



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. TC-1.4 DATE 7/9/2020

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

DATE OF MEETING Thursday July 9, 2020 LOCATION Virtual

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

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

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

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, July 9, 2020 1:00 – 3:30 pm 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      | 7/9/2020: 1:00 PM |
| TC 1.4 YEA/Education                       | 6/11/2020 4:00 PM |
| TC 1.4 Control Components and Applications | 6/8/2020 1:00 PM  |
| TC 1.4 Programs                            | 6/11/2020 5:00 PM |
| TC 1.4 Research                            | 6/8/2020 2:00 PM  |
| TC 1.4 Handbook                            | 6/8/2020 4:00 PM  |

|            |                                                                                                                                 |
|------------|---------------------------------------------------------------------------------------------------------------------------------|
| Seminar 5  | Control Hieroglyphics: The YEA Rosetta Stone                                                                                    |
| Seminar 9  | Leadership Strategies and Tactics: Utilizing Emotional Intelligence                                                             |
| Seminar 21 | Control for Grid Interactive Buildings: Impacts on Building Efficiency                                                          |
| Seminar 30 | The Role of Building Automation in Building Resilient Communities                                                               |
| Seminar 34 | Zero-Net Energy Hospitals: Is this a Myth                                                                                       |
| Seminar 38 | Controls in an Evolving Landscape: The impact of 5G, Blockchain, Modern Control Sequences, AI and other Exciting Technologies   |
| Seminar 39 | Low Cost Sensing Technologies for Grid-Interactive Efficient Buildings                                                          |
| Seminar 46 | Application and Machine Learning in GEB (Grid-Interactive and Efficient Building) Load Forecasting I                            |
| Seminar 48 | Designing for Resilient Strategies, Equipment and Controls                                                                      |
| Seminar 52 | Zero Energy Buildings and Intelligent Controls                                                                                  |
| Seminar 56 | Smart Grid Applications Guide: A New Tool for Building Professionals                                                            |
| Seminar 66 | How Smart Buildings Can Communicate with and Automatically Respond to Smart Grid? Introduction to Open ADR, BACnet and VOLTTRON |

#### 1) Call to Order

#### 2) Introduce Members, Guests, and Liaisons

### 3) Roll Call (Quorum)

|   |                             |
|---|-----------------------------|
| X | James Del Monaco, 6/30/21   |
| X | Christopher Benson, 6/30/23 |
| X | Jin Wen, 6/30/21            |
| - | Larry Fisher, 6/30/22       |
| - | Brandon Gill, 6/30/22       |

|   |                           |
|---|---------------------------|
| - | Mark Hydeman, 6/30/21     |
| X | Chariti Young, 6/30/21    |
| X | Nemat Lotfi, 6/30/23      |
| - | Amanda Pertzborn, 6/30/23 |
|   |                           |

### 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)

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

### 6) Approve agenda

- a) Jin Wen motions to approve. Chariti seconds. Approved 5-0-0

### 7) Group Discussion point

- a) **Certification Course in Building Automation Systems**
  - i) Larry Fisher to provide update to revising and resubmitting on a BAS Certification Course through ASHRAE. In process – should hear back in November on acceptance. If interested in assisting with this application/course, please reach out to Larry Fisher directly at [lfisherky@gmail.com](mailto:lfisherky@gmail.com).
- b) **Feedback on Virtual Conference**
  - i) Open discussion.
    - (1) Teams as opposed to Zoom was suggested (Naughton).
    - (2) Seminars should be released further than 1 week ahead of meetings. (Morrow)
    - (3) Tough to split conference and committee schedule (Benson)
    - (4) Suggestion of liaison to COVID task force, Chris Benson volunteered.

### 8) New business

- i) TC will be more active in utilizing Basecamp.
  - (1) Elise Backstrom updated the members on Basecamp prior to the Virtual Conference.
  - (2) James Del Monaco will continue to update new members on Basecamp as they apply for PCM.
- ii) Update on 1865-WS.
  - (1) Update by Kim Barker
    - (a) DOAS Systems & Sequences, companion to Guideline 36. Went out for bid. Bid awarded to Texas A&M, contract in progress. RP 1865. For more information, refer to Research Subcommittee Meeting Minutes. Need PMS identified, Jim Coogan volunteered, PMS to be confirmed offline.
    - (b) Zheng O'Neill (Texas A&M) stated contract is on hold until next year due to budget issues.
- iii) Update on RP-1819 Multi-Zone VAV CO2 Demand Controlled Ventilation
  - (1) Requesting a no-cost extension through July 1, 2020
  - (2) Next Steps: Complete review of the final report and request approval from TC 1.4 in June 2020 at the Annual Conference in Austin
  - (3) Refer to RP Subcommittee meeting minutes for more information.

## 9) Announcements

### a) TAC – Technical Activities Committee

- i) Update on TAC initiative to reduce the number of technical groups
  - (1) TAC has a subcommittee to implement recommendations of TC Rep-Org Ad HOV final report.
  - (2) So far, TAC has approved 4 TC mergers – 3.2&3.3, 8.10&8.12, 9.4 & 9.8, 7.3&7.8.2020
  - (3) Several TCs are still in the discussion phase.
  - (4) New MTG on Cybersecurity for HVAC Systems and Related Infrastructure has been formed since Orlando.
    - (a) Mike Pouchak requests roster of MTG liaisons to be posted for contact information. Mike Galler ( ) is the MTG Chair, stakeholder list was identified as 1.4, 1.5, 2.10, 5.6, 7.9, 7.6, 9.9, SSPC-135, Guideline 13. They will all be asked to submit for membership.
    - (i) Pouchak - TAC approved the formation of a new Multidisciplinary Task Group (MTG) in Orlando: Title: MTG.CYB (Cybersecurity for HVAC Systems and Related Infrastructure) This MTG will include members from TC's 1.4, 1.5, 2.10, 7.5, 5.6, 7.9, 7.6. 9.9 and SSPC 135. This text is from the Winter 20 Research and Technology Report: Research & Technical Activities Report Winter 2020, Release 4 (this is located under Research and Technical Activities reports under the ASHRAE Research page:<https://www.ashrae.org/technical-resources/research>)

MTG home page:

<https://www.ashrae.org/technical-resources/technical-committees/section-mtg-multidisciplinary-task-groups>

(ii) [mikeg@nist.gov](mailto:mikeg@nist.gov)

(iii)

- (5) ASHRAE is promoting TC meetings between the conferences. Meeting minutes should be documented and posted to Basecamp.

### b) CEC – Conferences and Expositions Committee

- i) ASHRAE has requested TCs reach out to members to volunteer to review conference papers.
- ii) Technical Program Statistics for Virtual Conference:
  - Conference Papers and Extended Abstracts
    - X conference paper abstracts submitted, X approved
    - X conference papers presented
    - X Conference Paper Sessions
  - Technical Papers
    - X Technical papers received
    - X Technical papers presented
    - X Technical Paper Sessions
  - Seminars
    - X submitted
    - X presented
  - Panels
    - X submitted
    - X scheduled
  - Workshops
    - X submitted

- X scheduled
- Forums
  - X submitted
  - X scheduled
- Debates
  - X submitted
  - X scheduled
- iii) Upcoming conferences
  - 2021 Winter – Chicago, Illinois, January 23 – 27
  - 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)

**10) OLD BUSINESS**

a) **PROJECT COMMITTEE AND ONGOING RESEARCH REPORTS**

- i) SSPC 135 (BACnet) – Michael Osborne / Carol Lomonaco
  - (1) Published BACnet SC addendum in November. Clarifications and understanding for implementation are occurring. James requested written update from Carol.
- ii) SGPC 13 (Specifying Building Automation Systems) – Ron Bernstein
  - (1) June 10<sup>th</sup> PE meeting had full attendance. Significant revision in process, many new sections. Informal PC meeting mid July for outstanding sample spec document issues. Goal to issue for public review in 2020. Anyone interested in reviewing, reach out to James Del Monaco or Phil Naughton.
- iii) SGPC 36 (High Performance Sequences of Operation for HVAC Systems) –Steve Taylor
  - (1) Standing indicating under continuous maintenance. 4 addendums for public review published in the last few months. ASHRAE publishes weekly email for these if you subscribe. Most major manufactures implementing SOO's in process at a variety of maturities. One of the national labs projects on controls languages was discussed. (Chariti Young).

b) **SUB-COMMITTEE REPORTS**

- i) **Executive** – James Del Monaco
  - (1) Chariti Young was given DSA from ASHRAE for her service. Congrats Chariti!
- ii) **Education/YEA** – Michelle Shadpour
  - (1) Meeting went well, less attendance due to virtual meeting. Opportunities to get involved were discussed and YEA member volunteered to chair seminar for Standards and Guidelines course
  - (2) TC seminar before Main TC1.4 meeting will be a panel directed toward YEA members, if interested in participating on panel, please reach out to Michelle.
- iii) **Control Components and Applications** – Chad Moore
  - (1) New ideas for the TC to work on - research and seminars
  - (2) Refer to subcommittee meeting minutes.
- iv) **Program** – Frank Shadpour
  - (1) 13 Programs Presented via Virtual Conference.

(2) 11 Proposals for Chicago Winter Conference.

v) **Research** – Kim Barker

- (1) WS 1865 moved to RP 1865 and Texas A&M awarded project from bid.
- (2) RP-1711 has been completed. Final report approved by TC1.4, disposition form was completed, paper presented at this virtual conference.
- (3) RP-1661 (co-sponsored with TC 4.7) has no cost extension to april 1, 2021.
- (4) RTAR has been prepared and will be sent to TC for feedback and direction.

vi) **Handbook** – Charlotte Dean

- (1) Chapter 7 of Fundamentals – Started review. Approval anticipated after the Virtual Conference. Extension granted for submittal to July 31<sup>st</sup>.
- (2) Handbook central:  
<https://www.ashrae.org/technical-resources/ashrae-handbook/ashrae-handbook-central>

vii) **Standards** – Steve Taylor

viii) **Webmaster** – Joseph Kilcoyne/Elise Backstrom

- (1) Website is up-to-date.

c) COMMITTEE LIASION REPORTS

i) TC 1.5 (Computer Applications) – Mike Pouchak

- (1) TC1.5 has been active in research area. 1811 nearing completion, 1810 proceeding. TC 1.5 contributed 3 speakers for TC 1.4 seminar for this conference.

ii) TC 2.10 HVAC Security – Kim Barker

iii) TC 5.6 (Control of Fire & Smoke)

iv) TC 6.1 (Hydronic Systems)

v) TC 6.7 (Solar Energy Utilization) – Gaylen Atkinson

vi) TC 7.3 (Operations & Maintenance Management)

vii) TC 7.5 (Smart Building Systems) – Jin Wen

- (1) Lots of ongoing research, upcoming programs seeking co-sponsorship but still in development. Seeking collaboration for detection diagnostics to begin dialog for guidelines or standards. 2 handbook chapters under heavy revision – supervisory control and \_\_\_\_\_. If interested in contrinbuting to these, contact Joe (Xiaohui Zhou?). 7.5 is struggling to get YEA involved and shout out to Michelle and TC 1.4 for their help with this.

viii) TC 7.6 (Systems Energy Utilization)

ix) TC 7.9 (Building Commissioning) – TBD

x) TC 9.10 (Laboratory Systems) – Jim Coogan

- (1) Revising laboratory design guide. Test standard 110 starting revision process.

xi) TC 9.11 (Clean Rooms) – Phil Naughton

- (1) No controls focus currently. MTG Air Change Rates ongoing with research project for examining air change rates for health care facilities, etc. and their scientific basis.

xii) SSPC 62.1 (Ventilation and Acceptable IAQ) – Steve Taylor

xiii) SSPC 90.1 (Energy Efficient Design of New Buildings) – Steve Taylor

xiv) SSPC 202 (Commissioning Process for Buildings and Systems) – TBD

xv) TC 1.6 (Terminology) – Phil Naughton

- (1) No new. Creating terminology to be adopted to ASHRAE official terminolofy.

xvi) SGPC 0.2 & 1.2 (The Commissioning Process) – TBD

xvii) SPC 189.1 Design of High-Performance Building – Bogi Setty

xviii) MTG Occupant Behavior in Buildings – Kim Barker

- (1) No updates. Many RTAR available in Basecamp. If interested, reach out to Kim.

xix)MTG CYB – MikKim Barker/Ron Bernstein

d) SOCIETY COMMITTEES

### **11) Upcoming Deadlines**

- Chicago Winter Conference – June 23 – January 27, 2021
- Seminar and Forum proposals for Chicago are due by August 3, 2020
- RTARs & Work Statements August 15, 2020.
- Conference Website: [www.ashrae.org/conferences/2021-winter-conference-chicago](http://www.ashrae.org/conferences/2021-winter-conference-chicago)
- Conference Chair: Maggie Moninski
- Program Focus at Chicago Winter Conference
  - i. Track 1: HVAC&R Fundamentals and Applications
  - ii. Track 2: Systems and Equipment
  - iii. Track 3: Refrigeration and Refrigerants
  - iv. Track 4: Environmental Health Through IEQ
  - v. Track 5: Building Performance and Commissioning for Operation and Management
  - vi. Track 6: Energy Conservation
  - vii. Track 7: International Design
  - viii. Track 8: Standards, Guidelines and Codes
  - ix. Track 9 (Mini-Track): Based on Chuck Gullledge's Presidential Theme (to be announced and not accepting papers)

### **12) Next Meeting – Chicago, IL | January 23 – January 27, 2021**



















### **13) Adjourn**

a) Chariti motions. Chris Benson seconds.






## Participants (10)


Find a participant

- EB** Elise B... (Me, participant ID: 117581)  
-  James Del Monaco (P2S Inc, TC 1.4 ...  
- JK** Joe Kilcoyne - SC Engineers  
- PN** Phil Naughton - Applied Materials  
-  Chris Miller  
-  Dave Morrow - Applied Marketing...  
- GT** Greg Tayco - Ecosystem  
- JJ** Jimmy Jen - EPE
- JK** Joe Kilcoyne (SC Engineers) 
- MS** Michelle Shadpour (SC Engineers)


b)



EB (Me, participant ID: 117581) **Unmute** **More >**



 James Del Monaco (P2S Inc, TC 1.4 Ch...  

CW Craig Wray - TC 1.4 Stds Liaison 



AO Aaron Opatz  




AS Amanda Smith  

AA Ariana Axelrod - Control Technologies, Inc.  



BR Bryan Rasmussen, Texas A&M University  




 Chariti Young - ALC  

CA Chris Amundson - JCI  

CM Chris Miller - P2S Inc.   

CB Christopher Benson  



 Dave Morrow - Applied Marketing Knowl...  

 David Yuill - University of Nebraska  



EG Edward Gutowski  

EO Emre Ozmen  

 Frank Shadpour  




















































JC Jim Coogan, Siemens  

 Jin Wen - Drexel University  










































JK Joe Kilcoyne - SC Engineers  

|           |                                      |  |  |
|-----------|--------------------------------------|--|--|
|           | Sam Vetter - Eastern University      |  |  |
| <b>JK</b> | Joe Kilcoyne - SC Engineers          |  |  |
| <b>J</b>  | JoeDon                               |  |  |
| <b>MI</b> | Michelle's iPhone                    |  |  |
|           | Mike Pouchak                         |  |  |
| <b>MI</b> | Mohamed Ibrahim                      |  |  |
| <b>NL</b> | Nemat Lotfi                          |  |  |
| <b>OR</b> | Omar Rojas                           |  |  |
| <b>PN</b> | Phil Naughton - Applied Materials    |  |  |
| <b>RK</b> | Robert Kraft - Greenheck             |  |  |
| <b>RB</b> | Ron Bernstein                        |  |  |
|           | Steve Grant                          |  |  |
| <b>SI</b> | Steven's iPhone                      |  |  |
| <b>TS</b> | Terry Schroeder (WRA - Engineer)     |  |  |
| <b>TC</b> | Thomas Cocker                        |  |  |
| <b>TB</b> | Tony Bruno                           |  |  |
| <b>TB</b> | Tyler Bradburn - Systemair           |  |  |
|           | Yifeng Hu-UNL                        |  |  |
| <b>ZO</b> | Zheng O'Neill - Texas A&M University |  |  |
| <b>JK</b> | Joe Kilcoyne (SC Engineers)          |  |  |
| <b>MS</b> | Michelle Shadpour (SC Engineers)     |  |  |

Find a participant

- EB** Elise Backstro... (Me, participant ID: 117581)  
-  James Del Monaco (P2S Inc, TC 1.4 Ch...   
- CW** Craig Wray - TC 1.4 Stds Liaison 
- AO** Aaron Opatz - Trane  
- AS** Amanda Smith - PNNL  
- AA** Ariana Axelrod - Control Technologies, Inc.  
- BR** Bryan Rasmussen, Texas A&M University  
-  Chariti Young - ALC  
- CD** Charlotte Dean  
- CA** Chris Amundson - JCI  
- CM** Chris Miller - P2S Inc.   
- CB** Christopher Benson, University of Utah  
-  Dave Morrow - Applied Marketing Knowl...  
-  David Yuill - University of Nebraska  
-  Edward Gutowski, vanZelm Engineers  
- EO** Emre Ozmen  
-  Frank Shadpour  
- GT** Greg Tayco - Ecosystem  
- JC** Jim Coogan, Siemens  
-  Jin Wen - Drexel University  
-   

Find a participant

|                                                                                     |                                      |                                                                                                                                                                         |
|-------------------------------------------------------------------------------------|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>J</b>                                                                            | JoeDon                               |       |
| <b>KB</b>                                                                           | Kimberly Barker - Siemens            |       |
| <b>MI</b>                                                                           | Michelle's iPhone                    |       |
|    | Mike Pouchak                         |       |
| <b>MA</b>                                                                           | Mohamed Alagraa                      |       |
| <b>NL</b>                                                                           | Nemat Lotfi                          |       |
| <b>OR</b>                                                                           | Omar Rojas                           |       |
| <b>PN</b>                                                                           | Phil Naughton - Applied Materials    |       |
| <b>RK</b>                                                                           | Robert Kraft - Greenheck             |       |
|   | Ron Bernstein                        |     |
|  | Steve Grant - E Solutions            |   |
| <b>SI</b>                                                                           | Steven's iPhone                      |   |
| <b>TS</b>                                                                           | Terry Schroeder (WRA - Engineer)     |   |
| <b>TC</b>                                                                           | Thomas Cocker                        |   |
| <b>TB</b>                                                                           | Tony Bruno - Trane                   |   |
| <b>TB</b>                                                                           | Tyler Bradburn - Systemair           |   |
|  | Yifeng Hu-UNL                        |   |
| <b>ZO</b>                                                                           | Zheng O'Neill - Texas A&M University |   |
| <b>JJ</b>                                                                           | Jimmy Jen                            |                                                                                                                                                                         |
| <b>JK</b>                                                                           | Joe Kilcoyne (SC Engineers)          |                                                                                      |
| <b>MS</b>                                                                           | Michael Smith - SCF                  |                                                                                                                                                                         |

