

**AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING  
ENGINEERS, INC.**

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 TC 3.1

Date: June 27, 2011

TC/TG/TRG TITLE Refrigerants and Secondary Coolants

DATE OF MEETING 31 January 2011

LOCATION Las Vegas, NV

MEMBERS PRESENT	YEAR APPTD	MEMBERS ABSENT	YEAR APPTD	EX-OFFICIO MEMBERS AND ADDITIONAL ATTENDANCE
Dave Wilson (Chair) – voting	7/2010	Damon Johnson – CM (Provisional)		Chris Seeton - Guest
Debra Kennoy (Vice Chair) – voting	7/2010	Kapil Singhal – CM (Provisional)		Roger Voorhis - Guest
Umar Khokhar (Secretary) – voting	7/2010	Karim Amrane - CM		Sarah Widder - Guest
Kevin Connor (Handbook) – non voting	7/2010	John Andrepont - CM		Steve Brown - Guest
Samuel Sami (Program) – non voting	7/2010	Earl Clark - CM		
Barbara Minor (Research) – voting	7/2010	Thomas Clemens - CM		Kyle Whitaker - Guest
Felix Flohr (International) – voting	7/2011	Denis Clodic - CM		Hewitt Gaudin - Guest
Sean Cunningham (Webmaster) – non voting	7/2010	Alan Cohen - CM		Knut Petry – Guest
Bill Walter (Standards) – voting	7/2010	Robert Doerr - CM		William Schulte - Guest
Don Bivens - voting	7/2010	Barry Fields - CM		Warren Clough - Guest
Stephen Kujak – voting	7/2009	Cynthia Gage - CM		Phillip Bonnet - Guest
Maryline Rassi – voting	7/2010	Richard Jacobsen - CM		Sebastian Bonnet - Guest
Sonny Sundaresan – voting	7/2008	Jim Lavelle - CM		Hans-Joadium - Guest
Osami Kataoka – CM		Ken Lilje - CM		A. Riemer - Guest
Marc Scancarello - CM		Bert McJimsey - CM		Mary Koban - Guest
Bruce Badger - CM		Nandini Mouli - CM		Bianca Hydutsky - Guest
Robert Richard - CM		Sunil Nanjundaram - CM		Frank Rinne - Guest
George Kazachki - CM		Bjorn Palm - CM		Kenji Takizawa - Guest
Gus Rolotti - CM		Thomas Reinarts - CM		

Mark McLinden - CM		Rajiv Singh - CM		
Bill Murphy (Section Head) – non voting		Steven Szymurski - CM		
Mike Vaughn – Staff Liaison non voting		Koichi Watanabe - CM		
		Tom Watson - CM		
		Andrzej Wesolowski - CM		
		Xiaomei Yu – CM		
		Jing Zheng - CM		

### KEY CONTACTS

SPLS Liaison*	Janice Peterson
TAC Chair:	Charles Wilkin
TAC Section Head:	William Murphy
All Committee Liaisons As Shown On TC/TG/TRG Rosters:	RAC Research: Raymond Cohen Special Pubs: John Clark Standards: Douglass Abramson Handbook: Hassan M. Bagheri Chapter Technology Transfer: Jennifer Leach Professional Development: Filza Walters
Manager Of Standards* Manager Of Research & Technical Services	Stephanie Reiniche Michael R. Vaughn

\* receives a copy of the TC 3.1 meeting minutes

**1. CALL TO ORDER** (Dave Wilson, Chair)

- A. Introductions of members and guests – Chair called the meeting to order at 4:15 P.M. and attendees introduced themselves.
- B. Agenda Revision/acceptance  
*Motion to approve was made by Debra Kennoy and seconded by Bill Walter.*  
*Motion passed: 8 / 0 / 0 / 10 (CNV)*  
*(For / Against / Abstain / Total [Chair Voting [CV] or Chair Not Voting [CNV]])*
- C. Establishment of a quorum – There were 10 voting members present out of 10, which constitutes a quorum.

Voting members for this meeting:

Don Bivens - present  
Steve Kujak - present  
Sonny Sundaresan - present (4:30)  
Bill Walter - present  
Dave Wilson - present  
Maryline Rassi – present  
Debra Kennoy – present  
Umar Khokhar – present  
Barbara Minor – present  
Felix Flohr –present (international member)

**2. APPROVAL OF ALBUQUERQUE JUNE 2010 MEETING MINUTES**

*Motion to approve was made by Barbara Minor and seconded by Steve Kujak.*  
*Motion passed: 8 / 0 / 0 / 10 (CNV)*

**3. CHAIRMAN'S ANNOUNCEMENTS** (David Wilson)

A. **Section 3 Meeting Report** (Debra Kennoy)

- i. ASHRAE ordered selection process for technical programs: (1) conference papers, (2) transactions, (3) seminars, then (4) forums.
- ii. Upcoming ASHRAE meetings
- June 25 – 29, 2011: Montreal
    - a. Theme: Net-Zero Buildings
    - b. Montreal Seminar and Forum Sessions - due 2/14/11
    - c. Final Technical Papers and Full Conference Papers - due 3/7/11
  - January 21 – 25, 2012: Chicago
    - a. Theme: The Impact of HVAC&R on Our Daily Lives
    - b. Full Technical Papers and Conference Papers abstracts –

due 4/18/11

- c. Chicago Seminar and Forum Proposals accepted starting 6/3/11

iii. Starting in June 2012 (San Antonio) - program themes are eliminated

**B. Roster review**

<b>2010 – 2011 (as of 01JUL2010)</b>		
	<b>Position</b>	<b>Roll-off date</b>
<i>David Wilson</i>	<i>Chair</i>	<i>30JUN2012</i>
<i>Debra Kennoy</i>	<i>Vice Chair</i>	<i>30JUN2014</i>
<i>Umar Khokhar</i>	<i>Secretary</i>	<i>30JUN2014</i>
<i>Barbara Minor</i>	<i>Research Chair</i>	<i>30JUN2014</i>
<i>William Walter</i>	<i>Standards Chair</i>	<i>30JUN2012</i>
<i>Don Bivens</i>	<i>Member</i>	<i>30JUN2012</i>
<i>Stephen Kujak</i>	<i>Member</i>	<i>30JUN2013</i>
<i>Maryline Rassi</i>	<i>Member</i>	<i>30JUN2014</i>
<i>Ganesan Sundaresan</i>	<i>Member</i>	<i>30JUN2012</i>
<i>Samuel Sami</i>	<i>Program Chair - Non-Voting</i>	
<i>Kevin Connor</i>	<i>Handbook Chair - Non-Voting</i>	
<i>Sean Cunningham</i>	<i>Webmaster – Non Voting</i>	
<i>Felix Flohr</i>	<i>International Member</i>	<i>01JUL2011</i>

**4. Research Subcommittee** (Barbara Minor) - see Attachment 1

- a. Report from Research Subcommittee Chair’s Meeting  
There is \$1.3 million available for research and 18 projects to be funded.
- b. Completed Research Projects (for Project Disposition at this meeting)
  - 1) 1484 Energy and Performance of Secondary Coolant Low Temperature Refrigeration Systems

This research project has been completed and the executive summary has been modified.

*Motion to approve revised executive summary was made by Bill Walter and seconded by Barbara Minor.*

*Motion passed: 9 / 0 / 0 / 10 (CNV)*

*Dave Wilson to submit Project Disposition Report and Executive Summary to Mike Vaughn on Feb. 1. Samuel Sami to ask Project Lead Eckhard Groll to submit Technical Paper on Project for Montreal meeting.*

c. Ongoing Project Reports

i. Binary Refrigerant Flame Boundary Concentrations (1507-RP)

- i. Description: databank for useful binary pairs in commercial refrigerants (60 C and 100 C). Identify standard flammable mixture for confirming accuracy of data from flame test apparatus. To aid assessment of new refrigerant blends for SSPC 34.
- ii. Project Monitoring Subcommittee: D. Kennoy, T. Leck, R. Richard, S.Sundaresan, X. Wang
- iii. Status:  
Project was awarded to Safety Consulting Engineers (SCE) in the 4<sup>th</sup> quarter of 2009.  
The project is reported as 70% completed by SCE. PMS to review data in update recently received and select additional binary pairs for testing. Target for completion is June 2011.

ii. Assessment of Burning Velocity Test Methods (1583-RP)

- i. Description: evaluate burning velocity test methods for precision and accuracy; investigate ways to simplify the methods and reduce costs without sacrificing quality.
- ii. Project Monitoring Subcommittee: D. Kennoy, B. Minor, R. Richard, W. Walter, X. Wang
- iii. Status:  
Project was awarded to AIST during the 3<sup>rd</sup> quarter of 2010.  
The project started and is on track. PMS met with Contractor in December.

iii. Study of Input Parameters for Risk Assessment of 2L Flammable Refrigerants in Stationary Applications and Commercial Refrigeration (1580-RP)

- i. Description: develop critical input data which can be used in risk assessments for residential air conditioning, heat pumps and small commercial refrigeration applications in occupied spaces; identify and determine refrigerant charge sizes, leak rates and leak scenarios, potential ignition sources and whether these sources are capable of igniting 2L refrigerants.
- ii. Project Monitoring Subcommittee: D. Kennoy, B. Minor, C. Seeton, S. Sundaresan, W. Walter, X. Wang
- iii. Status: Contractor bids received and reviewed by PMS. Discussion of proposals and selection of Contractor was made at closed session of TC 3.1 in Las Vegas. Research Subcommittee Chair (Minor) will submit recommendation forms to MORT by Feb. 1 deadline.

d. Tentative Research Projects

i. Assessment of Alternative Approaches to Predicting the Burning Velocity of Refrigerants (1584-TRP)

- i. Description: identify technically acceptable parameters to accurately predict or estimate the burning velocity of refrigerants; a reliable, less expensive approach to burning velocity will reduce the cost of safety classification and increase the participation in the development of new refrigerant candidates that may be only mildly flammable.
  - ii. Project Monitoring Subcommittee: S. Cunningham, D. Kennoy, B. Minor, R. Richard, ARTI representative
  - iii. Status: This project has been approved and should go out for bid during the Spring of 2011.
- e. New Work Statements  
None.

f. Proposed RTARs

i) Risk Assessment of Flammable Refrigerants in Centrifugal Chiller Applications

- i. Description: TC 8.2 (Centrifugal Machines), Mark Adams as lead, asked TC 3.1 to cosponsor a draft RTAR on this project presented at this meeting: estimated cost of \$300k and 12 months duration. This proposal would also include in its scope large quantity refrigeration applications (supermarket racks, sea containers). The drafting committee was Mark Adams, D. Hinde, S. Sundaresan, K. Kontomaris, and P. Johnson.
- ii. Seeton and S. Sundaresan volunteered to be on the Project Monitoring Subcommittee from TC 3.1.
  - iii. TC 8.2 is lead sponsor.

*Motion to approve as to whether TC 3.1 should co-sponsor this project was made by Bill Walter and seconded by Barbara Minor.*

*Motion passed: 8 / 0 / 0 / 10 (CNV)*

g. Research Plan (See Attachment)

*Motion to approve Research Plan was made by Bill Walter and seconded by Don Bivens.*

*Motion passed: 10 / 0 / 0 / 10 (CV)*

h. ASHRAE Research Goals Liaisons

- iv. Refrigerant Program Action Plan ad hoc Committee (B. Minor – liaison)  
Goal: cradle-to-grave refrigerant management  
Danny Hallel (Chair) of the ad hoc committee of 8-10 people was to make a presentation to tech council on Tuesday on their recommendations. ASHRAE is managing this JSRAE proposed project.
- v. Refrigerants and Their Use in Building Environments (W. Walter)  
Goal: new position document which will build upon previous position on Low GWP refrigerant alternatives and technologies. A scoping meeting was scheduled for Tuesday night (Feb. 1) for interested participants.  
Plan to have a draft position document for the June 2011 meeting in Montreal

- vi. Improve Specific Components of HVAC&R Systems (S. Sundaresan)  
No contact

## 5. HANDBOOK SUBCOMMITTEE (Kevin Connor)

- a. A new team is in place. Additional volunteers will be welcome. Proposals need to be received and first drafts started by Montreal ASHRAE meeting. The TC Handbook Chair has about 1 year from Montreal to get handbook chapter submissions in to Hassan M. Bagheri for 2013.
  - i. Chapter 29 – S. Cunningham (lead reviewer) and Don Bivens
    - i. Van Baxter, Handbook Chair for TC 2.5, has requested TC 2.5 members for input on changes we want to make to the Global Environmental Properties section for the 2013 Fundamentals Chapter on Refrigerants. Van asked for suggested changes to text or Tables 3 and 4 **by April 29, 2011**. Cynthia Gage volunteered to help. She can handle the environmental properties.
    - ii. Are there new fluids to add?
  - ii. Chapter 30 – M. McLinden (lead reviewer)
    - i. Are there new fluids to add?
  - iii. Chapter 31 – K. Connor (lead reviewer)
- b) CD Plus is no longer available. The handbook on-line is available for spreadsheets, animation, etc.

## 6. PROGRAM (Samuel Sami)

- a) Las Vegas 29 Jan – 2 Feb 2011
  - i) Sunday, January 30, 2011, 11:00 AM -12:30 PM, Seminar 6: Building a Sustainable Future by Removing Barriers for Low GWP Refrigerants.
  - ii) Sunday January 30, 2011, 1:30 PM-3:00 PM, Seminar 11 (Sponsor: TC03.08 Refrigerant Contaminant; Co-Sponsors: TC 3.1, ASHRAE Associate Society Alliance): Cradle to Grave Refrigerant Management.  
Note: This was not approved by ASHRAE and would be re-submitted for Montreal.
  - iii) Monday, January 31, 2011, 8:00 AM-9:30 AM, Seminar 22 (Co-sponsor TC 08.01 Positive Displacement Compressors): Vapor Compression Cycles, Systems and Components with Natural Refrigerants.  
Note: The title has been changed when it was introduced in the program.
  - iv) Special Session: Roadmap Discussion, Tuesday, February 1, 8:00 – 9:30 a.m. (LVCC) N256, DOE Next Generation Ultra-Low GWP Refrigerant.
- b) Montreal 25-29 June 2011:  
Forum / Seminar proposals due 2/14/11

Final Technical / Full Conference papers due 3/7/11

- i) Forum – Implementation of 2L Refrigerants (Barbara Minor Chair)
- ii) Forum – Implications for Use of Refrigerants with Glide (Sonny Sundaresan Chair)
- iii) Seminar – Cycles, Systems, Components with Low GWP Refrigerants (Georgi Kazachki Chair)

*Motion to approve Forum / Seminar proposals was made by S. Sami and seconded by D. Kennoy.*

*Motion passed: 9 / 0 / 0 / 10 (CNV)*

## 7. **STANDARDS (Bill Walter)**

- a) Standards Reaffirmation Subcommittee (SRS) whether Guideline 6 - 2008 should be revised, reaffirmed, or withdrawn (W Walter)

Note: The content still appears to be appropriate but there are a few questions about the references. The sales for number of copies sold in respective years are as follows: 324 in 1996; 118 in 2008; 1 in 2010. Decision is not based on sales alone. Details will be circulated among TC 3.1 members. This will be followed by a letter ballot, with requested response of 3.1 members by March 4.

- b) ASHRAE Standard 34, *Designation and Safety Classification of Refrigerants* (W Walter)

Note: Addenda 34e-2010, 34f-2010, 34g-2010, and 34h-2010 were approved by the ASHRAE Standards Committee and will be formally added to the standard.

- c) ISO Standard 817, *Refrigerants – Designation and Safety Classification* (W Walter)

Note: The draft has been approved for advancement to FDIS. The earlier version was modified in response to comments received from previous review. It is currently being reformatted and will be recirculated for approval – no additional comments will be accepted. A Maintenance Agency must still be formed.

- d) SPC-177 MOT Fractionation Measurement of Refrigerant Blends (R Richard)

Note: The committee is continuing the development of this MOT. AHRTI agreed to fund a study on fractionation testing and error analysis, which should be completed in 6 to 9 months. A public review of the MOT is anticipated for 2013.

## 8. **WEB SITE** (Sean Cunningham)

- Meeting minutes are now posted on the ASHRAE website.

## 9. **OTHER BUSINESS**

None

## 10. **MEETING ADJOURNED – 6:00 PM**

ASHRAE TC 3.1 Refrigerants and Secondary Coolants  
Approved Minutes – January 2011 (Las Vegas, NV)

*Motion to adjourn was made by D. Bivens and seconded by S. Sami. Motion passed by general consensus.*

TC 3.1 went into a closed session meeting to review bids for 1580-RP.

<b>ASHRAE Research Projects</b>		
	<b>Project Title</b>	<b>Comments/Status</b>
<b>Current Research</b>	<p><b>1507-RP: Binary Refrigerant Flame Boundary Concentrations and databank for useful binary pairs in commercial refrigerants.</b> Identify standard flammable mixture for confirming accuracy of data from flame test apparatus. Databank to aid assessment of new refrigerant blends for SSPC34.</p>	Project 70% complete, finish by Montreal PI is A. Kusmierz. PMS: <u>Bob Richard</u> , Debra Kennoy, Sonny Sundaresan, Steve Szymurski, and Tom Leck
	<p><b>1583-TRP: Assessment of Burning Velocity Test Methods</b></p>	Contract awarded to AIST project has started Project monitoring subcommittee: <u>B. Minor</u> , D. Kennoy, R. Richard, W. Walter, X. Wang
	<p><b>1484-RP: Energy and Performance of Secondary Coolant Low Temperature Refrigeration Systems.</b> Literature Research and Industry Review</p>	Complete - D. Wilson to send in final paperwork Horton. PMS: <u>Kevin Connor</u> , Xudong Wang, D. Bivens, D. Hinde.
<b>Tentative Research Projects (TRPs)</b>		
Priority 1	<p><b>1580-TRP: Risk Assessment of 2L Flammable Refrigerants in Stationary Applications</b> a) residential a/c &amp; heat pumps b) small commercial refrigeration</p>	Contractor bids received  TRP subcommittee: B. Minor, D. Kennoy, C. Seeton, W. Walter, S. Sundaresan, and X Wang
Priority 2	<p><b>1584-TRP: Assessment of Alternative Approaches to Predict Burning Velocity of a Refrigerant</b></p>	Schedule to send out for bids spring '11 TRP subcommittee: Debra Kennoy, B. Minor, R. Richard, S. Cunningham, and ARTI person.

<b>Non-Prioritized Research Suggestions</b>		
	<b>Project Title</b>	<b>Comments/Status</b>
<b>AHRTI</b>	<b>Fractionation testing and error analysis for refrigerant blends in support of SSPC34</b> <b>SPC-177P title is:</b> MOT Fractionation Measurement of Refrigerant Blends	Project to be managed by AHRTI  WS prepared by R. Richard, D. Kennoy, A. Kusmierz, J. Dieckmann
<b>RTAR needed</b>	<b>Identification of new fluids</b> for high temperature energy conversion applications (CHP/organic Rankine cycle); also low grade heat recovery.	Rescope for property needs for ORCs, HPs S. Sami to chair and lead RTAR preparation K. Kontomaris and J. Kauffman to assist M. Spatz to ask for member from Honeywell
<b>RTAR prepared</b>	<b>Risk Assessment of 2L flammable refrigerants in applications using large quantity of refrigerants such as centrifugal chillers, supermarket racks, sea containers, etc.</b>	Possible interest by TCs 8.2, 10.7, 3.1 RTAR written and will be reviewed by TC 3.1  assistance from D. Hinde, S Sundaresan, K. Kontomaris, and P. Johnson.
	<b>Secondary fluids for refrigeration:</b> properties of low temp. secondary coolants such as formate/acetate water solutions;	Sundaresan analysis 50% complete Finish and make recommendation for future work by Montreal
	<b>Lubricants for carbon dioxide refrigeration systems.</b>	Sundaresan reviewed and asked to remove this topic as no further work identified
	<b>What is required for design of equipment and rooms</b> for safe use of low flammability refrigerants, particularly those classified as 2L?	Std 15 ad hoc committee has adequately addressed this topic More ideas may be found thru UL work
	<b>Low GWP refrigerant properties:</b> stability, materials compatibility, other data needs.	No call for ASHRAE-sponsored work at this time as significant industry activity is ongoing (McLinden).
	<b>Implications for Use of High Glide Refrigerants</b>	Consider forum to look for new research ideas (Sundaresan, Spatz, Bivens)