

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

TC/TG/TRG MINUTES COVER SHEET

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

TC/TG/TRG NO 1.1 DATE January 26<sup>th</sup> 2015

TC/TG/TRG TITLE: Thermodynamics and Psychrometrics

DATE OF MEETING 1/26/2015 LOCATION Chicago, Illinois

MEMBERS PRESENT	YEAR APPTD	MEMBERS ABSENT	YEAR APPTD	EX-OFFICIO MEMBERS AND ADDITIONAL ATTENDANCE
James Schaefer (Chair)	13	<i>Corresponding Members</i>		Wayne Kraft
Omar Abdelaziz (Vice Chair)	13	Mark Ahlers	05	Dean Johnson
Vikrant Aute (Webmaster)	13	Chad Bowers	09	
Bill Fox (Research)	13	Robert Braun	05	
Tony Jacobi	13	Steven Brown	07	
Hans-Joachim Kretzschmar (Non-Quo)	13	Yongfang Zhong	11	
Thomas Kuehn	13	Roy Crawford	88	
Stanislav Perencevic (Non-Quorum)	13	Jonathan Douglas	07	
		Ellen Franconi	99	
<i>Corresponding Members</i>		Don Gatley	01	
Kashif Nawaz (Handbook)	13	Art Geisler (Research Liais.)	11	<i>Provisional Corresponding Members Absent</i>
Ray Rite	13	Siviakumar Gopalnarayanan	06	<b>Alamelu Brooks (Ends 6/30/15)</b>
Hongmei Liang	14	Sebastian Herrmann	11	Hongmei Liang (Ends 8/7/16)
S. A. Sherif	05	Anna Hueffed	09	<b>Nick Mislak (Ends 4/4/15)</b>
David Yuill (2017 Handbook Fundam.)	13	Edwin Huestis	11	Om Taneja (Ends 1/14/16)
Howard Cheung (Program)	11	Jason Hugenroth	07	Dario Petric (Ends 9/10/16)
Kashif Nawaz	14	Omar Huzayyin	11	Ciara Poolman (Ends 5/4/16)
Chris Laughman	14	Sandy Klein	02	<b>Amanda Smith (Ends 6/30/15)</b>
Ray Rite	14	Ness Lakadawala	11	
		Jason LeRoy	99	
		Pedro Mago	05	
		Thomas Meyer	07	
		Pavan Naicker	11	
		Ron Nelson	86	
		Nicole C Okamoto	04	
		Jose Perez-Galindo	04	
		Eric Ratts	01	
		Trilochan Singh	92	
		Robert Tozer	97	
		Kurt Zoellick	09	
		Liping Liu (Secretary)	13	
		Christopher Halford	13	
		Sunil Mehendale	14	
		S Sami	06	
		Laura Schaefer	02	

## Distribution

*All members of TC/TG/TRG plus the following:*

TAC Section Head:	<a href="mailto:SH1@ashrae.net">SH1@ashrae.net</a>
TAC Chair:	<a href="mailto:TACchair@ashrae.net">TACchair@ashrae.net</a>
All Committee Liaisons As Shown on TC/TG/TRG Rosters:	
RAC Research:	<a href="mailto:RL1@ashrae.net">RL1@ashrae.net</a>
Program:	<a href="mailto:PL1@ashrae.net">PL1@ashrae.net</a>
Standards:	<a href="mailto:SL1@ashrae.net">SL1@ashrae.net</a>
Handbook:	<a href="mailto:hbf1@ashrae.net">hbf1@ashrae.net</a>
Chapter Technology Transfer:	<a href="mailto:CTTC1@ashrae.net">CTTC1@ashrae.net</a>
Special Pubs:	<a href="mailto:Mark.fly@ashrae.net">Mark.fly@ashrae.net</a>
Manager Of Standards:	Claire Ramspeck <a href="mailto:MOS@ashrae.net">MOS@ashrae.net</a>
Manager Of Research & Technical Services:	Mike Vaughn <a href="mailto:MORTS@ashrae.net">MORTS@ashrae.net</a>

**Unapproved Minutes**  
**TC 1.1 Thermodynamics and Psychrometrics**  
**Monday, Jan 26, 2014, Chicago, Illinois**  
**2:15 pm – 4:15 pm**

**1. Call to Order:**

James Schaefer called the meeting to order at 2:15 pm. A sign-in sheet was distributed and attendees registered. James asked attendees to introduce themselves. James asked whether anyone had extra items to add to the agenda and none was proposed.

James reviewed quorum. All of the 8 of 9 voting member were present (6 plus 2 non-quorum members). Quorum was established.

**2. Liaison Reports:**

David Yuill reported the status on 2017 Handbook Fundamentals.

Chapter: Psychrometrics (due 03/01/2016)

Chapter: Thermodynamics (due 07/28/2016) – with TC8.3

David mentioned that he would work with Kashif Nawaz to get things going. However, everyone on the committee should read the hard copy and propose changes and revisions. The TC also needs to vote.

David reported that ASHRAE encourages at least one practical design example for each chapter. A calculation example is also required. It is suggested to consider the needs of international members who may have needs that we don't anticipate, for example, they may prefer old / traditional methods that don't require fast computers etc. Sustainability calculations ore metrics are desired. Now only print or online as an option, for both for an extra fee. David asked the audience for questions, and thanked for all the effort working on the handbook.

**3. Chair Report and Announcements:**

James Schaefer discussed some of the announcements from the section breakfast:

See attached notes at the end of minutes.

**4. Previous Minutes Approval:**

The previous Seattle meeting minutes were approved by the TC unanimously (8-0-0-1).

**5. Roster Updates:**

There are three voting members rolling off James, Bill, and Hans-Joachim (non-Quorum). The following changes will be made to the roster to roll on Howard Cheung, Kashif Nawaz will be made voting members, Hans-Joachim will be renewed. James asked the audience who would like to become a provisional corresponding member to please e-mail [TCStaff@ashrae.net](mailto:TCStaff@ashrae.net) with their ASHRAE ID and intent to join TC 1.1.

**6. Subcommittee Reports:**

*Research Subcommittee* (Bill Fox)

ASHRAE research projects update: ASHRAE is working on the next strategic plan for research.

Possible Research –

Research on transport properties, Vikrant and Hans-Joachim would bid. Bill will look for the workstatement for RP-1485 and then James will help with the work statement.

Containments in air and how they affect the properties, possibly with a tie in to fugacity. Vikrant will work on an RTAR.

Tony Jacobi mentioned he still wants to continue to work on RTAR “mass diffusivity of refrigerant in oil”, though would rather be a bidder than an RTAR author. TC 3.4 might be interested, Bill will look into possible authors of an RTAR.

We will contact Art about if the author of a work statement can bid on the project.

#### *Program Subcommittee* (Howard Cheung)

Howard submitted a seminar “Environmentally sound refrigeration” for Seattle meeting but it was not accepted. Howard resubmitted for Chicago and was accepted. Please attend if you can on Wednesday. Speakers Ralph Muehleisen and Laura Schaefer.

Howard contacted TC7.4 Exergy Analysis for Sustainable Buildings for cosponsoring a program on “ideal buildings” but received a late response last time. Currently no authors are available.

Howard will submit “Psychrometric Calculations: Effort, Accuracy, Applicability” – Workshop. Speakers: Omar (chart analysis) – Vikrant (mathematical analysis) – Kashif (application analysis) – James (Moderator). Bill moved and Vikrant seconded for a vote of 8-0-0-1 to approve this workshop. TC 8.4 and SPC 213 are possible co-chairs. This is a kind of continuation of “Psychrometric Fundamentals” that did not make it in Chicago.

#### *Standard Subcommittee* (James Schaefer)

James will stay with the Standard Subcommittee chair as he rolls off as TC 1.1 chair. Standard 213P (Method for Calculating Moist Air Thermodynamic Properties) is meeting on Tuesday Morning and will be discussing accuracy versus complexity of the equations.

#### *Handbook Subcommittee* (Kashif Nawaz)

Practical examples and sustainability examples are desired. Might be able to link to Joe Lstiburek articles of the journal which are available on-line for condensing plain psychrometric applications and examples.

In one example problem of the handbook, if using the entropy number shown, one couldn't get the sensible heat ratio from the chart. Kashif is still confirming that there is an error, though it looks like there is and it will be updated in the next version.

Ray Rite reported about MTG. Low GWP. The task group was trying to organize programs about lower GWP alternative refrigerants and is currently mostly keeping track of the different programs that are related. Ray Rite will be the primary and Sankar Padhmanabhan will be the secondary. Vikrant will send James the forms to fill out.

#### *Website* (Vikrant Aute)

<http://tc11.ashraetcs.org>

Will update standard page, roster is up to date from July, and approved meeting minutes will be updated.

## **7. Old Business:**

Last meeting:

James reported that Donald Gatley contacted him about the definition of relative humidity for superheated steam. James mentioned that they are working on possible changes on the definition and he would get more details and forward them to the committee.

Hans-Joachim Kretzschmar reported that the International Association for the Properties of Water and Steam (IAPWS) is looking to propose a new definition of relative humidity, not via molar fractions or partial pressures but using fugacity of water in humid air. James asked why moving to fugacity. It seemed a problem because not many people know about fugacity. Hans-Joachim also mentioned that the IAPWS is looking to develop a new definition of PH value for areas at high salt concentrations to agree on a standard for the definition of relative humidity in the atmosphere. Omar explained that the definition is for areas relevant to sea water, not everywhere. Thomas asked what if for normal air. Hans-Joachim said he would send the proposal from IAPWS to James to be shared with the TC as a base for future discussion.

Vikrant raised a new question about the standard. Should transport properties be included? Vikrant suggested new research projects to study transport properties. Bill Fox will work with Hans-Joachim Kretzschmar on this item.

This meeting:

IAPWS

2014 - Thermometry Working Group 'Relative Humidity' on the TEOS-10 salinity standard (which uses the IAPWS-2008 Gibbs function formulation for seawater) compatible calculation of fugacity and relative fugacity of water vapour in humid air.

2013 - Coordinated by the IAPWS/SCOR/IAPSO Joint Committee on the Properties of Seawater, which links IAPWS to the ocean science organizations SCOR (Scientific Committee on Oceanic Research) and IAPSO (International Association for the Physical Sciences of the Ocean), steps were taken towards finding a 'traceable link' between the TEOS-10 salinity standard (which uses the IAPWS-2008 Gibbs function formulation for seawater) and the SI (international system of units). A plan was also formulated to investigate the development of a traceable definition of pH that would be relevant at the high salt concentrations found in the ocean and to agree on a standard for the definition of relative humidity in the atmosphere.

Explanation of Fugacity – For ideal gas the value is 1 and thus has not affect.

<https://www.youtube.com/watch?v=AMBoLiQJMFQ>

Is the fugacity ratio in our temperature/pressure range 1 and thus it does not really matter to us? Does fugacity help with containments and the research into the impact they have to moist air properties.

## **8. New Business**

Refrigerant Track in St. Louis, with alternate refrigerants from MTG was proposed to Thomas.

## **9. Adjournment:**

Vikrant moved, Omar seconded. The meeting was adjourned at 4:00PM.

Submitted by James Schaefer

# ASHRAE TC/TG/TRG ACTIVITIES SHEET TC/TG/TRG

DATE Jan 2015

TC/TG/TRG NO. 1.1 TC/TG/TRG TITLE: Thermodynamics and Psychrometrics

CHAIRMAN: James Schaefer, Jr. VICE CHAIRMAN: Omar Abdelaziz SECRETARY: Liping Liu

## TC/TG/TRG Meeting Schedule

### Location Past 24 months

San Antonio, TX – June 23-27, 2012  
Dallas, TX – January 27-31, 2013  
Denver, CO – June 22-26, 2013  
New York City, NY – January 18-22, 2014  
Seattle, Washington – June 2014

### Location next 24 months

Annual 2015 – Atlanta, Georgia; June 27 – July 1  
Winter 2016 - Orlando, Florida; January 25 – 27  
Annual 2016 – St. Louis, Missouri; June 25 – 29  
Winter 2017 – Las Vegas, Nevada; Jan 28-Feb 1

## TC/TG/TRG Subcommittees

Function	Chairperson
Standards	James Schaefer
Handbook	Kashif Nawaz
Programs	Howard Cheung
Research	Bill Fox
Webmaster	Vikrant Aute

## RESEARCH PROJECTS – Current & Past

<u>Project Title</u>	<u>Contractor</u>	<u>Monitoring Comm. Chair</u>	<u>Report Made</u>	<u>Reported by</u>
TRP – 1460				
URP – 1485	Don Gatley	Ron Nelson	June 2008	

## LONG RANGE RESEARCH PLAN

<u>Rank</u>	<u>Title</u>	<u>W/S</u>	<u>Approved</u>	<u>To R&amp;T</u>
-------------	--------------	------------	-----------------	-------------------

## HANDBOOK RESPONSIBILITIES

Year and Volume	Chapter and Title	No.	Deadline	Handbook Sub. Liason
2017 Fundamentals	1 Psychrometrics		2016	Kashif Nawaz
	2 Thermodynamics		2016	

## STANDARDS ACTIVITIES

### TECHNICAL PAPERS from Sponsored Research – Title, when presented (past 10 yrs & planned)

#### TC/TG/TRG Sponsored Symposia – Title, when presented (past 10 yrs & planned)

Exergy Efficient Systems and Applications for Sustainable Buildings, Long Beach, CA – June 2007  
Exergy: A New Frontier in Green Building Simulation, Long Beach, CA – June 2007  
Psychrometrics at Extreme Conditions; Cincinnati, OH - June 2001  
Thermoeconomics and Second-Law Analysis of HVAC&R Systems; Atlanta, GA - January 2001  
Second-Law Studies of Systems and Processes; Chicago, IL - January 1999

**TC/TG/TRG Sponsored Conference** – Title, when presented (past 10 yrs & planned)

Exergy as a Measure of Performance and Sustainability (planned), Albuquerque, NM – June 2010

**TC/TG/TRG Sponsored Seminars** – Title, when presented (past 10 yrs & planned)

Environmentally Sound Refrigeration, Chicago, IL – January 2015

Thermoelectric cooling new applications for an old idea, Dallas, TX – January 2013

Magneto-Caloric Refrigeration: Are You Attracted to Cool Ideas?, Chicago, IL – January 2012

Thermodynamics of Advanced Cycles and Systems, Orlando, FL – January 2010

Thermoeconomics of Net Zero Design, New York, NY – January 2008

Exergy 101 for Beginners, Long Beach, CA - June 2007

Exergy 201 Use it or Lose it, Long Beach, CA - June 2007

Advanced Cycles and Systems, Dallas, TX – January 2007

Advanced Cycles and Systems for Air Conditioning, Refrigeration and Power, Quebec City, Canada – June 2006

Exergy Analysis and Sustainability, Part I: Fundamentals, Quebec City, Canada – June 2006

Soft Cake Yet Not Crusted: Humidity Control and Measurement Challenges and New Technologies at Room, Low, and High Temperature Ranges, Chicago, IL – January 2006

Second Law Analysis and Optimization: Orlando, FL – February 2005

How Second-Law Analysis Can Save You Money; Atlanta, GA - January 2001

**TC/TG/TRG Sponsored Forums** – Title, when presented (past 10 yrs & planned)

Thermodynamics of Biological Systems and Processes (planned); Orlando, FL – June 2009

Thermodynamics of Sustainable Urban Energy Systems; Chicago, IL – January 2009

Humidity Measurements at Extreme Temperatures; Denver, CO – June 2005

**JOURNAL PUBLICATIONS** – Title, when published (past 3 yrs & planned)

Submitted by: James Schaefer