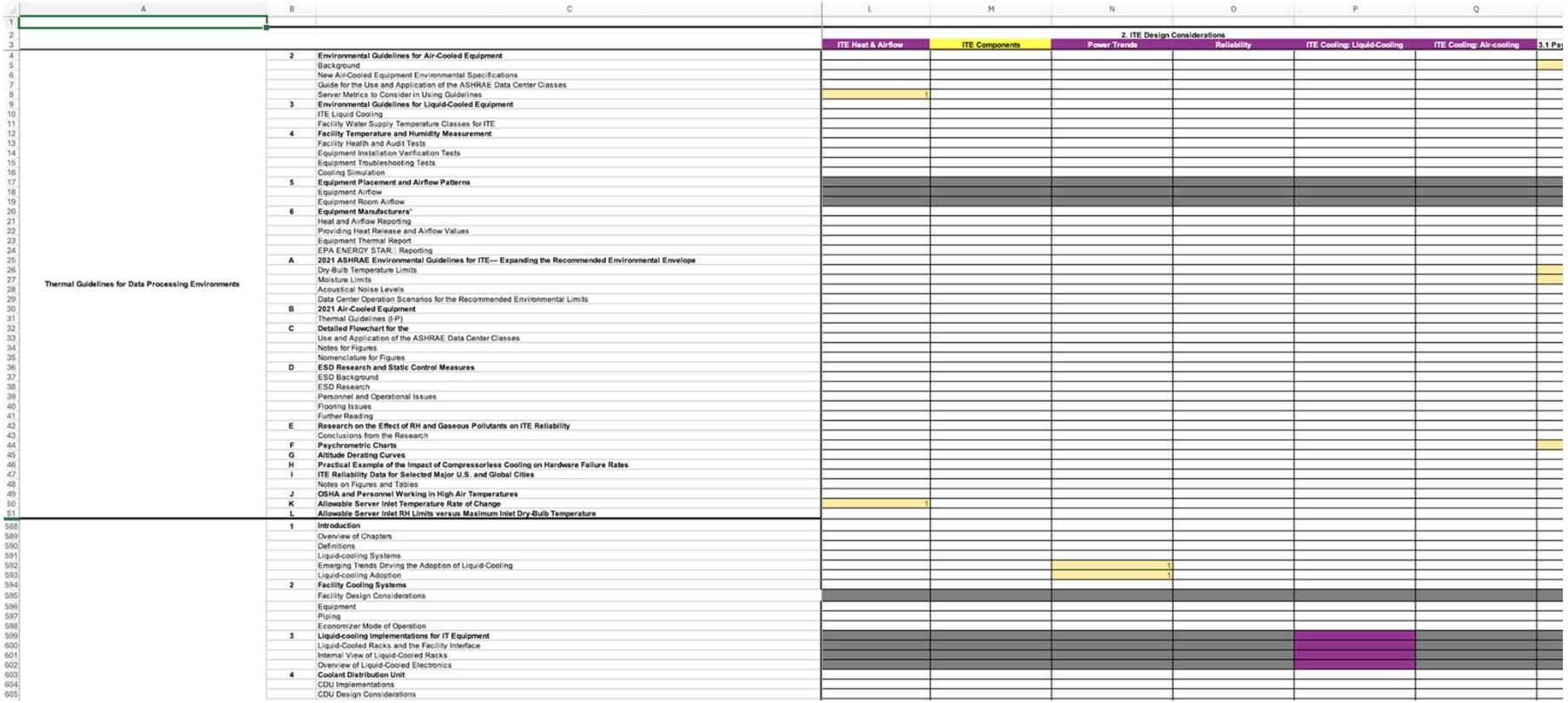
Next Steps



			2. ITE Design Considerations						
			ITE Heat & Airflow	ITE Components	Power Trends	Reliability	ITE Cooling: Liquid-Cooling	ITE Cooling: Air-cooling	3.1 Pa
Thermal Guidelines for Data Processing Environments	2	**Environmental Guidelines for Air-Cooled Equipment**							
		Background							
		New Air-Cooled Equipment Environmental Specifications							
		Guide for the Use and Application of the ASHRAE Data Center Classes							
		Server Metrics to Consider in Using Guidelines	1						
	3	**Environmental Guidelines for Liquid-Cooled Equipment**							
		ITE Liquid Cooling							
		Facility Water Supply Temperature Classes for ITE							
	4	**Facility Temperature and Humidity Measurement**							
		Facility Health and Audit Tests							
		Equipment Installation Verification Tests							
		Equipment Troubleshooting Tests							
		Cooling Simulation							
	5	**Equipment Placement and Airflow Patterns**							
		Equipment Airflow							
		Equipment Room Airflow							
	6	**Equipment Manufacturers'**							
		Heat and Airflow Reporting							
		Providing Heat Release and Airflow Values							
		Equipment Thermal Report							
		EPA ENERGY STAR:: Reporting							
	A	**2021 ASHRAE Environmental Guidelines for ITE— Expanding the Recommended Environmental Envelope**							
		Dry-Bulb Temperature Limits							
		Moisture Limits							
		Acoustical Noise Levels							
		Data Center Operation Scenarios for the Recommended Environmental Limits							
	B	**2021 Air-Cooled Equipment**							
		Thermal Guidelines (I-P)							
	C	**Detailed Flowchart for the**							
		Use and Application of the ASHRAE Data Center Classes							
		Notes for Figures							
		Nomenclature for Figures							
	D	**ESD Research and Static Control Measures**							
		ESD Background							
		ESD Research							
		Personnel and Operational Issues							
		Flooring Issues							
		Further Reading							
	E	**Research on the Effect of RH and Gaseous Pollutants on ITE Reliability**							
		Conclusions from the Research							
	F	**Psychrometric Charts**							
	G	**Altitude Derating Curves**							
	H	**Practical Example of the Impact of Compressorless Cooling on Hardware Failure Rates**							
	I	**ITE Reliability Data for Selected Major U.S. and Global Cities**							
		Notes on Figures and Tables							
	J	**OSHA and Personnel Working in High Air Temperatures**							
	K	**Allowable Server Inlet Temperature Rate of Change**	1						
	L	**Allowable Server Inlet RH Limits versus Maximum Inlet Dry-Bulb Temperature**							
	1	**Introduction**							
		Overview of Chapters							
		Definitions							
		Liquid-cooling Systems							
		Emerging Trends Driving the Adoption of Liquid-Cooling			1				
		Liquid-cooling Adoption			1				
	2	**Facility Cooling Systems**							
		Facility Design Considerations							
		Equipment							
		Piping							
		Economizer Mode of Operation							
	3	**Liquid-cooling Implementations for IT Equipment**							
		Liquid-Cooled Racks and the Facility Interface							
		Internal View of Liquid-Cooled Racks							
		Overview of Liquid-Cooled Electronics							
	4	**Coolant Distribution Unit**							
		CDU Implementations							
		CDU Design Considerations							

- **List of all book chapters, mapped to topics was created at the Winter Meeting.**
- **Next step is to take all of the material (across books) that relate to a topic and edit/re-write into a "Wikipedia" style topic.**
- **Volunteers are requested that can help with this editing.**

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

Agenda

- Liquid Server Thermal Template (Dustin Demetriou)
- S-Class Definition and Addition of S20/25 (Paul Artman)
- Thermal Guidelines Tech Brief (Mark Seymour/Dustin Demetriou)
- IT Equipment Power Trends (Mark Steinke)
- Chip BC for Cold Plate (Mark Steinke)

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Thank You

TC 9.9 Website:

tc0909.ashraetcs.org

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

Attendance

ASHRAE TC 9.9 Attendance Record

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

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Meeting ID: 282 351 545 380
Passcode: h7fwVb
Physical Meeting Room: Indianapolis Marriott, Indiana E (1)

Main Meeting
Hybrid Event Timing: Monday June 24, 2024 ; 2:30 - 7:00 pm EDT
Event Address: https://www.microsoft.com/microsoft-teams/join-a-meeting
Meeting ID: 279 454 711 503
Passcode: DqcYw7
Physical Meeting Room: Indianapolis Marriott, Indiana ABC (1)

Contact us at tc99chair@gmail.com
Technical Committee Website: http://tc0909.ashraetcs.org

Attendance is being recorded using a Google Form. Please make sure you complete the form at:

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ASHRAE TC 9.9 Datacom Encyclopedia Work Session

Dustin Demetriou, Don Beaty

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA

Activity

Volunteers needed for sub-topic and book compression

Word documents with mapped content to be reviewed

Content to be edited

- **remove duplicate text**
- **move sentence/ paragraphs for readability**

No rewriting (modifications or editing) of content

Attendance: https://forms.gle/tD3sKPS83kAZpgwAA