MEETING MINUTES

ASHRAE TECHNICAL COMMITTEE 9.9
Mission Critical Facilities, Data Centers, Technology Spaces and Electronic Equipment

2026 Annual Meeting

June 28 & 29, 2026

Austin, Texas

1791 Tullie Circle, N.E./Atlanta, GA 30329
404-636-8400

TC/TG/MTG/TRG MINUTES COVER SHEET

(Minutes of all Meetings are to be distributed to all persons listed below within 60 days following the meeting.)

TC/TG/MTG/TRG No. T.C. 9.9 DATE June 28, 2026

TC/TG/MTG/TRG TITLE Mission Critical Facilities, Data Centers, Technology Spaces and Electronic Equipment

DATE OF MEETING Sunday June 28, 2026 LOCATION JW Marriott – JW Lonestar Ballroom D, Level 3

VOTING MEMBERS PRESENT	VOTING MEMBERS ABSENT
Dustin Demetriou	Paul Finch
Mark Steinke	Joe Gangemi
Jason Matteson	David Quirk
Rick Pavlak	Lixia Wu
Bob McFarlane	
John Gross	
David McGlocklin	
Tim Shedd	
Ecton English	

CORRESPONDING MEMBERS PRESENT	PROVISIONAL MEMBERS PRESENT
Sam Abdelfattah	Lauren Huffman
Ahmed Abdelsalam	Amir Ibraheem
Cory Abramowicz	Thomas Kolpasky
Greg Alexander	Donovan Aguirre
Mohammad Alkiswani	Joseph Pickens
Mukul Anand	Nitin Rathod
Don Beatty	Viswanathan Ganesh
Darren Burgess	Tanya Hutter
Jerrod Buterbaugh	Alireza Behfar
Chris Campbell	Anke Beyer-Lout
Tod Canty	Christine Miner
Min Chen	Guiseppe Nardulli
Fabio Clavijo	Matt Hatley
Brad Cochran	Chris Newton
Tom Davidson	Archan Shah

CORRESPONDING MEMBERS PRESENT	PROVISIONAL MEMBERS PRESENT
Rohit Dhumane	Jeshwanth Kundem
Ben Dolcich	Pedro Perez
Dan Donahoe	George Zhang
Ken Duncan	Keegan Yaroch
Nicolas Estefanell	Arihant Sharma
Evan Ferguson	Philip Yu
John Groenewold	Ashley August
Edward Gutowski	Eric Hall
John Han	Kaustubh Phalak
Ali Heydari	Hui Zhao
Sara Hitt	Shane Fisher
Vimaldoss Jesudhas	Kenneth Coll
Matthew Kaufeler	Ashley DeHope
Alexandre Kontoyanis	Ashok Thyagarajan
Carlos Lisboa	Ray Good
Will Martin	Nick Dotzenrod
Guillermo Massucco	Mahdiyar Khalilzade Shabestari
Michael McKenna	Eugene Hoffman
Dave Moss	Peter de Bock
Chris Muller	Fatima Yusuf
Kelley Mullick	Viken Koukounian
Shlomo Novotny	Frank Silva
Sankaranarayanan Padhmanabhan	Min Chen
Amanda Pertzborn	
Craig Petersen	
Benjamin Petschke	
Alkesh Solanki	
Michael Stuart	
Mahash Valiya Naduvath	
Jonell Watson	
Eric Yang	
Neil Yuksel	
Wangda Zuo	

GUESTS PRESENT	
Matthew Mcintosh	Achintya Prasad
Kevin Britton	Vache Soghomonian
Greg Evans	Tania Ullah
Eduardo Garcia	Pradeep Jamdade
Sung A Kim	Annie Elliott
David Collins	Mark Skierkiewicz
Michael Beatty	Jon Schofield
Geoff Crosby	Dipti Singh
Justin Prosser	Uschas Chowdhury
Takumi Fujino	Naimish Pandya
Sugun Tej Inampudi	Jon Douglas

GUESTS PRESENT	
Vansh Bhatia	Matthew Pattom
Sean Anderson	Adrienne Lowke Stoinoff
Scott Munns	Danial Rodriguez-Campo
Ricardo Matiz	Shuji Furui
Katalina Massucco	Arindom Joardar
Jaco Dirker	Krystal Cheung
Edith Luveina Joseph	

ATTENDANCE RECORD	
In Person	132
Virtual	11

PUBLISHED AGENDA

TC 9.9 Working Session
(Programs, Research, Handbook, & Encyclopedia)

Time: Sunday - June 28, 2026 6:00 PM – 8:00 PM CDT

Location: JW Marriott Austin, JW - Lonestar Ballroom D - L3

Virtual: https://www.microsoft.com/microsoft-teams/join-a-meeting
Meeting ID: 238 890 229 089 21
Passcode: zX9yr6af

Section	Topic	Time	Presenter
Welcome	Welcome & Agenda	10	Mark Steinke
Publications Subcommittee	Working Session Primer	5	Dustin Demetriou
Programs Subcommittee	Working Session Primer	5	Eric Yang
Research Subcommittee	Working Session Primer	5	Brad Cochran
Working Sessions	Track 1: Encyclopedia / Tech Briefs Track 2: Programs Track 3: Research Track 4: Handbook	95	Dustin Demetriou Eric Yang Brad Cochran Bob McFarlane/Jonell Watson
	Total Time:	120	Minutes

CALL TO ORDER: 06/28/2026 6:03pm CDT – Mark Steinke

INTRODUCTION – Mark Steinke

- Call to order
- Introduction of TC9.9 leadership team
- Explanation of meeting as a working session with (4) tracks
    a. Encyclopedia / Tech Briefs
    b. Programs
    c. Research
    d. Handbook
- If you are virtual, raise your hand in the chat.
- Record your attendance via the link or QR code. This attendance record is how we determine your participation for consideration of your membership.
- Recitation of ASHRAE Code of Ethics
- Reference to provided links for ASHRAE Core Values, Diversity Statement and Antitrust Policy
- Explanation for in-person attendees covering how the physical space will be divided to work on the (4) working sessions
- Comments to virtual participants that they may likely drop from the meeting after the subcommittee readouts; as in-person working sessions will not be able to accommodate virtual participation.

TRACK 1a: DATACOM ENCYCLOPEDIA – Dustin Demetriou

- Goal to solicit volunteers to be Content Developers for each of a predefined list of topics that need to be created and/or edited based on recent encyclopedia work since Winter Conference
- Call to action – Sign up for a topic in the electronic form and mark Status field as “In Progress”
- At session end, volunteers send drafts to tc99publications@gmail.com

TRACK 1b: TECH BRIEFS – Dustin Demetriou

- Tech briefs have been well received so far
- Need to accelerate to (2) every 6 months to have real impact
- TC9.9 IT Subcommittee meeting monthly to focus on Tech Briefs
- Goal to support development of one tech brief during conference with a draft as output
    a. L2A CDU Trends – Jason Matteson
    b. Demystifying biostatic vs biocide vs biofilm – Matt Hatley
    c. Fluid Quality – Tanya Hutter
    d. Fluid Testing and Maintenance – Lauren Huffman
    e. TCS Commissioning – John Gross

TRACK 2: PROGRAMS – Eric Yang

- (11) programs accepted in Austin, TX
- First time having a dedicated Data Center Track
- Deadline already passed for conference paper abstracts (Winter 2027). Contact Eric if you have an approved abstract
- Call to action to join Eric in the Programs working session to brainstorm programs ideas

TRACK 3: RESEARCH – Brad Cochran

- ASHRAE sponsored ~1000 research projects since 1960 (~$90M)
- All research project outputs are available to all ASHRAE members for free

- ASHRAE has (42) active research projects; (2) by TC9.9
- TC9.9 submitted (4) RTARs in Spring 2026 and 1 Work Statement
- ASHRAE has raised $4M in 2026 for RPs and is looking for more projects
- During working session, will review all RTARs status, step through the process and discuss new research ideas
- Note: ASHRAE sponsors research; they do not conduct research internally

TRACK 4: HANDBOOK – Bob McFarlane / Jonell Watson

- Handbook chapter is nearly complete (18 items with comments needing resolution or missing content)
- Need volunteers for 11-12 of the remaining open items (subject matter experts)
- Need to finish all open items by tomorrow to get out to TC9.9 for vote
- Must get voted out of TC9.9 by the end of July 2026
- Call to action for volunteers to join the working session

CALL FOR IN-PERSON ATTENDEES TO DIVIDE INTO WORKING GROUPS

MEETING ADJOURNED: 06/28/26 6:44pm – Mark Steinke

1791 Tullie Circle, N.E./Atlanta, GA 30329
404-636-8400

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TC/TG/MTG/TRG No. T.C. 9.9 DATE June 29, 2026

TC/TG/MTG/TRG TITLE Mission Critical Facilities, Data Centers, Technology Spaces and Electronic Equipment

DATE OF MEETING Monday June 29, 2026 LOCATION JW Marriott – JW Lonestar Ballroom D, Level 3

VOTING MEMBERS PRESENT	VOTING MEMBERS ABSENT
Dustin Demetriou	Paul Finch
Mark Steinke	Joe Gangemi
Jason Matteson	John Gross
Rick Pavlak	
Bob McFarlane	
David McGlocklin	
Tim Shedd	
Ecton English	
David Quirk	
Lixia Wu	

CORRESPONDING MEMBERS PRESENT	PROVISIONAL MEMBERS PRESENT
Sara Hitt	Lauren Huffman
Neil Yuksel	Amir Ibraheem
Ken Duncan	Thomas Kolpasky
Chris Campbell	Donovan Aguirre
Mohammad Alkiswani	Joseph Pickens
Jonell Watson	Andrew Jenkins
Nicolas Estefanell	Viswanathan Ganesh
Vimaldoss Jesudhas	Tanya Hutter
Mahesh Valiya Naduvath	Jaime Comella
Dominick Lovicott	Anke Beyer-Lout
Craig Petersen	Cheng-Min Yang
Matthew Kaufeler	Guiseppe Nardulli
Benjamin Petschke	Matt Hatley
Eric Yang	Michael Stuart

CORRESPONDING MEMBERS PRESENT	PROVISIONAL MEMBERS PRESENT
Ben Dolcich	Keegan Yaroch
John Franklin	Arihant Sharma
Chris Muller	Philip Yu
Cosimo Pecchioli	Hui Zhao
Greg Alexander	Kenneth Coll
Min Chen	Ashley DeHope
Chris Newton	Ashok Thyagarajan
Justin Seter	Nick Dotzenrod
Mark Malkin	Eugene Hoffman
Will Martin	Peter de Bock
Jerrod Buterbaugh	Fatima Yusuf
Carlos Lisboa	Archan Shah
Don Beatty	Yash Trivedi
Kaustubh Phalak	Cory Abramowicz
Sang Lee	Michael Stuart
Dan Donahoe	Patrick Birbarah
Michael McKenna	Lalith Sai Madhav Rayala
Thomas Canty	David Rose
Meraj Mohebi	Sun Woong Baek
Dave Meadows	George Zhang
Alkesh Solanki	Rachel Guo
Amin Ajdari	Paul Lewis
CJ Tang	Tim Daniels
Edward Gutowski	Sankar Padhmanabhan
Evan Ferguson	Bill Davies
Matt Koukl	Cheng-Yi Lee
Brad Cochran	Yan Chen
Shlomo Novotny	Chris Soh
Pardeep Shahi	Guowen Li
Meraj Mohebi	Hemant Tiwari
Alireza Behfar	Marty Martinelli
John Groenewold	Raha Kalantarpour
Ali Heydari	Beth McDaniel
Adam Abubakar	Cem Keskin
Shahar Belkin	Rich Supkowski
Kelley Mullick	Majid Entezarian
Alan Neely	Thomas Bise
Mark Pavol	Mitchell Szydlowski
Gerardo Alfonso	Mike Klein
Jim VanGilder	Abdur Rahman Quadri
Dave Moss	Eric Tunks
Rajendera Kapoor	William Truong
Charles Freda	Amin Ajdari
Tom Davidson	
Alexandre Kontoyanis	

GUESTS PRESENT	
Greg Busch	Dipti Singh
Sarat Kuchibhatla	Jan De Pauw
Melissa Olson	Kyle Ayotte
Kevin Britton	Greg Evans
Bhavnesh Patel	Jeff Autor
Achintya Prasad	Karla Alvarez
Matthew Mcintosh	John Schofield
Austin Sutterfield	David Collins
Edith Luveina Joseph	Yang Clark
Sung A Kim	Ashwin Salvi
Jon Scholte	Srushti Dupare
Tania Ullah	Cindy Moreno
Pradeep Jamdade	Paul Ehrlich
Ryan Ratajczak	Whitney Tristan
Ying Zhao	Justin Fulwider
Jake Holt	Scott West
Adrienne Lowke Stoinoff	Li Yao
Wei Wang	Isaac Mahderekal
Huang Lin	Saikiran Ravisanker
Douglas Maddox	Matthew Pattom
Jamon Craig	Adam Maser
Jon Guy	Steve Harrington
Yiyuan Jia	Keith Dunnavant
Rachel Romero	Wayne Borrowman
Tifft Gannon	Art Malenfant
Daniel Rodriguez-Campo	Mike Donovan
Annie Elliott	John Fernandes
Shuji Furui	Dan Wood
Chaitee Paul	Ahmad Nazari Gazik
Himanshu Modi	Scott Munns
George Land	Richard Westgarth
Matt Waskowski	Bill Healy
Anusya Murali	Vansh Bhatia
Douglas Poffinbarger	Takumi Fujino
Uschas Chowdhury	Luis Guevara
Paul Kalinowski	Kevin Roe
Galen Gerig	David Sickinger
Anvay Joshi	Miguel Beltran

ATTENDANCE RECORD	
In Person	205
Virtual	32

PUBLISHED AGENDA

TC 9.9 Main Committee Meeting

Time: Monday - June 29, 2026 2:30 PM – 7:00 PM CDT
Location: JW Marriott Austin, JW - Lonestar Ballroom D - L3
Virtual: https://www.microsoft.com/microsoft-teams/join-a-meeting
Meeting ID: 281 603 549 934 33
Passcode: n74wX6LM

Section	Topic	Time	Presenter
Welcome	Welcome, Agenda, & Meeting Etiquette	10	Mark Steinke
Introductions	TC 9.9 TPS, Structure, Subcommittee Chairs, Voting Members Introductions	15	Mark Steinke
TC 9.9 Activity	Recorded Votes Logistics Updates Website Updates	15	Mark Steinke Ecton English
TC 9.9 Membership	Membership Statistics	10	John Groenewold
Programs Subcommittee	2026 Summer & 2027 Winter Meeting Other Updates	15	Eric Yang
Handbook Subcommittee	Updates on Handbook Chapter Progress	5	Robert McFarlane Jonell Watson
Standards Subcommittee Liaison Reports	Standard 90.1 Standard 90.4 SSPC 127 OCP Decarb	20	Rick Pavlak Marcus Hassen David McGlocklin Matt Koukl Lixia Wu
BREAK		15	-
Attendance	Review Attendance Statistics	5	Mark Steinke
International Subcommittee	General Updates LinkedIn Statistics	10	Paul Finch
Research Subcommittee	Updates RTARs	35	Brad Cochran
Publications Subcommittee	Encyclopedia Updates Tech Briefs	20	Don Beaty Dustin Demetriou
IT Manufacturers Subcommittee	Updates	45	Dustin Demetriou
BREAK		10	-
IT Manufacturers Working Session	Closed Door Session (By Invitation Only)	45	Dustin Demetriou
	Total Time:	275	Minutes

CALL TO ORDER: 06/29/26 2:32 PM CDT – Mark Steinke

WELCOME & INTRODUCTIONS - Mark Steinke

- Mark Steinke called the meeting to order and welcomed all attendees.
- Mark informed us about procedural changes to tradition to shorten some long duration items.
- Mark introduced himself, John Gross not present, Chris Campbell present and some volunteers to help admit people online (Jason Matteson)
- Housekeeping and meeting etiquette was presented
- Thanks to Dave McGlocklin for bringing another projector to show the content (2nd copy)
- Presentation of agenda and informational about emails, website and LinkedIn site for info updates
- Attendees were asked to record attendance via the link or QR code provided in the meeting.
- Mark Steinke read the ASHRAE Code of Ethics / Value Statement aloud.
- The following links/references were provided to the group:
  - ASHRAE Code of Ethics
  - ASHRAE Core Values
  - ASHRAE Diversity Statement
  - ASHRAE Antitrust Policy

ASHRAE ORGANIZATIONAL STRUCTURE – Mark Steinke (2:40pm)

- Mark Steinke presented an overview of the ASHRAE organizational structure and TC 9.9's role within the society.
- ASHRAE is organized into Technical Committees (TCs), Task Groups (TGs), and other specialized groups.
- Technical Committees are responsible for preparing handbook chapters, originating and coordinating research, presenting programs, reviewing technical papers, evaluating standards, and advising the Society.

TC 9.9 TITLE, PURPOSE & SCOPE – Mark Steinke (2:41PM)

- TC 9.9 Title: Mission Critical Facilities, Data Centers, Technology Spaces and Electronic Equipment
- TC 9.9 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.
- TC 9.9 Scope: All things datacom facilities – from IT equipment thermal characteristics to data center design, operations, sustainability, and emerging technologies including liquid cooling and AI/HPC workloads.

TC 9.9 MEMBERSHIP - Mark Steinke (2:42PM)

- Mark Steinke presented an overview of TC 9.9 participants
- TC 9.9 is the largest ASHRAE Technical Committee, with over 700+ members at peak.
- Membership spans a broad cross-section of the datacom industry including:
  - Producers of Datacom Equipment
  - Producers of Facility Equipment
  - Users of Datacom Equipment

  - Government Agencies, Enterprise, Telco, Utilities, Consultants, Academia, Testing Laboratories
- Industry volunteers provide the expertise that drives TC 9.9 deliverables.
- Key areas of TC 9.9 influence: Handbook, Standards, Research, Programs
- Technical activities include: Books, White Papers & Tech Briefs, Encyclopedia, Education
- Showed the "mindmap" of the TC9.9 structure
- Showed previous TC9.9 chairs
- Showed current TC9.9 officers and subcommittee chairs
- Showed current TC9.9 voting members (SY 25/26) There are 13.
- Thanked voting members (2) ending their terms and welcomed new incoming voting members (3)

TC 9.9 VOTING MEMBERSHIP UPDATES (SY 2026/2027) – Mark Steinke

- Total Voting Members for SY 26/27: 14
- VM Terms Ending: 5
- New VMs Added (3):
  - Paul Artman – AMD
  - Vali Sorell – Oracle
  - Matt Koukl – Affiliated Engineers, Inc.
- Thank you to outgoing Voting Members:
  - Rick Pavlak
  - Paul Finch
- Displayed attendance QR code and call to action to submit now. Explained the new process without personal introductions.

TC 9.9 ACTIVITIES SY 2025/2026 - Mark Steinke (2:49PM)

- Mark Steinke presented a summary of TC 9.9 activities for Society Year 2025/2026 (July 1, 2025 – June 30, 2026).
- **Roster Updates for SY 26/27**
  - Completed a major overhaul of the TC 9.9 membership roster.
  - Original roster had over 750+ members listed.
  - Removed inactive accounts, email bounce-backs and members with zero attendance records
  - Final roster count for SY 26/27: 483 members
- **Roster Updates for SY 27/28 (In Progress)**
  - Working on a formal proposal for minimum activity requirements for Corresponding Members (CMs).
  - Finalizing the activity requirement for Provisional Corresponding Members (PCMs).
  - Proposal to be sent to the TC for vote.
- **Votes – SY 25/26**
  - (14) votes were conducted by the Technical Committee during SY 25/26 (1 failed; but passed after resubmission)
- Mark displayed the TC9.9 Publication timeline (including the new tech briefs/alerts).
- Mark displayed TC99 logistics updates for file sharing and collaboration
  - Decision to use http://www.files.ashrae.org

  - Explained the two separate sites (TC 9.9 members, TC9.9 leadership)
  - We've piloted this platform within leadership
  - Explained that all members will not be automatically added. Members must be added on an as needed basis.
- **TC 9.9 Website Statistics - Ecton English**
  - 10k active users, spikes around conferences
  - Displayed (1) year period just after 2026 Winter Conference up to June 2026
  - Displayed statistics on datacom encyclopedia requested during previous conference
  - ASHRAE provided datacom encyclopedia data. Ecton can't access directly. Well visited over the last 90d. Over 13k visitors.
  - Datacom encyclopedia (June 22, 2026) has 933 subs; increased from 448 (June 2025).
  - Found some user duplications. Request users check to ensure they are not double billed.

- **Introduction to Kevin Muldoon – ASHRAE Section 9 head (our section head)**
  - Connection and liaison to TAC. Open to feedback from members.
  - Kevin is rolling off of TAC. Corey Metzger will roll on as our section head.
  - Call for TC9.9 to review our TPS and ensure we're still aligned
  - Submission forms available online for a new Connect program to allow people to shadow TAC (focused on YEA)
  - Call to submit nominations for Hightower Award
  - TC Roster updates due by Chicago for SY27/28.
  - Encourage the TC to use the typical activity form to gather info in the meeting
  - ASHRAE put together 'future of ASHRAE conferences (FOAC) committee'. Consideration to eliminate the annual meeting. Lots of feedback, postponed decision for 30d. Call to action to provide feedback on this plan. Want all member voices. (QR code)
  - In Chicago a new track for Application notes and Professional Practices – lesson learned, best practices, case studies, etc.
  - In 2027 annual (New Orleans) there's a mini track available for 7/8 sessions on a topic. Can submit for a mini track to be created
  - ASHRAE launching master calendar for all TC meetings. Submit requests to add meetings to the calendar. Will be available in ASHRAE 365 app.
  - Request from Tim Shedd to send out the proposal for elimination of conference being eliminated. (agreed by Muldoon)
  - Request for how to respond to elimination of conference. Agreed mark Steinke can put up QR code (Muldoon) to allow members to respond to ASHRAE CEC (Conferences and Expositions Committee)
  - Mark Steinke comments that QR code will be on an upcoming slide with some details.
- **Mark announced topical conference (2027 Data Center & AI Integration Conference) – (3:11PM)**
  - Approved by conference and exposition committee (CEC)
  - March 3-5, 2027 in Dallas, Texas
  - Call for submissions, raise awareness, sponsorship.
- TC9.9 Activity – how to get involved
- **ASHRAE CEC Updates (3:17PM)**

  - Includes QR code for feedback on future conferences (inc. elimination of annual conference)
  - Clarification from Marcus Hassen on the conference elimination. Soonest that could happen would be 2030 due to existing commitments.
- Meeting attendance QR code displayed again

MEMBERSHIP SUBCOMMITTEE - John Groenewold (3:22PM)

- PCM / CM / VM definitions slide
- Roster update slide that shows a total net reduction due to the culling of inactive members
- Meeting attendance slide showing 2025 Winter & Annual Meetings and 2026 Winter Meeting
- Reminder for members to keep contact email updated to ensure no email bounce backs
- Live, in-person attendance check – 153 souls (3:30PM, Groenewold)

PROGRAMS SUBCOMMITTEE - Eric Yang

- Eric Yang, Programs Subcommittee Chair, provided the following update.
- **Austin 2026 Conference Programs**
  - (11) programs accepted for the Austin 2026 Annual Conference with TC9.9 sponsorship
  - Call to action for people with conference papers approved for Chicago to reach out to Eric.
  - Displayed slides on programs included in 2026 Annual Conference (Austin)
  - Displayed (5) Mini Tracks for Future Conference Programs
  - Suggestion to use the search bar in ASHRAE 365 app with term “9.9” to find all programs.
  - Showed all tracks for 2027 Winter Conference (Chicago)
  - Showed slides for program ideas for Chicago (separated by what track they fit into)
  - Call to action seeking input/help on any not yet marked green
  - Comments that these are just proposed ideas; not final list
- Showed slide for key dates for programs
- Thank you to Eric Yang on setting up mini tracks for TC9.9. ASRHAE CEC is now formalizing the mini track process for all TCs.

HANDBOOK SUBCOMMITTEE - Robert McFarlane / Jonell Watson (3:34PM)

- Explained the purpose of Applications Handbook Chapter 20 (TC9.9 Owned Chapter)
- Comments that our chapter reflects the very high quality of our TC (Bob)
- Comments about the use cases of the Handbook and its position as a legal reference document
- (4) Handbooks published on 4-year cycles
- TC9.9’s responsibility is Chapter 20 of the Applications Handbook
  - “Data Centers and Communication Facilities”
- Chapter 20 has 120 topics; all of which have been reviewed and/or edited for the update release
- Comments about how reviewers often add more content they feel is applicable and it’s been awesome but challenging as a lot of extra work for editors to organize and remove duplication
- Displayed the Chapter 20 Primary Reviewers, Revisors and Secondary Reviewers

  - Thank you to all participants
- Showed the current status Chapter 20 review timeline slide
  - Functionally 3-year timeline; but must be submitted to ASHRAE 1 year before publishing
  - Comments to voting members if all final info is returned, expect to vote by end of next week. It is 53 pages long with a small print. They are asking all members to read it, but they are not looking for revisions. Only checking for technical inaccuracies. If found, give the problem and the solution. By middle of July (17) to get finalized. Absolute deadline is July 31 for submission to executive committee. Bob is now on that committee and doesn't want to ask for an extension on his own chapter.
- IMPORTANT CONCERN slide shown. Not just TC9.9. All TCs. Can use AI to help analyze other handbook chapters and standards for overlap and possible conflicts.
  - Suggestion for TC9.9 to create a task force in the future to review and find duplications & conflicts
- Bob expressed his thanks to Jonell and everyone for helping. He's been doing this for 12 years. After Chicago, once they review the final galley proofs, Bob will hand off to Jonell.
  - Call to action for a second hand to work with Jonell; as it's not a one-person job.
  - Jonell thanks to everyone and Bob.

STANDARDS SUBCOMMITTEE - Rick Pavlak (3:49PM)

90.1 Update Liaison Report – Rick Pavlak

- 90.1-2025 version is published (referenced 90.4-2025)
- 90.1 meets (4) times per year
  - Twice at conferences
  - Twice as ASHRAE HQ in Atlanta
- 2028-2031 workplan has 2 components
  - Energy Efficiency (Traditional 90.1 standard)
  - Net Zero Operational Carbon (90.1E will be created for this; may be appendix or similar)
- (22) active addenda after 90.1 spring meeting [5 new]
- Reported in 90.4 mtg on Saturday (Steve Rosenstock). US DOE came to the meeting and DOE representatives were alluding to being unhappy about the length of cost justification that allows for payback. They think the timeline should be shorter. Stay tuned to see what will happen with this.

Standard 90.4-2025 Update – Marcus Hassen (3:53PM)

- Fun fact – today is 10yr anniversary of when 90.4 was approved by ASHRAE standards committee and ASHRAE board of directors. Recognize that milestone; with any original founders of 90.4 to stand. 28 days later, the first edition was published.
- Steady progression and gaining momentum. State by state adoption is always slow.
- IECC adopted sec 6 & 8 into the energy code (2021); continued in 2024
- ASHRAE 90.1 – Alternate compliance path using 90.4 (since 90.1-2019)
- Working group operations slide shown [4 working groups]
  - Mechanical (MLC) Working Group

  - Electrical (ELC) Working Group
  - Marketing Working Group
  - Environmental and Social Governance (ESG); added as a workgroup a few years ago
  - All groups meet monthly and act as great onramp for new participants
- Technical workstreams slide shown
  - MLC Metrics
  - ELC Metrics
  - ASHRAE Harmonization (Water Usage, Carbon / Emissions, Renewable Energy)
- 2022 ASHRAE position paper on decarbonization
  - Prioritized by ASHRAE.
  - 90.1 and 90.4 were (2) of the (14) standards identified as decarbonization supporting standards
  - Water use is getting a lot of attention and applies well within 90.4
- Addendum D slide shown
  - Refinement of MLC to stay abreast of industry trends
  - Needs to be aligned with TC9.9 (temp classes and other things)
  - Water regulation extracted from the addendum to be put in a different one (definition to follow)
  - 2nd public review coming (ISC)
- AI Data Center Framework slide shown (Launch June 10, 2026)
  - Developed with heavy contributions from TC99 and 90.4
  - Done in 9m; ahead of schedule
  - Joint effort between ASHRAE, NEMA and PNNL
  - Intentional decision to publish online; interactive. Will need continuous update and the format works well for that (like our datacom encyclopedia)
  - Key section authors recognized at CEBD meeting and 90.4 meeting
- Skipped slide on topical conference – already covered
- Showed ASHRAE Governmental Affairs slide
  - Industry is at an inflection point. Both intense demand and challenges to deploy.
  - In first 6 weeks of 2026, 300 different bills in 30 US states having to do with data centers
  - ASHRAE wants to ensure that policymakers are enabled with correct information
  - State of Illinois has a bill on data centers requiring they meet energy requirements (refers 90.4) for certain benefits and tax exemptions
  - Seeing more escalation in ASHRAE leveraging TC9.9 to participate more before legislative bodies
- Showed slide on 90.4 regulatory influence and work plan
  - 5 guiding philosophies for the 2028 work plan
  - Several also in the 2025 work plan
- Increased code adoption and regulatory influence
- Rapid response to ai driven load density and cooling technologies evolution
- Continuous refinement
- Strong alignment with TC9.9
- Transition from energy-only to broader sustainability metrics

OCP Liaison – Matt Koukl (4:06PM)

- Call to action to come to presentation tomorrow (9:45 – 10:45AM)
- About a year since MOU signed.
- Show slide on why collaborate
  - Generate wider knowledge base
  - Educate – Avoid duplication of work
  - Collaborate – Shared / aligned roadmap
  - Communicate – Published work
- Aligned activities
  - Flow velocity and erosion workstream (OCP Cold Plate SPJ)
  - Guidelines for pre-commission preparation of TCS row manifolds
  - Fluids workstream (OCP Cold Plate SPJ)
  - Initiation of OCP Cooling Environments CDU SPJ
- Underway Activities
  - PG25 mixing studies

SSPC 127 Update – Dave McGlocklin (4:09pm)

- Released 127 Addendum B – Method of Test for L2L CDUs (June 2026)
  - OEMs and Labs already using this
- In-Work 127 Addendum C – Method of Test for L2A CDUs
  - Hope to be out for letter ballot voting in the coming weeks
- In-Work 127 Addendums for 2-Phase DLC (Heydari) and Immersion (Bean)
  - SSPC 127 mostly covering 2-phase progress tomorrow (8AM-12PM)
- In-Work 127 Addendum D – Air-Cooling Harmonization with AHRI 1360
  - Work is complete. Next meeting will begin building the addendum
- Goal is to have the entire, updated Standard 127 republished in 2027

—— BREAK (4:10PM Return at 4:25PM) —— Attendance reminder ——

MEETING ATTENDEE INTRODUCTIONS - Mark Steinke (4:32PM)

- Following the first break, Mark Steinke presented attendance statistics
- Attendee statistics by association
  - Design = 35%
  - OT Manufacturer = 27%
  - IT Manufacturer = 10%
  - Operations = 12%
  - Build = 7%
  - Academia = 6%
- Attendee statistics by ASHRAE TC9.9 membership type
  - Corresponding Member (CM) = 65%
  - Provisional Corresponding Member (PCM) = 28%

  - Voting Member (VM) = 7%
- Attendee statistics by attendance type
  - In-Person = 86%
  - Virtual = 14%
- Attendee statistics by location
  - Domestic (US) = 91%
  - International = 9%
- Attendee statistics (YEA)
  - Non-YEA = 86%
  - YEA = 14%
- Comments about how we can refine this in the future. (Steinke)

INTERNATIONAL SUBCOMMITTEE - Paul Finch (Not present, covered by Steinke)

- TC9.9 LinkedIn page has been very active compared to the main ASHRAE page
  - Created in 2018
  - ASHRAE asking TC9.9 for more information about our engagement success
- 34% increased followers between January 2026 and June 2026
  - 3887 followers up from 2890
  - Likely driven by release of tech briefs
- Showed slide with international awareness
  - Paul is working to move and expand more into MENA and APAC regions
  - Call to action for those regions to talk to Paul about how to further this

RESEARCH SUBCOMMITTEE - Brad Cochran

- Brad Cochran, Research Subcommittee Chair, provided the following update.
- Showed slide on updates with (4) RTARs
  - RTAR-2007 Height Limitations in U1010.DVN.8.1 (Returned w/o Vote)
  - RTAR-2108 Flow Velocity Impact on Erosion (Accepted w/Comments; need work statement created)
  - RTAR-2109 Experimental Evaluation of Mixing Different Inhibitor Types in Water Glycol Mixtures (Rejected; ASHRAE questioned whether this was proper for ASHRAE) This could be resubmitted but would need to work harder to prep
  - RTAR- 210 External Modeling of Data Centers (Returned w/Comments; will be updated in couple weeks and go back in front of committee by August 31 deadline)
- WS-1956 Compact CFD Modeling Guidance for Thin Flow Resistance (originally came from RP-1675)
  - This project was meant to close some gaps left from that. This was a very targeted piece of research with a few benchtop measurements with the work dominated by CFD. The latest work statement was accepted conditionally; need to answer some questions. Should go out to bid Fall 2026
- RP-1913 Study of the Corrosion Impact on IT Equipment (Took several years to develop work statement and pass through research)

  - Awarded to Syracuse; who had done a previous study on 'x-factor'. The test facility setup is nearly complete. Call to action on help with data center access in coastal areas; because they need to place coupons in real data centers to compare against testing)
- RP-1972 Data Center Direct-to-Chip Liquid Cooling Resiliency – Failure Modes and IT Throttling Impacts (Awarded to Univ. of Pretoria in South Africa)
  - Awarded end of April 2026, got approval for researcher Jaco Dirker to come to this conference
  - Still working to finalize the scope and target purpose of the research
  - 4 members of PMS present at conference: Jim Van Gilder, Matthew Kaufeler, Tom Davidson, Eric Yang
- Showed research ideas slides. No discussion on these now, but these are some ideas. Reach out to discuss further.
- Showed slide with research portal link and contact info for Brad Cochrane
  - https://app.ashrae-research.com
  - TC09.09.RES@ashrae.net (Brad Cochrane alias email)

PUBLICATIONS SUBCOMMITTEE - Dustin Demetriou

- Showed a slide on encyclopedia with QR and explained the origin story of it.
- https://datacom.ashrae.org
- Gave perspective that datacom books were about $80 each and encyclopedia is only $24/33 yearly.
- Showed the encyclopedia update summary slide
  - Reviewed ITE Design Considerations
  - Reviewed Facility Design Considerations
  - Reviewed Environmental Guidelines
  - Reviewed Cooling Technologies
  - Created database of action items
  - Categorization of chapters from PUE, Real Time Energy Measurements, Best Practices and DCIM datacom books complete
  - Have ruled out some books that will NOT be integrated into the encyclopedia (ex: Power Trends circa 2008)
- Goal was to have all books integrated and content updated by end of 2026
- Call to action on feedback for the encyclopedia (email provided; datacom@ashrae.net)
- Displayed slide on what's new in encyclopedia
  - Can be found at the bottom of the Datacom Encyclopedia homepage
  - May 20, 2026 – TCS Coolant Integrity and System Readiness published
  - June 29, 2026 – AI's Indirect / Direct Impact on Data Center Infrastructure Planning published
- Displayed slide on homepage depicting the overall page structure
  - Brand new sections on main page for tech snapshots and bulletins
- Displayed datacom encyclopedia work structure
  - Site Management - Partially ASHRAE and partially the TC
  - Content Supervision – IT Subcommittee and Publications Chair

  - Topic Editor (6 topics) – Responsible for content updates, managing edits, finding editors, topic structure
  - Content Developer – Edit 1+ article(s) within a topic to ensure consistency, integrate datacom books content into existing articles
  - Going to be looking to fill roles for Topic Editors and Content Developers.
- Displayed slide on content developers with QR code to volunteer
  - Call to action for volunteers who are subject matter experts
- Displayed slide on next steps
  - Next couple of months ID topic editors. Prefer at least a 1-year term.
  - Call to action for someone to review and serve as editor for the Energy Efficiency topic
  - Call to action for reviewers for Contamination, Structural, Server Efficiency and Green Tips books content
- Thanks to Dustin Demetriou for making the Datacom Encyclopedia a reality

IT SUBCOMMITTEE – Demetriou (5:25PM)

- Displayed IT manufacturers subcommittee updates slide
- Comments (Demetriou) about unfortunate changes by ASHRAE to end subcommittee meetings at conferences
- CDU Safety Testing with IEC 62368-1 (same as previous conference; but reiterate)
  - Concerns with tubing & fitting compatibility test requirements
  - IT Subcommittee approached TC108 USTAG to seek guidance if usage of IEC 60335-2-40 is acceptable for standalone CDUs
  - Interpretation submitted to IEC Chairman's Advisory Group for review 4Q2025
  - Manufacturers came to IT subcommittee to ask if we could guide the industry on this; as was done for a previous issue with pressure testing cold plates to 5x pressure
  - Displayed key concerns slide. Did not cover the entire slide, but summary is that standard required every combination of fluid and materials be tested together for compatibility. It was very long process extending everything
  - Confirmation from IEC108 (slides; 2). Panel agreed that 60335-2-40 is an acceptable standard for standalone CDUs in data centers. TC108 panel published 108/862/INF Interpretation
  - TC108 will be working on the next version of 62368, so we will be working with them to bring this guidance into that standard
- Justin Prosser presented for Danfoss on the UL62368-1 vs. UL60335-2-40 Issue
  - Timeline slide. Issues started after July '25 release of 62368-1 standard Ed. 4; with CDU vendors requiring them to comply as a component supplier
  - This guidance doesn't help Danfoss much. They need ASHRAE TC9.9 to agree that CDUs made and/or used in US/CAN follow 60335-2-40 as the standard. This would likely require documentation updates in OCP and similar.
  - Justin went to AHRI Product Safety Standard 60335 Advisory Group which helps to harmonize the position of safety standards in the heating and cooling industry. They were not comfortable giving guidance without the approval of ASHRAE TC9.9
  - Justin is asking for TC9.9 to agree on this. Call for comments.

  - Ben Dolcich comment – ASHRAE 15 refers to 60335-2-40 (not 62368)
  - Comments from Tim Shedd that the table shown in PPT suggests that CDUs might fit into 62368. Asking for comments why 60335 is applicable for CDUs. Responses from Will Martin that 60335 is applicable; as a replacement for UL 1995. Recently UL (not IEC) made comment they only wanted it to apply to refrigerant systems; but didn't say why.
  - Comments from UL to clear up that the table in PPT. 60335-2-40 does apply to water cooled systems; the 'refrigerant cycle' reference is referring to the core heat rejection
  - Comments from Jason Matteson about making a proposal within the TC to vote on this
  - Comments from Dave Quirk about how IEC has a conflict "resolution" body; not the TC. Feedback from Steinke/Matteson that Justin is looking for a TC99 opinion position; not an official resolution of IEC standards that overlap.
  - Demetriou summarized that TC9.9 would put together a position with TC vote that IEC/UL 60335-2-40 is the appropriate standard for CDUs. Question from Justin if TC9.9 needs anything from him. Response = NO
- IT Subcommittee Publishing – Technical Briefs (5:46PM)
  - Devised to release information to market even faster than the encyclopedia
  - First tech brief on CDUs a while ago; very good market feedback
  - 3 levels: tech alert (more like a LinkedIn post), technical snapshot (concise but more technical treatment), technical bulletin (longer yet, but not replace info in encyclopedia)
  - Publishing approach is to host monthly meetings, 1-week IT Subcommittee review, 1-week TC9.9 review and vote
  - The idea was to get people into a room to work; because things don't get done well offline
  - Gets published both in the encyclopedia as well as online for free
  - Over time, content gets mapped to datacom encyclopedia
  - Displayed tech brief index slide with update on progress to date
  - Request access to Google Drive by emailing tc99publications@gmail.com
  - There is a potential to get (5) more out by the end of the year (winter meeting)
- Tech Snapshot published today – AI's Indirect / Direct Impact on Data Center Infrastructure Planning & It's Predecessors
  - Don comments about hardware vendors needing to help enable the data center to support the HW
  - Slide on Thermal Mgmt. Consortium. Shows the progression over time for HW definition and categories
  - Displayed slides on trend analysis over time
  - Displayed front page of the new Tech Snapshot (Steinke)
  - GPC vs HPC slide – Make (2) simple categories to segregate versatility and cost-efficiency (GPC) against parallelism and performance (HPC)
  - High-level GPC & HPC trends slide – Tries to show how the floor space allocation and power allocation do not scale together when you have mixed compute
  - Server volume GPC & HPC trends slide – Tries to show that the overall server volume for HPC is growing faster than GPC, but GPC is still the largest share of total volume
  - GPC liquid cooling trends slide – Show large volume that will be air cooled. Increase of liquid cooling adoption in GPC as well

- GPC / HPC Infrastructure trends – Two graphs because the y-axis cannot align well between the two types. HPC density is increasing rapidly, but GPC density is relatively flat. Purple curve really represents AI workloads
- Impact on infrastructure planning – be aware that these workloads are coming, and we will see more mixed-use cases. Both segments are growing. GPC density growth is moderate; HPC is extreme. We will see liquid cooling proliferate into GPC as well; at least in hybrid / mixed use.
- Comment from Don Beatty – Intention on the Tech Snapshot is to communicate directionality; without getting caught up in technical details
- Question from Cosimo Pecchioli - Question if we see a transition from AI training to AI inference and a corresponding decrease in rack power density. Steinke comments that the Tech Snapshot is not going into that level of detail on purpose to avoid confusion in the interest of providing general directionality to the industry
- Comment from Tim Shedd – Don't try to interpret quantities from power trends slide. Some other slides give some idea of quantities, but they're trying not to give info on quantities. It's intended to be easy to consume without overcomplicating. Only look at each page independently and don't try to bring it all into a larger message that isn't the intention
- Comment from Paul Artman – This is directionally accurate and not a lot more to it. This is giving some basic guardrails for general interpretation

- Showed TCS Coolant Integrity and System Readiness Best Practices Tech Bulletin (Justin Seter)
  - Only one that failed; due to many comments. Edits have resulted in a better result and there is appreciation for the reviewers reading thoughtfully
  - Call to action to go find the Tech Bulletin on LinkedIn; Like and Comment to drive engagement
  - Genesis of this was just to get bullet points out for the industry where we were seeing a lot of problems in real time
  - Showed a few slides on the content with basic explanation about the nexus of the need for this with industrial contractors in data centers; which is not typical as its usually commercial contractors
  - Comments from Dustin that it's available and free. No need to take photos of the slides. Go to the TC9.9 website
  - Comment from Steve Harrington about how PG transitions from biostatic to something bio loves to eat. Lower PG concentrations are NOT ok. Response (Demetriou) guidance that may fit in with another fluids Tech Brief that is currently in development.

CALL TO CLOSE: 06/29/26 6:16 PM – Mark Steinke