

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

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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.**

These minutes have been approved by this committee.

TC/TG/TRG NO TC 3.1

Date: 08 Mar 2012

TC/TG/TRG TITLE Refrigerants and Secondary Coolants

DATE OF MEETING 21 January 2012

LOCATION Chicago, IL

MEMBERS PRESENT	YEAR APPTD	MEMBERS ABSENT	YEAR APPTD	EX-OFFICIO MEMBERS AND ADDITIONAL ATTENDANCE
Dave Wilson (Chair) – voting	7/2010	Umar Khokhar - CM	7/2011	Xudong Wong - Guest
Debra Kennoy (Vice Chair) – voting	7/2010	Osami Kataoka – CM	7/2006	Kyle Karber – Guest
Sean Cunningham (Secretary) – voting	7/2011	Damon Johnson – CM (Provisional)	2/2010	Shigeharu Taira - Guest
Sonny Sundaresan – voting	7/2008	Kapil Singhal – CM	7/2010	Chun cheng Piao - Guest
Barbara Minor (Research) – voting	7/2010	William Aloys Schulte – CM	10/2010	Som Shrestha - Guest
Maryline Rassi – voting	7/2010	Karim Amrane – CM	7/1997	Amy Shifflett - Guest
Don Bivens - voting	7/2010	John Andrepont – CM	7/2001	Hewitt Gaudin - Guest
Bill Walter (Standards) – voting	7/2010	Earl Clark – CM	7/1992	Corey Anderson - Guest
Stephen Kujak – voting	7/2009	Thomas Clemens – CM	7/2001	Joe Nigro - Guest
Samuel Sami (Program) – voting	7/2011	Denis Clodic – CM	7/2007	Kris Crosby - Guest
Kevin Connor (Handbook) – voting	7/2011	Alan Cohen – CM	7/1999	Julie Majurin - Guest
Felix Flohr – CM	7/2011	Bruce Badger – CM	7/2010	Kenji Takizawa - Guest
George Kazachki - CM	7/2008	Barry Fields – CM	7/2001	Hameed Metghalchi - Guest
Robert Richard - CM	7/2000	Cynthia Gage – CM	7/1992	
Marc Scancarello - CM	7/2010	Richard Jacobsen – CM	7/1990	
Gus Rolotti – CM		Jim Lavelle – CM	7/2010	
Bill Murphy (Section Head) – NVM	7/2010	Ken Lilje – CM	7/2001	
Warren Clough - CM	7/2011	Bert McJimsey – CM	7/1997	

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 D. Wilson and seconded by B. Walters.*
 - Motion passed: 11 / 0 / 0 / 11 (CV)*
(For / Against / Abstain / Total [Chair Voting [CV] or Chair Not Voting [CNV]])
- C. Establishment of a quorum – There were 11 voting members present out of 11, which constitutes a quorum.

Voting members for this meeting:

- Steve Kujak - present
- Sonny Sundaresan - present
- Bill Walter - present
- Dave Wilson - present
- Maryline Rassi – present
- Debra Kennoy – present
- Sean Cunningham – present
- Barbara Minor – present
- Don Bivens – present
- Kevin Connor – present
- Samuel Sami - present

2. APPROVAL OF MONTREAL, CANADA JUNE 2011 MEETING MINUTES

Motion to approve draft minutes with no changes was made by S. Kujak and seconded by D. Kennoy.
Motion passed: 11 / 0 / 0 / 11 (CV)

3. CHAIRMAN'S ANNOUNCEMENTS (D. Wilson)

A. Section 3 Meeting Report

- i. ASHRAE Re-branding
 - i. A re-branding of ASHRAE was announced at the Chicago meeting. All TC websites need to be update to reflect new logo and tagline by 01 Mar 2012.
- ii. Hightower award
 - i. Winner announced at the conference (Don Beaty – TC 9.9)
- iii. Member comments
 - i. Committee members are reminded that they cannot speak on behalf of ASHRAE
- iv. TC support for ASHRAE Conference
 - i. Each TC should provide a list of potential Paper Reviewers and Session

Chairs.

- v. Registration fee for speakers:
 - i. A \$100 registration fee for speakers will begin at the Dallas meeting.
- vi. Dates:

Conference paper / abstracts	Full technical papers	Conference papers / submitted for review	Seminar and Forum session proposals
JUN 2012 – San Antonio (23-28 JUN 2012)			
Theme: High Performance Buildings, Integrated Design, Energy Modeling and Specialized Applications			
26 SEP 2011	26 SEP 2011	09 JAN 2012	13 FEB 2012
JAN 2013 – Dallas (26–30 JAN 2013)			
Theme: none			
19 MAR 2012	16 APR 2012	09 JUL 2012	13 AUG 2012

- B. New MTG proposed: “Alternative Low GWP Refrigerants”. B Minor will represent TC3.1 with S. Cunningham as alternate.
- C. When revising or creating a new Standard, TC will need to recommend a Chair.

4. Research Subcommittee (Barbara Minor)

- A. Report from Research Subcommittee Chairs Meeting. Barbara Minor noted pipeline of projects for TC 3.1 starting to run dry, need more RTAR, WS submissions this year.
- B. Ongoing Project Reports
 - a. Binary Refrigerant Flame Boundary Concentrations (1507-RP)
 - i. Description: databank for useful binary pairs in commercial refrigerants (60 C and 100 C, 50% relative humidity @ 23 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: Saw some unusual data, most pairs are done. Falling slightly behind schedule. Contractor requested no cost time extension. Expected completion February 2012, results to be presented to full TC in San Antonio.
 - b. 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 3Q2010.
The project is on schedule with expected completion in March 2012. Kenji Takizawa from AIST presented a status report and preliminary findings at the 3.1 Research Subcommittee meeting in Chicago. It was noted that for refrigerants with $BV < 4$ cm/sec, the vertical tube method may not be acceptable for getting an accurate BV value, and the only conclusion that can be made is that the BV is <10 cm/sec with this method. Cost data for the different BV methods was presented, together with cost reduction ideas.
- c. 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: Project was awarded to Navigant. Started June 2011 with expected completion date June 2012. Bill Goetzler from Navigant Consulting presented a progress report and plans going forward at the 3.1 Research Subcommittee meeting in Chicago.

C. Approved Research Projects

- a. Assessment of Alternative Approaches to Predicting the Burning Velocity of Refrigerants (1584-RP)
- 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, X. Wang (ARTI representative)
 - iii. Status: Principal investigator Dr. Hamed Metghalchi, Northeastern University. Project began Nov. 2011 and is on target with expected completion date September 2012. Dr. Metghalchi presented at the 33.1 Research Subcommittee meeting in Chicago a project update and plans going forward. He noted that so far in his study it appeared burning velocity was related to MIE, but there did not appear to be significantly reliable MIE data. He would explore this further.

D. New Work Statements - None

E. Proposed RTARs

a. Phase 2 of 1584-RP

- i. Description: Investigate more deeply MIE, hot surface ignition, 2L flame instability, kinetic mechanisms and/or other flammability characteristics relevant to class 2L refrigerants, which can be used in risk assessments.
- ii. Sonny Sundareson, Bob Richard, Debbie Kennoy volunteered to develop RTAR

b. Phase 2 of 1580-RP

- i. Investigate what is needed to determine safe charge limits for 2L refrigerants in US HVACR designed equipment.
- ii. Samuel Yana Motta and Barbara Minor volunteered to develop RTAR

F. Research Plan (See Attachment)

G. ASHRAE Research Goals Liaisons Reports

a. National Refrigerants Management Plan (B. Minor – liaison)

- i. Goal: cradle-to-grave refrigerant management – voluntary program to be managed by ASHRAE
- ii. Danny Hallel noted that the ad hoc committee recommendation completed their work and present at Tech Council, to be voted on January 24, 2012.

b. Refrigerants and Their Use Responsible Use (W. Walter - liaison)

- i. Goal: new position document which will build upon previous position on Low GWP refrigerant alternatives and technologies.
- ii. Document approved by Tech Council and sent to Board for vote on Jan. 24.

c. Improve Specific Components of HVAC&R Systems (S. Sundaresan - liaison)

- i. No further information. S. Sundaresan to check with Wayne Reedy to determine if any further work is required.

5. HANDBOOK SUBCOMMITTEE (Kevin Connor)

A. The goal is to vote on draft before San Antonio meeting.

a. Chapter 29 – S. Cunningham (lead reviewer) and Don Bivens

- i. Environmental section draft completed
- ii. Consider deleting the old refrigerants and adding new fluids (e.g., HFOs) to the chapter.
- iii. Suggested to split performance table into parts, eg. low temperature, medium temperature, AC.
- iv. It was requested that more current input was needed on material compatibility, including HFO data. R40 was also brought up as an issue.
- v. Changes would be added from the Chicago meeting and distributed.

- b. Chapter 30 – M. McLinden (lead reviewer)
 - i. Good progress made on charts.
 - ii. P-H diagrams added for R-1234yf, 1234ze, dropped H₂ and para-H₂.
 - iii. He diagram formats need updating
 - iv. References need to be updated.
- c. Chapter 31 – K. Connor (lead reviewer)
 - i. Lithium Bromide data needs to be entered
 - ii. Otherwise, there are minor editorial changes.
- d. Kevin Connor would try to get a letter ballot out to TC 3.1 members on the proposed Handbook Chapter drafts by April.

6. PROGRAM (Chris Seeton)

- a. January 2012 (Chicago):
 - a. Seminar – Advancements and Trends in Low Global Warming Impact (LGWI) Technologies. Co-sponsored with TC 10.7, 8.1.
- b. June 2012 Annual Conference (San Antonio)
 - a. Seminar – Standards Development for Class 2L Flammable Refrigerants
 - i. Chair: W. Walter
 - ii. Suggested speakers; Brian Rodgers (UL), Els Baert (Daikin), Phil Johnson.
 - b. Seminar – Design Performance and Efficiency Impact on Low GWP Refrigerants on system and/or components.
 - i. TC10.7 lead (Georgi Kazachki). TC3.1 to co-sponsor.
 - c. Forum – Safety Requirements for Class 2L Refrigerants (cosponsored with SSPC 15 & SSPC 34)
 - i. Lead: Chris Seeton (3.1) with Dennis Dorman (SSPC 15) - will try to resubmit rejected Chicago Forum proposal related to SSPC 15 ad hoc 2L committee work.
- c. Other Program Ideas
 - a. High Glide Refrigerants. Assess after Purdue Conference.
 - b. AHRI Material Compatability project
 - c. Advances in Low GWP Refrigerants
 - d. Flammable Refrigerant Applications

*Motion to approve the Seminar proposals for San Antonio meeting was made by S. Sundaresan and seconded by K. Connor.
Motion passed: 9 / 0 / 0 / 9 (CV)*

7. STANDARDS (Bill Walter)

a. Guideline 6

- i. M Rassi gave an update on the revision progress. The first FTF meeting of interested project committee members was held in Chicago on Jan. 23 to plan out updates needed and volunteers for assignments.

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

- i. The definition of an azeotrope is being reviewed by SSPC 34.
- ii. One refrigerant application will be reviewed at the SSPC34 meeting. Refrigerant blend R1290/290/600a (55.0/40.0/5.0).

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

- i. Approved to go to FDIS. Some editorial changes required.
- ii. Possible publication at end of 2012 or early 2013.
- iii. A maintenance agency must still be formed.

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

- i. Goal is to develop standard apparatus by June 2012 meeting.

8. WEB SITE (Sean Cunningham)

Meeting minutes and presentations are posted on the ASHRAE website.

9. OTHER BUSINESS

- a. Proposed replies to Online Technical FAQs numbers 24, 46 and 84 were reviewed.

Motion to approve the FAQ 24, 46 and 84 replies was made by S. Kujak and seconded by S. Sundaresan.

Motion passed: 9 / 0 / 0 / 9 (CV)

10. MEETING ADJOURNED

Motion to adjourn was made by K Connor and seconded by S. Cunningham. Motion passed by general consensus.

Attachment 1
TC 3.1 Annual Objectives for 2011-2012 Society Year

Objective	Completion Date
Bidder Selection TRP-1584 (Methods for Predicting Burning Velocity of 2L Refrigerants)	7/2011
Complete RP-1507 (Binary Flame Boundary Concentrations)	9/2011
Complete RP-1583 (Assessment of Burning Velocity Test Methods)	3/2012
Complete RP-1580 (Input Parameters for Risk Assessment of 2L Refrigerants)	5/2012
Chair Recommendations TC Roster for 2012 year to Section Head	1/2012
Review Handbook Chapters 29, 30, 31 for changes, appoint reviewers, start revisions	7/2011
Robust Research Plan development and submittal to MORTS	1/2012, 6/2012
New RTAR and Work Statement submissions to MORTS	8/2011, 12/2011
Submit \geq 1-2 Program Forum/Seminar/Tech paper proposals for Chicago, San Antonio	8/2011, 2/2012
Participate in Research Liaison Document Development and Ad Hoc Committees	ongoing
Annual review/update of FAQs and TC website, maintain active member communications	ongoing

ATTACHMENT 2 - Current TC 3.1 Research Plan 2011-2012

ASHRAE Research Projects		
	Project Title	Comments/Status
Current Research ASHRAE	<p>1507-RP: Binary Refrigerant Flame Boundary Concentrations and databank for useful binary pairs in commercial refrigerants. Identify standard flammable mixture for confirming accuracy of data from flame test apparatus. Databank to aid assessment of new refrigerant blends for SSPC34.</p>	<p>Project nearing completion, finish 2/12 \$15K extension granted for added tests PI is A. Kusmierz. PMS: <u>Bob Richard</u>, Debra Kennoy, Sonny Sundaresan, Xudong Wang and Tom Leck</p>
	<p>1583-TRP: Assessment of Burning Velocity Test Methods</p>	<p>PI presented update 1/23/12 to TC Research project in progress, finish 3/12 Project monitoring subcommittee: <u>B. Minor</u>, D. Kennoy, R. Richard, W. Walter, X. Wang</p>
	<p>1580-TRP: Input Parameters for Risk Assessment of 2L Flammable Refrigerants in Stationary Applications a) residential a/c & heat pumps b) small commercial refrigeration</p>	<p>PI presented update 1/23/12 to TC Research Scheduled completion May, 2011 PMS subcommittee: <u>B. Minor</u>, D. Kennoy, C. Seeton, W. Walter, S. Sundaresan, and X Wang</p>
	<p>1584-TRP: Assessment of Alternative Approaches to Predict Burning Velocity of a Refrigerant</p>	<p>PI presented update 1/23/12 to TC Research Project began Nov, 2011 PMS subcommittee: <u>D. Kennoy</u>, B. Minor, R. Richard, S. Cunningham, Xudong Wang, Kenji Takizawa</p>
AHRTI	<p>Fractionation testing and error analysis for refrigerant blends in support of SSPC34 SPC-177P title is: MOT Fractionation Measurement of Refrigerant Blends</p>	<p>Project in progress with AHRTI Complete March, 2012 Contractor - Safety Consulting Engineers AHRTI PMS <u>R. Richard</u>, B. Minor S. Kujak, M. Scancerello, X. Wang M. McLinden</p>

Non-Prioritized Research Suggestions		
	Project Title	Comments/Status
New Idea Prepare RTAR	Phase II of 1584-RP to investigate more deeply MIE, hot surface ignition, 2L flame instability, kinetic mechanisms and/or other flammability characteristics relevant to 2L flammable refrigerants which would be useful to understand risks	Sonny Sundaersan (Lead), Bob Richard Debbie Kennoy, Greg Linteris
New Idea Prepare RTAR	Phase II of 1580-RP to investigate what is needed to determine safe charge limits for 2L refrigerants in US HVACR designed equipment vs Europe designs where work has been done. Consider input of UL working groups	Sam Yanamotta (Lead), Barbara Minor, other volunteers?
	Implications for Use of High Glide Refrigerants	Proposed seminar for Chicago meeting. Not accepted - resubmit? (Sundaersan - Seminar Chair)
	Phase II for RP-1484 - Energy and Performance of Secondary Coolant Low Temperature Refrigeration Systems	Working to finalize paper for ASHRAE presentation (Groll)
	Phase II for 1507-RP: Binary Refrigerant Flame Boundary Concentrations and databank for useful binary pairs in commercial refrigerants.	Some variability was identified in ASTM E681 when testing low flammability refrigerants May need another research project to resolve
RTAR prepared	Risk Assessment of 2L flammable refrigerants in applications using large quantity of refrigerants such as centrifugal chillers, supermarket racks, sea containers, etc.	RTAR approved but placed on hold because AHRI has a risk assessment in progress. Will wait until AHRI project is complete.