



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

DRAFT

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. TC-1.4 DATE 1/21/2021

TC/TG/MTG/TRG TITLE Control Theory and Application

DATE OF MEETING Thursday January 21, 2021 LOCATION Virtual

MEMBERS PRESENT	YEAR APPTD	MEMBERS ABSENT	YEAR APPTD	EX-OFFICIO MEMBERS AND ADDITIONAL ATTENDANCE
James Del Monaco	2019	Jin Wen	2017	Corresponding –
Brandon Gill	2018	Mark Hydeman	2017	Provisional –
Larry Fisher	2018	Lotfi Nemat	2019	Guests –
Chris Benson	2019	Chariti Young	2019	
Amanda Pertzborn	2019			

DISTRIBUTION: All Members of TC/TG/MTG/TRG plus the following:

TAC Section Head: Jennifer Leach, PE	SH1@ashrae.net
All Committee Liaisons As Shown On TC/TG/MTG/TRG Rosters (Research, Standards, ALI, etc.)	jkohler9@comcast.net ; ahmed.kashef@nrc-cnrc.gc.ca ; jatkisson@aeieng.com ; pharmeng@shaw.ca ; shammerling@ashrae.org
Steve Hammerling, Manager Of Research & Technical Services	MORTS@ashrae.net

Note: These draft minutes have not been approved and not the official, approved record until approved by the TC.



ASHRAE Technical Committee 1.4

Meeting Agenda

TC 1.4 Control Theory and Application

<http://tc14.ashraetcs.org/>

Thursday, January 21, 2021 1:00 – 3:30 pm EST Virtual Conference

“Commitment to the ASHRAE Code of Ethics – In this and all other ASHRAE meetings, we will act with honesty, fairness, courtesy, competence, integrity and respect for others, and we shall avoid all real or perceived conflicts of interests. (See full Code of Ethics: <https://www.ashrae.org/about-ashrae/ashrae-code-of-ethics>.)”

TC 1.4 Control Theory and Application	1/21/2021 1:00 PM
TC 1.4 YEA/Education	1/15/2021 1:00 PM
TC 1.4 Control Components and Applications	1/15/2021 2:00 PM
TC 1.4 Programs	1/15/2021 3:00 PM
TC 1.4 Research	1/20/2021 2:00 PM
TC 1.4 Handbook	1/20/2021 4:00 PM

Seminar 10	Standardizing High Performance: Guideline 36 and Beyond (LIVE)
Seminar 13	What Have you Done for Me Lately? BAS Best Practices for O&M Success (LIVE)
Seminar 26	Smarter Together: Integrating HVAC & Lighting Control (LIVE)
Seminar 29	Avoid the Headlines! Today’s Top 10 Security Best Practices for Controls (LIVE)
Seminar 30	Controls Standards, Guidelines and Codes: What YEA Need to Know! (LIVE)
Seminar 31	Optimize and Succeed with DOAS (LIVE)
Seminar 38	Best Option for Demand Flexible, Grid Interactive Energy Efficient Buildings: Rule Based Algorithmic Controls or Model Predictive Controls
Seminar 71	Open: Not Live, Accessible Through Portal at Anytime; New Dogs, New Tricks: Air Flow Control Update

1) Call to Order

2) Introduce Members, Guests, and Liaisons

3) Roll Call (Quorum)

<input checked="" type="checkbox"/>	James Del Monaco, 6/30/21	<input type="checkbox"/>	Mark Hydeman, 6/30/21
<input checked="" type="checkbox"/>	Christopher Benson, 6/30/23	<input type="checkbox"/>	Chariti Young, 6/30/21
<input type="checkbox"/>	Jin Wen, 6/30/21	<input type="checkbox"/>	Nemat Lotfi, 6/30/23
<input checked="" type="checkbox"/>	Larry Fisher, 6/30/22	<input checked="" type="checkbox"/>	Amanda Pertzborn, 6/30/23
<input checked="" type="checkbox"/>	Brandon Gill, 6/30/22	<input type="checkbox"/>	

4) TC 1.4 Scope

- a) ASHRAE Technical Committee 1.4 is concerned with control theory, systems, and components (excluding refrigerant flow controls) for heating, ventilating, air conditioning, and refrigeration uses.

5) Approve minutes from previous meeting (posted on website and Basecamp)

- a) Vote to occur by email.

6) Approve agenda

- a) Chris Benson motions to approve. Amanda Pertzborn seconds. Approved 5-0-0.

7) Group Discussion point

- a) **TC 1.4 Cybersecurity Subcommittee**
 - i) Chris Benson to provide a proposition for a new subcommittee within TC 1.4 to focus on Cyber Security.
 - (1) Cybersecurity MTG chair Mike Galler wanted to make sure efforts were not duplicated between the MTG and any subcommittee formed.
 - (2) Larry Fisher proposes a forum be submitted for the summer meeting to attract interest and involvement. Chris Benson confirms there is a program being proposed on this topic.
 - (3) Chris Benson proposes a subcommittee expanded to explore Disruptive Technologies as they relate to controls.
 - (4) Subcommittee draft charter to be created and posted to Basecamp.
 - ii) New MTG on Cybersecurity for HVAC Systems and Related Infrastructure was formed in Orlando.

8) New business

- i) TC has will be more active in utilizing Basecamp.
 - (1) Elise Backstrom updated the members on Basecamp prior to the last Virtual Conference.
 - (2) TC Chair (James Del Monaco) will continue to update new members on Basecamp as they apply for PCM.
 - (3) To join the TC membership, use the "Join TC" link on the TC website and James will add you to the Basecamp at that time.
- ii) Executive Committee to Propose New Subcommittee for Consideration
 - (1) Refer to open discussion.
 - (2) Vote to occur at a later date via email. Subcommittee draft charter to be created for review.

9) Announcements

- a) **TAC – Technical Activities Committee**

- i) Update on TAC initiative to reduce the number of technical groups
 - (1) TC ReOrg committee issued a final report.
 - (2) So far, TAC has approved several TC mergers – 3.2&3.3, 8.10&8.12, 9.4 & 9.8, 7.3&7.8. TC's 10.1 and 10.3 have approved a merger as well.
 - (3) Many more being considered.
 - (4) Annual reaffirmation process being performed.
- b) **CEC – Conferences and Expositions Committee**
 - i) Upcoming conferences
 - 2021 Winter – Virtual, February 9-11
 - 2021 Annual – Phoenix, Arizona, June 26 – 30
 - 2022 Winter – Las Vegas, Nevada, Jan. 29 – Feb. 2
 - 2022 Annual – Toronto, ON, June 25-29
- c) **RAC – Research Activities Committee**
 - i) RAC meeting to occur at a later date.

10) OLD BUSINESS

- a) PROJECT COMMITTEE AND ONGOING RESEARCH REPORTS
 - i) SSPC 135 (BACnet) – Michael Osborne / Carol Lomonaco
 - (1) Ron Bernstein reports Working Group 223 under SSPC 135 is progressing on semantic tagging.
 - ii) SGPC 13 (Specifying Building Automation Systems) – Ron Bernstein
 - (1) Full update to Guideline 13 has occurred over the past year. Full comprehensive review, new chapter on cybersecurity, update to building automation chapter, new addendums added. Anticipated publish date of Summer 2021, anticipated public review draft Q1 2021.
 - iii) SGPC 36 (High-Performance Sequences of Operation for HVAC Systems) –Steve Taylor
 - (1) Ron Bernstein reports profile and sequence enhancement is occurring. Graphics discussion has occurred.
 - (2) Kim Barker reports public reviews closed early January.
- b) SUB-COMMITTEE REPORTS
 - i) **Executive** – James Del Monaco
 - (1) Potential subcommittee discussed.
 - (2) Roster management.
 - ii) **Education/YEA** – Michelle Shadpour
 - (1) Engaged new YEA members in program submissions as chairs and as speakers.
 - iii) **Control Components and Applications** – Chad Moore
 - (1) New Ideas for the TC to Work on - Research and Programs
 - (a) Preparing for the Unknowns
 - (i) Pandemic Preparedness
 - (ii) Wildfires
 - (iii) Other Natural Disasters
 - (b) Virtualized Servers for Controls (Chris Miller)
 - (i) Graphics and Resets are in the cloud
 - (c) Paul Ehrlich Introduced a Project at LBNL – Open Controls

- (i) Focus on Three Pieces - definition of what goes into programming language, CDL, controls exchange format
 - iv) **Program** – Frank Shadpour
 - (1) 8 Programs Accepted for 2021 Virtual Winter Conference.
 - (2) 11 Planned Proposals for 2021 Annual Conference.
 - (a) Proposals are due 2/22/2021. If you are interested in submitting a proposal that was not discussed, please reach out to Frank for any help needed.
 - v) **Research** – Kim Barker
 - (1) Web-based training is available online if you're interested.
 - (2) RP-1711 is complete and should be available to all members shortly.
 - (3) RP-1661 no cost extension has been extended to April 31, 2021.
 - (4) RP-1865 is on hold due to funding.
 - (5) RTAR-1925 is awaiting approval of RL-1 Liaison.
 - (6) Two new RTARs are in process – Benefits of Zonal Scheduling in Existing Buildings and Optimal Warmup (and Cooldown?) Mode Operations (second is available on Basecamp (under Research Subcommittee folder) for comments).
 - vi) **Handbook** – Charlotte Dean
 - (1) Chapter 7 of Fundamentals – Submitted to ASHRAE after the last Virtual Meeting.
 - (2) Beginning Work on Chapter 48 of Applications Handbook
 - (a) Deadline Summer 2022.
 - (3) Handbook central:
 - <https://www.ashrae.org/technical-resources/ashrae-handbook/ashrae-handbook-central>
 - (a) Authoring portal has changed. If you need assistance with access, email the Handbook Subcommittee Chair.
 - vii) **Standards** – Steve Taylor
 - viii) **Webmaster** – Elise Backstrom
 - (1) Website is up to date with meetings and seminars.
 - (2) Website update is occurring. Call for members to look at website for any changes they'd like to see.
- c) COMMITTEE LIASION REPORTS
 - i) TC 1.5 (Computer Applications) – Mike Pouchak
 - (1) Liasion not present.
 - ii) TC 2.10 HVAC Security – Kim Barker
 - (1) Nothing to report. Meeting has not occurred for this conference.
 - iii) TC 5.6 (Control of Fire & Smoke)
 - iv) TC 6.1 (Hydronic Systems)
 - v) TC 6.7 (Solar Energy Utilization) – Gaylen Atkinson
 - (1) Liasion not present.
 - vi) TC 7.3 (Operations & Maintenance Management)
 - vii) TC 7.5 (Smart Building Systems) – Jin Wen
 - (1) Liasion not present.
 - viii) TC 7.6 (Systems Energy Utilization)
 - ix) TC 9.10 (Laboratory Systems) – Jim Coogan
 - (1) Liasion not present.
 - x) TC 9.11 (Clean Rooms) – Phil Naughton
 - xi) SSPC 62.1 (Ventilation and Acceptable IAQ) – Steve Taylor
 - (1) Liasion not present.
 - xii) SSPC 90.1 (Energy Efficient Design of New Buildings) – Steve Taylor

- (1) Liaison not present.
- xiii) SSPC 202 (Commissioning Process for Buildings and Systems) – TBD
- xiv) SPC207P, Method of Test for Fault Detection and Diagnosis of Air Economizers – Chris Benson
 - (1) Completed public review and up for vote for publication.
- xv) SPC231P, CDL – A Control Description Language for Building Environmental Control Sequences – Paul Erlich
 - (1) Kim Barker reports meetings are biweekly. Outline for standard is being developed.
 - (2) Chris Bensions states we are cognitive TC, this report will be moved other section in meeting agenda for the next conference.
- xvi) TC 1.6 (Terminology) – Phil Naughton
 - (1) Liaison not present.
- xvii) SPC 189.1 Design of High-Performance Building – Bogi Setty
 - (1) Liaison not present.
- xviii) MTG Occupant Behavior in Buildings – Kim Barker
 - (1) MTG has not met for this conference.
 - (2) Number of program proposals and RTARs in progress.
- xix) MTG Cybersecurity – Kim Barker/Ron Bernstein
 - (1) MTG has not met for this conference.
 - (2) MTG is requesting experts and interested individuals who wish to become involved reach out.

d) SOCIETY COMMITTEES

11) Upcoming Deadlines

- Phoenix Annual Conference – June 26 – June 30, 2021
- Seminar, Forums, Workshops, Panels and Debates proposals for Phoenix are due by February 22, 2021
- RTARs & Work Statements due March 15, 2021 for Spring, June 15 for Summer.
- Conference Website: <https://www.ashrae.org/conferences/2021-annual-conference-phoenix>
- Conference Chair: Maggie Moninski
- Program Focus at Phoenix Annual Conference
 - i. Track 1: Fundamentals and Applications
 - ii. Track 2: HVAC&R Systems and Equipment
 - iii. Track 3: Research Summit
 - iv. Track 4: Professional Development
 - v. Track 5: Design, Control, and Operation of Critical Environments
 - vi. Track 6: HVAC&R for Indoor Plants & Animals
 - vii. Track 7: Future Proofing – Renewable, Regenerative, and Resilient
 - viii. Track 8: Hot, Hot, Hot
 - ix. Track 9 (Mini-Track): To be announced

12) Next Meeting – Phoenix, AZ | June 26 – June 30, 2021

13) Adjourn



TC 1.4 Control Theory and Application

YEA/Education Subcommittee Meeting Minutes

Virtual January 15, 2021

10:00 - 11:00 am

- 1) Introductions
- 2) Young Engineers in ASHRAE (YEA) attendance
- 3) Discussed what we've been doing and our subcommittee vision
 - i) Facilitating Mentorship within ASHRAE
 - ii) Promoting and submitting YEA lead and focused seminars
- 4) Discussed past programs
 - i) Highlighted we have a YEA / new TC 1.4 member lead seminar.
- 5) Discussed opportunities to get involved:
 - i) Programs
 - Volunteer to be a speaker (Mentor: Elise)
 - Volunteer to be a chair (Mentor: Michelle) - One volunteer
 - ii) Research



TC 1.4 – PROGRAM SUBCOMMITTEE ZOOM MEETING 2021 ASHRAE WINTER MEETING - VIRTUAL CONFERENCE

The subject meeting was held via Zoom Video conferencing on Friday, January 2021 starting at 3:00 PM EST (12:00 Noon PST). A virtual sign-in sheet is attached.

Programs that will be presented Virtually at the Winter Meeting:

Feb 9–11, 2021.

1. Seminar 10

Tuesday: Live Chat Q&A with Speakers: 2/9/2021 6:00-7:50pm
Standardizing High Performance: Guideline 36 and Beyond (LIVE)
Chair: Chariti Young

2. Seminar 13

Wednesday: Live Chat Q&A with Speakers: 2/10/2021 7:00-8:50am
What Have You Done for Me Lately? BAS Best Practices for O&M Success (LIVE)
Chair: Charlotte Dean

3. Seminar 26

Thursday: Live Chat Q&A with Speakers: 2/11/2021 7:00-8:50am
Smarter Together: Integrating HVAC & Lighting Control (LIVE)
Chair: Scott Hackel

4. Seminar 29

Thursday: Live Chat Q&A with Speakers: 2/11/2021 12:00-1:20pm
Avoid the Headlines! Today's Top 10 Security Best Practices for Controls (LIVE)
Chair: Chariti Young

5. Seminar 30

Thursday: Live Chat Q&A with Speakers: 2/11/2021 12:00-1:20pm
Controls Standards, Guidelines and Codes: What YEA Need to Know! (LIVE)
Chair: Omar Rojas

6. Seminar 31

Thursday: Live Chat Q&A with Speakers: 2/11/2021 12:00-1:20pm
Decouple, Optimize And Succeed with DOAS (LIVE)
Chair: James Coogan

7. Seminar 38

Open: Not Live, Accessible Through Portal at Anytime
Best Option for Demand Flexible, Grid Interactive Energy Efficient Buildings: Rule Based
Algorithmic Controls or Model Predictive Controls?
Chair: Paul Ehrlich

8. Seminar 71

Open: Not Live, Accessible Through Portal at Anytime
New Dogs, New Tricks: Air Flow Control Update
Chair: James Coogan



Anticipated Programs for 2021 Virtual That will Not Take Place:

1. **Seminar: Algorithmic vs Predictive Control**
Chair: Paul Ehrlich
2. **Seminar: Minimizing Energy Use with Primary DOAS and Secondary Fan Powered Units in the Occupied Space**
Chair: Jim Coogan
3. **Seminar: Automating Control Sequence Selection and Evaluation**
Speakers: Paul Ehrlich, Mike Wetter, and Steve Taylor
Chair: Chariti Young
4. **Seminar: What have you done for me lately? BAS Best Practices for O&M Success**
Possible Cosponsor: 7.3 Operation and Maintenance Management
Chair: James Del Monaco
5. **Workshop: Understanding the Basics of Controls, the Key to Becoming a Great Engineer!**
Chair: Michelle Shadpour
6. **Seminar: The latest developments in integrated, digital control between lighting and HVAC**
Chair: Jim Coogan
7. **Seminar: Real World Applications for BACnet SC**
Chair: Chris Benson
8. **Seminar: Building Automation and Covid-19**
Chair: Elise Backstrom



Programs Proposed for 2021, Summer Meeting

1. **Seminar: Algorithmic vs Predictive Control**
Possible Speakers: Abhi,
Chair: Paul Ehrlich

2. **Workshop: Hands on Demonstration - Automating Control Sequence Selection and Evaluation**
Speakers: Paul Ehrlich, Mike Wetter, and Steve Taylor
Chair: Chariti Young

3. **Seminar: Innovative and New Ideas: BAS Best Practices for O&M Success**
Possible Cosponsor: 7.3 Operation and Maintenance Management
Speakers: Chris Benson,
Chair: James Del Monaco

4. **Workshop: Understanding the Basics of Controls, the Key to Becoming a Great Engineer!**
Possible Speakers: Abhi, Israa, Jim Coogan,
Cosponsors: YEA
Chair: Michelle Shadpour

5. **Seminar: Real World Applications for BACnet SC**
Possible Speakers: Jim Butler, Carroll Delmonico,
Chair: Chris Benson

6. **Panel Discussion: Lessons Learned: Building Automation and Covid-19**
Possible Speakers: Chris Benson, CSU System: James,
Chair: Elise Backstrom

7. **Seminar: Important Stuff with Guideline 36 – What’s good, What’s bad!**
Possible Speakers: Jim Coogan, Paul Ehrlich
Chair: Tara Shoorideh

8. **Seminar: Net Zero Energy Building Controls**
Possible Speakers: Veronica Adetola,
Chair: Paul Ehrlich

9. **Seminar: Artificial Intelligence and Deep Learning**
Possible Cosponsor TC’s: TC1.5
Possible Speakers: Amanda Pertzborn, Chris Benson as a consultant,
Chair: Abhi



- 10. Seminar: Critical Environments and Controls**
Possible Speakers: Robert Kraft,
Chair: Jim Coogan

- 11. Seminar: Hospitals Operating Room Control**
Possible Speakers: Jim Coogan, Steve Grant , Abhi, Kurt Montero,
Chair: Joseph Kilcoyne

- 12. Seminar: Wildfires: Smoke Control for Buildings**
Possible Speakers:
Chair: Open

Program “Pipeline” for Future Meetings:

- 1. Should I be Alarmed? Part 1: BACnet Alarm Options and When to Use Them**
Chair: Carol Lomonaco

- 2. Should I be Alarmed? Part 2: Building Operations Alarming Best Practices**
Co-sponsor: TC7.3
Chair: Michelle Shadpour

- 3. Should I be Alarmed? Part 3: Improving BAS Alarm Specification**
Chair: Chariti Young

- 4. Seminar: How to Become a Building Automation Engineer?**
Chair: Dave Kahn (YEA)

- 5. Be alarmed about what your BAS is not telling you: Is no news really good news?**

- 6. Web-Services. XML, SOAP: How Do I Get Non-Traditional BAS Information and Use It for My Building Automation**

- 7. Controls for Fuel Cells, Cogeneration, Micro-Cogeneration, and Renewables**

- 8. Data Analytics...What interesting information can be derived from BAS data?**

- 9. Special Sensors: Contaminants and Microbial Sensors**

- 10. Project Control Submittals – What should they include?**

- 11. Designing a Command and Control Center for Buildings and Large Campuses**

- 12. Humidifiers and Humidity Control for Critical Spaces**

- 13. How to Assess the DDC Systems of an Existing Facility?**



- 14. What Is That Most Consulting Engineers Are Doing Poorly? How to Properly Design and Specify Control Systems?**
- 15. Seminar: IAQ & Comfort through Building Automation Systems**
- 16. Application of Narrow AI in BAS, in the near future – Machine learning!**
- 17. Seminar or Conference Paper by Ron Bernstein: Smart Grid and Smart Buildings**



Proposed Tracks for 2021, Summer Meeting

Phoenix, AZ | Jun 26–30, 2021

- Track 1 Fundamentals and Applications:
- Track 2 HVAC&R Systems and Equipment:
- Track 3 Research Summit:
- Track 4 Professional Development:
- Track 5 Design, Control, and Operation of Critical Environments:
- Track 6 HVAC&R for Indoor Plants & Animals:
- Track 7 Future Proofing - Renewable, Regenerative, and Resilient:
- Track 8 Hot, Hot, Hot
- Track 9 Mini-Track To be announced.



Deadlines for 2021, Summer Meeting

Phoenix, AZ | Jun 26–30, 2021

Wednesday January 13, 2021: Revised Conference Papers/Final Technical Papers Due

Monday February 15, 2021: Extended Abstracts Due

Thursday February 18, 2021: Conference and Technical Paper Final Accept/Reject Notifications

Monday February 22, 2021: Program Submissions Due

Friday March 19, 2021: Extended Abstract Accept/Reject Notifications

Friday April 2, 2021: Program Submissions Accept/Reject Notifications

Potential Sources Bias Disclosure: In accordance with the ASHRAE Code of Ethics, speakers have been asked to fill out a potential sources bias disclosure document that will note affiliations/ involvement with any organizations with financial or commercial interest in the subject matter to be discussed.

Program Types

Technical Paper Session: These sessions present papers on current applications or procedures, as well as papers resulting from research on fundamental concepts and basic theory. Papers presented in these sessions have successfully completed a rigorous peer review. Forms for written comment are available at each session and sent to respective authors for reply and publication in ASHRAE transactions, if received by a certain date.

Conference Paper Session: These sessions present papers on current applications or procedures, as well as papers reporting on research in process. These papers differ from technical papers in that they are shorter in length and undergo a much less stringent peer review.

Seminar: These sessions feature presentations on subjects of current interest. There are not papers attached to seminars.

Workshop: These sessions enable technical committees and other ASHRAE committees to provide a series of short presentations on a topic requiring specific expertise. These short presentations are provided with an increased emphasis on audience participation and training in a specific set of skills. There are not papers attached to workshops.

Forum: The sessions are “off-the-record” discussions held to promote a free exchange of ideas. Reporting of forums is limited to allow individuals to speak confidentially without concern of criticism. There are not papers attached to forums.

Panel Discussion: Panel discussions can feature a broad range of subjects and explore different perspectives on industry related topics. This session format includes a panel of 3-4 speakers each addressing a facet of the session topic, followed by an interactive discussion lead by the session chair. Panel Discussions may be 60 minutes or 90 minutes in length and will be posted online in the Virtual Conference.

Debate: Debates highlight hot-button issues commonly faced by our membership. Industry experts, either on teams or as individuals, argue opposing sides of an issue, concluding with position summaries and audience feedback. Debate sessions may be 60 minutes or 90 minutes in length and will be posted online in the Virtual Conference.



Presentations and Guidelines:

1. Conference Paper vs. Technical Paper: Conference paper is limited to eight (8) pages, the timeline is shorter and the review process less rigorous than the technical papers currently presented in the Technical Paper Sessions.
2. Seminar and Forum Submissions: For Seminar submissions, they should include six (6) Learning Objectives and ten (10) Questions and Answers for the session.
3. Seminar Program Submission: 60 minutes (1-2 speakers) or 90 minutes (3-4 speakers).

Upcoming Meetings:

Jun 26–30, 2021 Phoenix, AZ

Jan 29–Feb 2, 2022 Las Vegas, NV

Jun 25–Jun 29, 2022 Toronto, ON

ASHRAE Announcement:

- Conference, presentations will be REQUIRED to be uploaded before the conference opening onsite. If a presentation is not uploaded, the presenter will be assessed a strike, within our 3 strike program. If a presenter collects three strikes, he/she will not be selected to present at another ASHRAE conference.

These minutes stated herein were approved by TC1.4 program subcommittee.

Submitted by: Frank Shadpour, PE
TC1.4 Program Subcommittee Chair
frank@scengineers.net



Appendix

2021 ASHRAE Annual Conference Phoenix, AZ | Jun 26–30, 2021

**The 2021 ASHRAE Annual Conference will be held in
Phoenix, AZ!**

Let's Hope It Happens in Phoenix!

The Technical Program along with Committee meetings, Registration, the Bookstore and Speakers Lounge will be at the Sheraton Phoenix Downtown and the Phoenix Convention Center.

• 2021 ANNUAL CONFERENCE TECHNICAL PROGRAM

"Our world has experienced fundamental change in the wake of the global COVID-19 pandemic. The HVAC community continues to respond addressing challenges in how we design, build, and operate buildings." said Christine Reinders, 2021 Conference Chair. "We continue to evolve, adapt, and innovate, confronting these challenges head on. The 2021 Annual conference in Phoenix will focus on critical environments, hot climates, and future proofing. The technical program, including the research summit and professional development, fosters sharing of knowledge to allow us all to serve our communities and solve society's greatest challenges."

The 2021 ASHRAE Annual Conference technical program is comprised of eight tracks, selected to represent areas of focus common among ASHRAE membership.

Track	Description	Track Chair
1	<p>Fundamentals and Applications: Fundamentals are the foundation for understanding applications in engineering. Key components of ASHRAE fundamentals include thermodynamics, psychometrics, fluid and mass flow. This track provides opportunities for papers and presentations of varying levels across a large topic base. Concepts, design elements and shared experiences for theoretical and applied concepts of HVAC&R design are included.</p>	<p>Sonya Pouncy sonyapouncy@gmail.com</p>
2	<p>HVAC&R Systems and Equipment: HVAC&R Systems and Equipment are constantly evolving to address the changing requirements of the built environment. Papers and programs in this track will focus on the development of new systems and equipment, improvements to existing systems and equipment and the proper application and operation of systems and equipment.</p>	<p>Rupesh Iyengar rupesh_iyengar@y...</p>
3	<p>Research Summit: Active research, and the exchange of those research findings, are critical to the development of our HVAC&R industry and built environment. The 8th annual research summit invites researchers to share those results, including ASHRAE-sponsored research and research of interest to the ASHRAE community. Researchers are invited to present papers, extended abstracts, seminars, forums or participate in panel discussions. The Research Summit includes a partnership with ASHRAE's archival journal, Science and Technology for the Built Environment.</p>	<p>Kristen Cetin cetinkri@msu.edu</p>
4	<p>Professional Development: As members of a professional organization, we not only participate for the great value of technical exchange, but also the interpersonal exchange. We recognize that the single greatest strength of our organization is its membership. This track is designed to allow those professionals an opportunity to develop in the areas of presentation skills, leadership, team-building, understanding various business operations, interpersonal skills, etc. In short, the Professional Development Track will cover all aspects of business outside of engineering/technical applications and lends itself to interactive session types such as workshops and forums.</p>	<p>Marites Calad mcalad@norman-v...</p>
5	<p>Design, Control, and Operation of Critical Environments: Critical environments often present design, control, and operation challenges that require innovation, attention to detail, and a thorough understanding of the intended operational parameters. This track includes innovative designs and strategies that adapt to the standards and special requirements presented by healthcare, cleanrooms, data centers, laboratories, isolation rooms, and pharmacies. Papers and presentations will also address how controls systems, smart building technologies, and security systems and other technologies are adapting to the emerging needs of critical environments.</p>	<p>Raul Simonetti raul.simonetti@car...</p>
6	<p>HVAC&R for Indoor Plants & Animals: This track addresses HVAC&R systems design for controlled environments that host plants & animals. Papers and programs in this track will present the challenges and opportunities associated with energy and water utilization for indoor growing spaces, including standards and regulations that guide the design of plant & animal habitats. Environmental parameters for indoor agriculture, including controlling temperature, humidity, air movement, air quality will be covered. This track will also address reducing consumption of energy & water and compare how crop types and animal species impact HVAC analysis and design.</p>	<p>Ryan MacGillivray ryan.macgillivray@...</p>
7	<p>Future Proofing - Renewable, Regenerative, and Resilient: The HVAC&R industry faces many challenges including climate change, pandemics, natural disasters, catastrophic accidents, and terrorism. Rising to meet these challenges are a host of technologies and strategies, including grid-enabled buildings, demand response, decarbonization, resiliency, zero energy design, energy-efficiency and renewable energy systems. This track invites papers, abstracts, seminars and forums that highlight the innovative technologies and strategies that are reimagining our relationship with the built environment now and into the future.</p>	<p>Andy Cochrane acochrane@indust...</p>
8	<p>Hot, Hot, Hot The world is warming. The built environment faces increased challenges to meet the demand for comfortable Indoor and outdoor environments in warmer climates. This track is for papers and presentations that address humidity control, outdoor cooling, passive cooling, water scarcity considerations, other design opportunities, and innovative technologies that help HVAC&R professionals adapt to the hottest climate trends.</p>	<p>Nohad Boudani nohadb@inco.com</p>
9 (Mini-track)	<p>To be announced.</p>	



Web Site Open for Extended Abstracts and Program Proposal Submittals

The 2021 ASHRAE Annual Conference is now accepting Extended Abstract papers and program proposals.

- Extended Abstracts are being accepted for the Research Summit track only. Extended Abstracts can be up to 3 pages in length and must be prepared using the Word template. Extended Abstracts are due February 15, 2021.
- Proposals for Seminars, Forums, Workshops, Panels and Debates are being accepted through February 18, 2021.

For more information or to submit an Extended Abstract or a program proposal, click here <https://ashraem.confex.com/ashraem/s21/cfp.cgi>

Phoenix Deadlines 2021 – June 26 - 30, 2021

Wednesday January 13, 2021: Revised Conference Papers/Final Technical Papers Due

Monday February 15, 2021: Extended Abstracts Due

Thursday February 18, 2021: Conference and Technical Paper Final Accept/Reject Notifications

Monday February 22, 2021: Program Submissions Due

Friday March 19, 2021: Extended Abstract Accept/Reject Notifications

Friday April 2, 2021: Program Submissions Accept/Reject Notifications

TC 1.4 Control Theory and Applications Research Subcommittee (RSC) Activities

Virtual Meeting – January 20, 2021

RSC Meeting Minutes:

1. Announcements

- a) Web-based Training Modules for RTAR, WS, PES and PMS are available on ASHRAE website.
- b) WS and TRP's must have milestone chart and associated costs for each milestone as a percent of total project cost. Bidders may propose a different milestone chart with associated costs than suggested in the RFP. A questionnaire will be sent to PMS Chair at each milestone level to obtain project status. Payments at each milestone level will be made to the contractor only after approval of each milestone deliverables by the PMS.
- c) RTARs and WSs should be reviewed by liaison prior to submission to RAC. TC 1.4 Research Liaison is Ahmed Kashef RL1@ashrae.net and Curtis Wilkins RACvchair@ashrae.net

Active Project Status:

Name	Project	PMS	Status
RP-1711 [DONE]	<i>Advanced Sequences of Operation for HVAC Systems – Phase II Central Plants and Hydronic Systems</i>	<i>Barry Bridges Marcelo Acosta Chad Moore Joe Kilcoyne</i>	<i>TC-1.4 approved final report, Disposition Form complete. Seminar presented at this meeting. Final report posted to ASHRAE website.</i>
RP-1661 TC 4.7 w/1.4	Development and Validation of Dynamic Models for the Control of Chiller Plants with Water Side Economizer	Jeff Stein (TC1.4)	No cost extension has been extended to April 31, 2021.
RP-1865	Optimizing Supply Air Temperature Control for Dedicated Outside Air Systems	Dove Feng John Murphy Jayson Bursill Edward Gutowski	Project was awarded to Texas A&M University and ASRHAE is waiting for the University Sponsored research Office to sign the contract. The P.I. for the project is Zheng O'Neill. Contract is on-hold, due to funding. Earliest work will begin is after June 2021 meeting.

2. Possible Research Project Status:

Status	Other TCs	Project	Champion	Remarks
RTAR-1925	TC1.4	Building Operation & Equipment Key Performance Indicators	Ian Bonadeo	Need approval of RL-1 Liaison. Explanation of TC1.4 negative votes for resubmittal for March 15, 2021
NEW RTAR	TC1.4	Benefits of Zonal scheduling in Existing buildings.	Chris Benson Chris Miller Jin Wen Terry Schroeder	DOE has existing building types to model impact of zonal scheduling. What makes a good building for zonal scheduling? What are the economic & comfort benefits? Impact of turn-down on building equipment?
NEW RTAR	TC1.4	Optimal Warmup (and Cooldown?) Mode Operation	Hwakong Cheng	Information has been placed on BaseCamp for review/comment by members.
RTAR	Co-sponsor TC	Common GUI system graphics for BAS Operators Specifying BAS graphics (Data sets, functional objects)	Marcelo Acosta Ron Bernstein Hwakong Cheng Carol Lomonaco	Identify minimal data set required for functional objects. Make graphics that are user-friendly. Number of clicks to navigate, Recommendations, how many bells and whistles get turned off to do your work. RP-1633. GUI for SGPC-36 sequences. GPC-13 can provide, examples.
WS		%kW vs, %CFM and %GPM curves for real systems	Steve Taylor Joe Zhou Jim Coogan Jin Wen	Real variable flow systems do not have ideal parabolic system curves because of closing dampers/valves. DP setpoint reset helps but actual and simulated performance doesn't match. Keep - Good idea!
WS	Co-sponsor TC 6.1	Selecting Control Valves	Steve Taylor Carol Lomonaco	Work statement under development. Keep
IDEA	Co-sponsor TC7.5	Effectiveness of Night Setback and Optimum Start	Gregory Cmar Reece Kim Barker Joe Zhou	Cold climates impact SSTO. How can we automate when you need to adjust night setback variable? Develop control sequence based on recovery time. Simulation for guidelines for changing reset temperature. Determine seasonal space temperature setpoint reset and/or impact of using rolling weather forecast (next-day, 3-day, 7-day) via internet.
IDEA	7.5 7.3	Alarm Management, Alarm escalation, suppression, alarm flooding, latching etc..	Carol Lomonaco Kim Barker Jin Wen (TC7.5)	Planned forum for Austin will provide more information to support development of RTAR.

Status	Other TCs	Project	Champion	Remarks
IDEA		Coordinating control of hybrid radiant and DOAS for maximum efficiency	Hwakong Cheng	CEC has done past research. Provides recommended research
IDEA		Cloud based MPC to that interacts with on BAS.	Needs champions Kim Barker	How do you simplify MPC to run optimum control sequence on BAS? Send optimization settings from the cloud to BAS.
RTAR	TC 7.9 TC 7.3	Persistence, Cost & Benefits of Commissioned Building Controls	David Underwood Joe Zhou Scott Hackel Ron Bernstein	When does building performance start to degrade? Report done by ComEd (28 bldgs).
IDEA		Retrofit of Adv. RTUs for mitigation of risks.	Chris Benson	Managing of the Adv. RTU conversion/retrofit. What steps need to be added to the process to identify if risk Is any risk to building occupants and equipment life/liability.
IDEA			Chris Benson	What do the adv sequences optimize? Optimization of cost, energy, carbon may impact selection sequences used.
IDEA	7.5		Jayson Bursill	Separate sensor proxy for different type of functions. Cost benefit, function benefits, Define best measurement. Example: occupancy sensor, security. Proxy for other values. May have home in GPC-13

Topics of Discussion (January 2021)

- [Chris Benson – University of Utah] Discussion focus on implementation & benefits of zonal scheduling. Improved energy savings in existing buildings
 - Jin Wen - DOE building types could be used to evaluate benefits of zonal scheduling Jin Wen will do quick literature search on research done and send it to Chris Benson.
 - Chris Miller – Need to consider impact turn-down will have on equipment operation. For example, had to use two different methods due to the turn-down ratio of the fan. Current sensor worked above 15%, below 15% data was provided by VFD.
 - Team members: Chris Benson, Jin Wen, Terry Schroeder-WRA and Chris Miller
- [Chris Miller] Occupancy driven – scheduling, zones. Are people there? How do you handle hotel? People moving locations throughout the day. MTG:OBB has several RTARs on occupancy driven demand control. What impact does occupancy driven zones have on BAS cybersecurity? What research has been done in this area?
 - RTAR, WS, RP from MTG:OBB (Occupant Behavior in Buildings)
 1. RP-883 – Global occupant database
 2. WS-1811 - Determining Occupancy Patterns in Clusters of Buildings with Data Drawn from Web Based Social Media (Dong)
 3. WS-1815 - Integrating Occupant Behavior Data into Building Performance Simulation (Hitchcock)
 4. RTAR-1870 - Investigating Occupant Energy Behavior and Building-Human Interaction in Office Buildings (Chen)

5. RTAR (TC 4.7) - Baseline modification when building occupant behavior changes (Abushakra)
 6. RTAR (TC 7.5) - Occupancy-Aware Control and Operation of HVAC Systems in Commercial Buildings (O'Neil).
 - [Hwakong Cheng, Taylor Engineering] - Optimal Warmup (and Cooldown?) Mode Operation
 - RTAR Topic was discussed. Document will be placed on BaseCamp for others to review/comment upon.
3. Research RTARs and WS Deadlines:
- **March 15 for spring meeting**
 - May 15 for June meeting
 - August 15 for fall meeting
 - December 15 for January meeting
4. Adjourn: 2:54
5. Attendance
1. Kimberly Barker, Siemens
 2. James Del Monaco, P2S
 3. Amanda Pertzborn, NIST
 4. Chris Amundson, JCI
 5. Chris Battisti, USACE-CERL
 6. Chris Benson, University of Utah
 7. Edward Gutowski, van Zelm Engineers
 8. Elise Backstrom, Exyte
 9. Ian Bonadeo, Hawkeye Energy Solutions
 10. JoeDon Breda, OSU Medical Center
 11. Sadra Hemmati, Michigan Tech University
 12. Terry Schroeder, WRA
 13. Tony Bruno, Trane
 14. Jin Wen, Drexel University
 15. Robert Kraft,
 16. Scott Hackel, Slipstream
 17. Larry Fisher
 18. Tara Shoorideh, P2S
 19. Charlotte Dean,
 20. Tomar Zarhi, WSP Canada
 21. Chris Miller, P2S
 22. John House
 23. Gwelen Paliaga
 24. Steve Grant
 25. Ron Bernstein
 26. Hwakong Cheng, Taylor Engineering
 27. Jim Coogan, Siemens

Topics of Discussion (June 2020)

- From Ron Bernstein - RBCG Consulting: BAS Cybersecurity design, validation, and commissioning
 - Suggest working with TC 1.5
 - Talk to Carol Lomonaco (JCI)
- From Ron Bernstein - RBCG Consulting:
 - Interaction of lighting controls with Hvac, breaking down silos, networked lighting controls
 - <https://www.designlights.org/news-events/news/new-dlc-report-webinar-interoperability-for-networked-lighting-controls/>

- <https://blog.designlights.org/2020/02/05/networked-lighting-controls-system-technical-requirements-v5-nlc5-released-and-open-for-comment/>
- <https://www.designlights.org/lighting-controls/reports-tools-resources/interoperability-for-networked-lighting-controls/>
- <https://betterbuildingsolutioncenter.energy.gov/summit/2020-sessions>
- For the better buildings summit, see Wed, June 10 session: The Next Frontier in Lighting: Getting Connected with the Integrated Lighting Campaign
- **Chris Benson – University of Utah:** Impact scheduling equipment has on energy & comfort. Traditional scheduling of equipment does not consider diversity. Historically scheduling was/is based on equipment operation (e.g., Ahu – single/all zones) versus Grouping similar zones (e.g., offices, classrooms, etc.) into Group/Class to account for diversity.
 - Chariti Young – ALC: The best way to turn system & improve overall efficiency of equipment needs to work its way back into Guideline 36. Specify guideline document on organize lighting & HVAC synchronize for success.
 - Chris Miller - P2S Inc.:
 - Coupled with Chris Benson Zones and minimum speed of 10% of max on the VFD to actual turn down to the zone.
 - This relates to only Chilled Water AHU's it will be difficult to get this granular on DX equipment and required min flow/load.
 - Maybe a research project and History of Tablet or Phone based Apps in the built environment how is it improving things, and where it is going, and the possibilities. Where has this gone since Bill Gates first developed it for his home.
 - Max Sun - P2S Inc.: What's currently happening with office buildings with large numbers of people working remote? Are mechanical systems still running at normal capacity?
 - James Del Monaco - P2S Inc. – Impact on ventilation system
 - Need to disable demand control ventilation? No longer people density
 - Need to for periodic flush fresh air into occupied space.

TC 1.4 Control Theory and Applications

Handbook Subcommittee

January 20, 2021 / 4:00 – 6:00 EST

Virtual Winter Conference- Zoom meeting

1. CALL TO ORDER

2. REPORT FROM APPLICATIONS HANDBOOK LIAISON (Kashif Nawaz)

- 2.1. TC approval for 2023 Applications, Chapter 48 “Design and Application of Controls” is due Summer 2022.

3. NEW BUSINESS

- 3.1. The subcommittee is in the process of starting to edit Applications, Chapter 48.
 - 3.1.1. Kashif Nawaz is our Applications Handbook Liaison for Chapter 48 in 2023.
- 3.2. Meeting minutes from 2020 Virtual Annual Conference has been posted to Basecamp (Charlotte)
- 3.3. Edits to the Chapter will be done using the ASHRAE Authoring Portal (AAP). The link to the portal is as follows: authoring.ashrae.org. It will open through Sharepoint. Anyone who's associated with TC1.4 can access the Chapters associated with this TC. Email Heather Kennedy for access (hkennedy@ashrae.org). Further guidance on the AAP can be found at the following link: <https://www.ashrae.org/technical-resources/ashrae-handbook/ashrae-handbook-central>
- 3.4. Chapter 48 of the Applications Review for TC1.4 will be split up into several sections:
 - 3.4.1. Heating Systems
 - 3.4.2. Cooling Systems
 - 3.4.3. Air Systems
 - 3.4.4. Special Applications
 - 3.4.5. Design Considerations and Principles
 - 3.4.6. Control Principles for Energy Conservations
 - 3.4.7. We will want to add references to G36 as appropriate (pressure reset strategies, etc)
 - 3.4.8. General review and identify gaps/areas:
 - 3.4.8.1. Energy recovery ventilators
 - 3.4.8.2. Heat recovery chillers and other
 - 3.4.8.3. Humidification- control to dew point instead of RH
 - 3.4.8.4. Explain what G36 is

4. NEXT MEETING AND SCHEDULE

- 4.1. Target a meeting in mid-March (read the Chapter, make larger organizational suggestions and new content suggestions), mid-May prior to summer
- 4.2. Confirm Phoenix meeting time Summer June 2021.

4.3. Charlotte to confirm with Jason A. that last Chapter submittal was ok.

5. **Adjourn**

Adjourn at 5 PM EST.

TC 1.4 Handbook Subcommittee Attendance List

Present	Name	email
X	Charlotte Dean	Charlotte.Dean@p2sinc.com
X	Chris Miller	Chris.Miller@p2sinc.com
X	Taraneh Shoorideh	Taraneh.Shoorideh@p2sinc.com
X	Terry Schroeder	tschroeder@wrallp.com
X	Ron Bernstein	ron@rb-cg.com
X	Jim Coogan	Jim.coogan@siemens.com
X	Robert Kraft	
X	Steve Grant	sjgrant@esolutionstn.com
X	Jacky Ly	Ly.jacky@gmail.com
X	Joe Don Breda	Joedon.breda@osumc.edu
Liaisons		
	Kashif Nawaz	Applications 2023 Handbook Liaison