

TC 8.5: Liquid to Refrigerant Heat Exchangers  
Minutes ASHRAE 2023 Annual Meeting

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. TC8.5 DATE 01/22/2024

TC/TG/MTG/TRG TITLE Liquid to Refrigerant Heat Exchangers

DATE OF MEETING 01/22/2024 LOCATION Chicago, IL

MEMBERS PRESENT	YEAR APPT D	MEMBERS ABSENT	YEAR APPTD	EX-OFFICIO MEMBERS AND ADDITIONAL ATTENDANCE	
Adnan H Ayub ('22)	7/1/2018	Gurunarayana Ravi ('26)	7/1/2023	<u>Cor. Members</u>	
Nicholas Zupp ('25)	7/1/2021	Druv Hoysall ('28)	7/1/2023	Lorenzo Cremaschi	Justin Kauffman
Proshat Mehdizad ('24) (YEA)	7/1/2020			Vikrant Aute	
Joe Huber ('28)	7/1/2023			Andrew Sommers	
Pedro Perez ('24)	7/1/2020			Yirong Jiang	<u>Pro Cor. Members</u>
Benjamin Dingel ('26)	7/1/2023			Achim Gotterbarm	Muneeshwaran (YEA)
Kashif Nawaz ('28)	7/1/2023			Arindom Jordar	Sugun Tej Inampudi
Icksoo Kyung ('24)	7/1/2020			Bradley Bock (Int'l)	
Khaled Saleh ('25)	7/1/2021			Chris Keinath	<u>Guests</u>
Andreas Knoepfler ('25) (Int'l)	7/1/2021			Stefan Elbel	L Collato Carballode (YEA)
Pratik S Deokar ('26) (YEA)	7/1/2023			Zahid Ayub	Pengtao Wang
				Lorenzo Cremaschi	Timm Buehsle
				Satheesh Kulankara	Vishwas Mehta (YEA)
				Harshad Inamdar	
<b>DISTRIBUTION: All Members of TC/TG/MTG/TRG plus the following:</b>					
TAC Section Head: Kevin Mercer, Kashif Nawaz			SH8@ashrae.net		
Research Liaison: Carl Huber Standard Liaison: Srinivas Katipamula Staff Liaison: Steven J Hammerling Handbook Liaison: Derek Crowe			srinivas.katipamula@pnnl.gov shammerling@ashrae.org derek.crowe@stantec.com		
Mike Vaughn, Manager Of Research & Technical Services			MORTS@ashrae.net		

YEA: Young Engineers in ASHRAE, Int'l: International Members, from outside USA and Canada

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

1. Monday, January 22, 2024, 2:30 PM. Call to order and reading of TC 8.5 scope (A. Ayub):

## TC 8.5: Liquid to Refrigerant Heat Exchangers

### Minutes ASHRAE 2023 Annual Meeting

- *TC 8.5 is concerned with the thermal and mechanical design, performance, and application of devices for accomplishing heat transfer between refrigerants (including secondary refrigerants) and liquids.*

#### 2. Introduction of members and guests (in-persona and virtual)

#### 3. ASHRAE Code of Ethics Commitment (A. Ayub)

- *“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>)
- Shared ASHRAE's Commitment of Health and Safety of the members and conference attendees.

#### 4. Establish quorum requirements (A. Ayub)

- 9 out of 13 voting members present (7 in-person and 2 virtual), quorum established.

Adnan Ayub (Chair, Handbook) '24	Joe Huber '28	Andreas Knoepfler '25	Benjamin Dingel '26
Nicholas Zupp (VC) '25	Pedro Perez (Webmaster) '24	Icksoo Kyung '24	Khaled Saleh '25
Proshat Mehdizad (Program) '24	Gurunarayana Ravi, '26 [not present]	Druv Hoysall '28 [not present]	Pratik Deokar (secretary) '26
Kashif Nawaz ('28) [joined the meeting at 3:00 pm]			

- Shared e-mail aliases of subcommittee chairs in presentation.

#### 5. Review/approve minutes from previous meeting with corrections (A. Ayub)

- Motion to approve minutes made by N. Zupp
- Seconded by J. Huber
- The vote was 9-0-0-4

#### 6. Handbook subcommittee report (A. Ayub)

- TC responsible to edit chapter 39: Condensers and chapter 42: Liquid Coolers (for 2024 version)
- Last time voted for no change in the chapters
- The chapter edits can be done only through authoring portal ([authoring.ashrae.org](https://authoring.ashrae.org)) in PDFs, and is suggested to leave the Track Changes on whenever possible
- A. Jordar to take responsibility as Handbook Subcommittee chair
- Future edits will be for 2028 Handbook version

#### 7. Program subcommittee report (P. Mehdizad)

- ASHRAE Winter 2024, Chicago, is in hybrid format with 11 Tracks
- TC8.5 had two programs for this conference
- First was a seminar session with TC 8.5 as the main sponsor and TC 1.3 as the co-sponsor, with the title of 'advancement in heat exchanger devices exploring cutting edge innovative services for heat transfer enhancements'
- Second program was a panel, with TC 1.3 as main sponsor and TC 8.5 was one of the co-sponsors, with the title of 'thermal and fluid applications of AI in advancing energy efficiency of HVAC&R equipment and building energy systems'
- Deadline for Summer 2024 submission is February 26th for program proposals
- Next ASHRAE Summer Conference is on June 22-26, 2024, in Indianapolis
- No new program ideas were proposed, while audience was encouraged and asked to contact P. Mehdizad

TC 8.5: Liquid to Refrigerant Heat Exchangers  
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8. Standards subcommittee report (J. Huber)
  - TC 8.5 is responsible for ANSI/ASHRAE Standard 22-2023, 24-2019, and 181-2023
  - SPC-22 and SPC-181 were formed to revised Standards 22 and 181
  - The revision and review work is complete, with out of date references fixed and ASHRAE Guideline 2 reference removed
  - The publication process completed in August 2023 and standard available for purchase
  - Few meetings ago the TC voted to revise Standard 24-2019, the paperwork to form SPC-24 was submitted
  - Only three people on SPC at the moment, while five people are needed to form SPC and get an approval
  - Volunteers need on SPC-24, one can volunteer to be on SPC from ASHRAE website
  - Approval of the SPC has been moved to 2024 Standards Project Liaison Subcommittee (SPLS) spring conference call
9. Webmaster report (P. Perez)
  - Website is up to date
  - Different webpages of the website is updated
10. Research subcommittee report (K. Nawaz)
  - Update from the Research Sub-Committee Chairs' Breakfast Meeting
    1. RAC is responsible for different technical activities related to research
    2. ASHRAE Strategic Plan 2021 is available online, and it is in the process of being updated and feedback can be provided
    3. There was a discussion on the budget for multiple years
    4. There had been reduction in the budget, and backlog of activities to be funded
    5. This year on, RAC has no backlog of approved work, and statements are ready to prepared
    6. There are going to be some changes; like better guidelines for work statements to added details to what should be the approximate budget, level of compensation, and actual student numbers, mention about exploring co-funding opportunities or provide cost share, names of potential bidders in the work statement
    7. ASHRAE has been putting the bid announcements on social media and as such, and from this year there is a good response to them
    8. Service to ASHRAE award process in place where a score sheet can be filled in to identify candidates
    9. RTARs and work statements needs clear and specific milestones, they also need details of previously addressed comments to ensure new people can understand previously done work based on comments and feedback
    10. In proposal revision process, everybody who is part of this activity has to be proactive and fair, and RAC has the authorization to revoke with justification, bidders information must remain confidential
  - 1683-RP "Experimental Evaluation of Two-Phase Pressure Drop and Flow Pattern in U-Bends with Ammonia" (PMS Chair Z. Ayub; co-sponsor with TC 1.3, Co-PI is L. Cremaschi and PI is GIK)
    1. Most work finished at GIK, while low temperature tests will be done at Auburn University
    2. GIK has some issues with visual observations where the U-bends were breaking, and at higher diameter and low temperatures the pressure drops were unusual; related to this several suggestions and ideas were proposed at the join meeting
    3. There would be ask for extension by contactors
  - RTAR and WS

## TC 8.5: Liquid to Refrigerant Heat Exchangers

### Minutes ASHRAE 2023 Annual Meeting

1. TC 1.3 and TC 8.5 had joint research meeting on 21 Jan 2024
  2. RTAR discussion on evaluation of CO<sub>2</sub> in condensation and evaporation, may potentially go directly for work statement and skip RTAR
  3. Possible work on hydrocarbons and synthetic refrigerants like R32 and R454B was discussed
  4. Someone volunteered to write RTAR related to flow performance in brazed plate heat exchanger
  5. J. Huber mentioned work on hydrocarbon evaporation and condensation on shell side
- RTAR: “Condensation heat transfer of novel low GWP refrigerants on enhanced tube bundles including effects of non condensables”
    1. K. Nawaz met and discussed the pending RTAR with Paul
    2. B. Dingle would update references in the above RTAR
    3. Motion was made by A. Knoepfler to move ahead with the RTAR
    4. Seconded by A. Ayub
    5. The vote was 11-0-0-2
  - 1800-RP: “Spray Evaporation on Enhanced Tube Bundles with Low GWP Pure Refrigerants and Refrigerant/Miscible Oil Mixtures” (PMS Chair J. Huber; co-sponsor with TC 1.3)
    1. Final report was submitted and approved by the PMS
  - Other RTARs, WS, and new topics for research
    1. K. Nawaz brought up the topic, but was not discussed due to time limitation

#### 11. Chairman’s report (A. Ayub)

- Task force for Building Decarbonization is encouraging TCs to go more towards the decarbonization topic
- CEBD or Center of Excellence for Building Decarbonization would be proposed
- CEBD will report to the Board of Directors Executive committee, and then liaison of councils and members, technology, publishing, and education will report to the proposed CEBD
- Discussion on DTG
- FG activity worksheets and survey worksheets needs to be submitted by July 27<sup>th</sup> at 7 pm CDT

#### 12. Section Head comments (K. Nawaz)

- A survey needs to know how many TC members attend regional chapter meetings
- There should be diverse and balance voting members in between academia and industry

#### 13. Membership subcommittee report (S. Kulankara)

- Roster is complete with 100 members
- A. Ayub, P. Mehdizad, P. Perez, and I. Kyung VMs are rolling off on June 30<sup>th</sup>
- Justin Kauffman requested to be a voting member

#### 14. MTG Liaison (S. Kulankara)

- For last conference, MTG.LowGWP had two sponsored seminars, and they were well received
- For Chicago three programs submitted, two were related to CO<sub>2</sub> and one related to PFAS, none were accepted
- Other ongoing research projects:
  1. RP-1806, Flammable Refrigerants Post-Ignition Simulation and Risk Assessment Update
    - Project running for 5 years
    - Phase 1 report due and expected to be out in mid February

## TC 8.5: Liquid to Refrigerant Heat Exchangers

### Minutes ASHRAE 2023 Annual Meeting

- In February, PMS will decide to move forward with remaining 2 phases
- Remaining phases are expected to be faster to finish in months rather in years
- 2. RP-1855, Determination of the Impact of Combustion Byproducts on the Safe Use of Flammable Fluorinated Refrigerants
  - Project finished, report available on ASHRAE website
- 3. RP-1884, Incorporation of odorants in refrigerants to improve leak detection
  - MTG.LowGWP is sponsor and TC 3.1 is main sponsor
  - Projects started last spring
- Research proposal discussed on devaluation of refrigerant charge in equipment
- Codes and Standards subcommittee monitors developments from around the world standards, and they have a ppt slides with updates

#### 15. New Business

- No new business was discussed

#### 16. Schedule Next meeting: Monday, June 24, 2024– Indianapolis, IN, USA

- at 2:30 pm
- N. Zupp will chair

#### 17. Adjourn

- K. Nawaz made a motion to adjourn, A. Knoepfler seconded.
- Adjourned at 4:10 CDT, vote was 11-0-0-2

Attached: Meeting Slides



# 2024 ASHRAE WINTER CONFERENCE

CHICAGO, JAN 20-24 | AHR EXPO, JAN 22-24

## ASHRAE Technical Committee 8.5 Liquid to Refrigerant Heat Exchangers

Welcome!

We will begin at **2:30 PM EDT**

A solid green horizontal bar spanning the width of the slide, located at the bottom.

# Welcome! TC 8.5 Liquid to Refrigerant Heat Exchangers



## Housekeeping

### Audio

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

### Video

- You are welcome and encouraged to share your webcam
- Be mindful that you are on display! Turn off your video when needed.

### Q&A

- Use the chat function to ask questions
- Our speaker will pause throughout the presentation to answer questions from the chat box.



**Adnan Ayub**

Chair, Facilitator for this virtual meeting

# TC 8.5 Call to Order and Reading of Scope

## **ASHRAE Technical Committee 8.5** **Liquid to Refrigerant Heat Exchangers**

TC 8.5 is concerned with the thermal and mechanical design, performance, and application of devices for accomplishing heat transfer between refrigerants (including secondary refrigerants) and liquids.



**Adnan Ayub**  
Committee Chair





# TC 8.5 Introduction of Members and Guests

Introduction of our members and guests...

- Please give your name and affiliation, and any TC 8.5 committee duties you have.
- In-person attendees will go first
  - Please be sure to note your attendance on the sign-in sheet.
- Online attendees will go next
  - Wait for a brief pause, and then speak. Remember to unmute before speaking, and then mute again after you have finished speaking.
  - Please send an email to [TC0805@ashrae.net](mailto:TC0805@ashrae.net) with subject “attendance 6/26” so we can log your attendance. Make sure the email contains your full name and please indicate if you are a YEA member.



Adnan Ayub  
Committee Chair



# ASHRAE Code of Ethics Commitment

- Our TC meeting will abide by the ASHRAE Code of Ethics:
- *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.*
- Full Code of Ethics:  
<https://www.ashrae.org/about-ashrae/ashrae-code-of-ethics>



Adnan Ayub  
Committee Chair



# ASHRAE Commitment to Care Statement

ASHRAE is committed to the health and safety of our members and conference attendees.

- Masks may be worn at the individual's discretion. Masks are not required inside the conference hotels but are strongly encouraged.
- Hand sanitizing stations will be positioned throughout the meeting space.
- If symptoms develop, attendees should NOT attend sessions and can join the conference virtually.
- If an attendee tests positive while at the conference, he or she may quarantine at the conference hotel at their own expense and should report the positive test to ASHRAE staff.

View the full Commitment to Care at [commitment-to-care.pdf \(ashrae.org\)](#)



## TC 8.5 Establish Quorum – Current Voting Members

- Adnan Ayub (Chair, Handbook) '24
- Nicholas Zupp (Vice Chair) '25
- Pratik Deokar (Secretary) '26
- Andreas Knoepfler '25
- Icksoo Kyung '24
- Proshat Mehdizad (Program) '24
- Pedro Perez (Webmaster) '24
- Khaled Hassan Saleh '25
- Gurunarayana Ravi '26
- Benjamin Dingel '26
- Kashif Nawaz (Research) '27
- Dhruv Hoysall '27
- Joe Huber (Standards) '27

Voting Members roll off after June 30 of the year indicated



**Adnan Ayub**  
Committee Chair



## Other TC 8.5 Positions

- Satheesh Kulankara Membership, MTG LGWP representative
- Vikrant Aute (MTG LGWP Alt 1)



**Adnan Ayub**  
Committee Chair



## TC 8.5 Email Addresses

- Chair: TC0805@ashrae.net
- Vice Chair: TC0805.VCH@ashrae.net
- Secretary: TC0805.SEC@ashrae.net
- Handbook: TC0805.HBK@ashrae.net
- Program: TC0805.PRO@ashrae.net
- Research: TC0805.RES@ashrae.net
- Standards: TC0805.STD@ashrae.net
- Webmaster: TC0805.WEB@ashrae.net

The full list of aliases can be found on the Technical Committees page on the ASHRAE website



**Adnan Ayub**  
Committee Chair



# TC 8.5 Handbook

- TC 8.5 is responsible for Chapters 39 and 42 of the ASHRAE HVAC Systems and Equipment Handbook
- Votes have been sent
- Looking for someone to take handbook subcommittee chair spot



**Adnan Ayub**  
Handbook Subcommittee Chair




# TC 8.5 Handbook

- Edits to be done through the authoring portal ([authoring.ashrae.org](http://authoring.ashrae.org)) (con't)
  - Make sure Track Changes are left on whenever possible
- Handbook in pdf version available through the technology portal of ASHRAE ([technologyportal.ashrae.org](http://technologyportal.ashrae.org))
- Handbook Liaison (our chapters): Derek Crowe ([derek.crowe@stantec.com](mailto:derek.crowe@stantec.com))



# TC 8.5 Program

- Hybrid conference, January 20-24, 2024
- 11 Tracks with a mixture of live and on-demand sessions, available for 18 months
- Seminars, Paper Session, Forum, Workshop, Round Tables
- Social events:
  - Welcome party
  - Companion meet & greet
  - Women in ASHRAE
  - Members night out



**Proshat Mehdizad**  
Program Subcommittee Chair



# TC 8.5 Program


- Tracks:
- Fundamentals and Applications
- HVAC&R Systems and Equipment
- Refrigerants & Refrigeration
- Decarbonization & Climate Change
- Hydronic Systems
- Ventilation, Indoor Air Quality & Air Distribution Systems
- Comfort, Indoor Environmental Quality & Energy Efficiency
- HVAC&R Controls
- Labs, Clean Spaces and Mission Critical facilities
- Tall Building Design
- Artificial Intelligence

**Proshat Mehdizad**  
Program Subcommittee Chair



# TC 8.5 Program

- TC 8.5 submitted programs for Winter 2024
- Seminar session
- *Main Sponsor TC 8.5, Co-sponsorship TC 1.3*
- *Advancements in Heat Exchanger Devices: Exploring Cutting-Edge Innovative Surfaces for Heat Transfer Enhancement*
- *Monday, January 22 9:45 AM– 10:45 AM CST*
- Panel
- *Main Sponsor TC 1.3, Co-sponsorship TC 8.5, TC 7.5, TC 8.4, TC 1.1, TC 1.4*
- *Thermal/Fluid Applications of AI in Advancing Energy Efficiency of HVAC/R Equipment and Building Energy Systems*
- *Sunday, January 21 1:30 PM– 3:00 PM CST*



**Proshat Mehdizad**  
Program Subcommittee Chair




# TC 8.5 Program

Summer Conference, Indianapolis, IN, June 22-26, 2024

## Tracks:

- Fundamentals and Applications
- HVAC&R Systems and Equipment
- Research Summit
- Professional Development
- Electrification: Possibilities and Pitfalls
- Artificial Intelligence and the Built Environment
- Building Life Cycle Assessment
- Legislation, Standards, Codes and Guidelines



**Proshat Mehdizad**  
Program Subcommittee Chair

## Deadlines:

- **November 29, 2023**  
Conference Paper Abstract Due
- **December 13, 2023**  
Conference Paper Abstract Accept/Reject
- **February 26, 2024**  
Other Programs Proposals Due
- **March 15, 2024**  
Extended Abstract Paper/Conference Due
- **April 1, 2024**  
Conference Papers Accept/Reject  
Notifications
- **April 12, 2024**  
Other Programs Accept/Reject  
Notifications




# TC 8.5 Program

## Future Programs

- ASHRAE Summer Conference, June 22-26, 2024, Indianapolis, IN
- ASHRAE Winter Conference, February 8-12, 2025, Orlando, FL
- 

## Discussion

- Program Ideas for Future Summer and Winter Conferences



**Proshat Mehdizad**  
Program Subcommittee Chair



## TC 8.5 Standards

### **TC 8.5 is responsible for the following Standards:**

- ANSI/ASHRAE Standard 22-2023  
Methods of Testing for Rating Liquid-Cooled Refrigerant Condensers
- ANSI/ASHRAE Standard 24-2019  
Methods of Testing for Rating Evaporators Used for Cooling Liquids
- ANSI/ASHRAE Standard 181-2023  
Methods of Testing for Rating Liquid to Liquid Heat Exchangers



**Joe Huber**  
Standards Subcommittee Chair



## TC 8.5 Standards

- SPC-22 and SPC-181 were formed to fix out-of-date references in Standards 22 and 181  
(SPC = Standards Project Committee)
- The revision and review process has been completed for both standards
- The publications process was completed in August 2023
  - Standard 22-2023
  - Standard 181-2023



**Joe Huber**  
Standards Subcommittee Chair



# TC 8.5 Standards

TC 8.5 voted to revise Standard 24-2019 to correct:

- Remove normative reference to ASHRAE Guideline 2 (Engineering Analysis of Experimental Data)
  - Guideline 2 has been withdrawn, and Guidelines should not be referenced normatively, since they suggest practices and procedures, not mandate them
- Fix other out-of-date references
- Only 3 people applied to be on the SPC to revise Standard 24. 5 members are required as a minimum.
- The approval of the SPC has been moved the 2024 SPLS Spring Conference Call



**Joe Huber**  
Standards Subcommittee Chair






# TC 8.5 Webmaster

- **TC 8.5 Website is up-to-date:**


- TC Meeting Schedule ✓
- Chicago Meeting Agenda ✓
- Tampa [Draft] Meeting Minutes ✓
- Seminar 26 Schedule ✓



Pedro Perez  
Webmaster



# TC 8.5 Research



**Kashif Nawaz**  
Research Subcommittee Chair



# TC 8.5 Membership

## Membership Housekeeping

- Adnan, Proshat, Pedro, and Icksoo rolling off as Voting Members (VM) after June 30
- Please send an email if you are interested in becoming a voting member




**Satheesh Kulankara**  
Membership Subcommittee Chair



# TC 8.5 Membership

## Provisional Corresponding Members

- Membership will expire
- Please send email ASAP if you wish to become a Corresponding Member  
[TC0805@ashrae.net](mailto:TC0805@ashrae.net)



**Satheesh Kulankara**  
Membership Subcommittee Chair



# Low Global Warming Potential Multidisciplinary Task Group



**Satheesh Kulankara**  
MTG Representative



# TC 8.5 Chair Report

- Task force for Building Decarbonization (TFBD)
  - Encouraging TC's to go for decarbonization
  - [www.ashrae.org/decarb](http://www.ashrae.org/decarb)
  - Currently, TFBD has been taking steps into building a plan for integrating decarbonization into ASHRAE.
- Proposing Center of Excellence for Building Decarbonization (CEBD)
  - Reports to ASHRAE Board of Directors Executive Committee
  - Members, Technology, Publishing & Education Councils will have a Decarbonization liaison who reports to the CEBD.



**Adnan Ayub**  
Committee Chair



# TC 8.5 Chair Report

- FG activity worksheets and survey worksheets need to be submitted by the Chair
  - Current form **MUST** be used (not one from Summer)
  - Each subcommittee chair will need to provide information necessary
    - Quick discussion with each subcommittee chair in the meeting
  - Submission for both worksheets by Tuesday, July 27<sup>th</sup> at 7 p.m. CDT



**Adnan Ayub**  
Committee Chair



## TC 8.5 Chair Report

- New version of Roster Form Online and Membership List proposed
  - More information by Satheesh
- FG activity worksheets and survey worksheets need to be submitted by the Chair
  - Current form MUST be used (not one from Summer)
  - Each subcommittee chair will need to provide information necessary
    - Quick discussion with each subcommittee chair in the meeting
  - Submission for both worksheets by Tuesday, July 27<sup>th</sup> at 7 p.m. CDT



Adnan Ayub  
Committee Chair





# Concluding Remarks

- **Schedule Next meeting:**  
Monday, June 24, 2024, Indianapolis, IN
- Note: I will not be available for next ASHRAE meeting; Nicholas will conduct the meeting in my absence
  - Nicholas will roll on as Chair of TC 8.5 as of July 1, 2024
- Adjourn



Adnan Ayub  
Committee Chair

