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

1791 Tullie Circle, N.E./Atlanta, GA 30329

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TC/TG/TRG MINUTES COVER SHEET

These draft minutes have been approved by this committee.

TC/TG/TRG NO TC 3.1 Date: 21 January 2012

TC/TG/TRG TITLE Refrigerants and Secondary Coolants

DATE OF MEETING 27 June 2011 LOCATION Montreal, Canada

MEMBERS PRESENT	YEAR APPTD	MEMBERS ABSENT	YEAR APPTD	EX-OFFICIO MEMBERS AND ADDITIONAL ATTENDANCE
Dave Wilson (Chair) – voting	7/2010	Felix Flohr – Member Non Quorum	7/2007	Chris Seeton - Guest
Debra Kennoy (Vice Chair) – voting	7/2010	Samuel Sami (Program) – CM	7/2010	Laurent Abbas - Guest
Umar Khokhar (Secretary) – voting	7/2010	Damon Johnson – CM (Provisional)	2/2010	Kostas Kontomaris - Guest
Sonny Sundaresan – voting	7/2008	Kapil Singhal – CM	7/2010	Dan Manole - Guest
Barbara Minor (Research) – voting	7/2010	William Aloys Schulte – CM (Provisional)	10/2010	Sebastian Hermann - Guest
Maryline Rassi – voting	7/2010	Karim Amrane - CM	7/1997	John Molnar - 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	Knut Petry – Guest
Stephen Kujak – voting	7/2009	Thomas Clemens - CM	7/2001	Wes Dunn - Guest
Gus Rolotti - CM	7/2010	Denis Clodic - CM	7/2007	Tatsuro Kobayashi - Guest
Osami Kataoka – CM	7/2006	Alan Cohen - CM	7/1999	Julie Majurin - Guest
Robert Richard - CM	7/2000	Robert Doerr - CM	7/2008	Hans Matthiesen - Guest
George Kazachki - CM	7/2008	Barry Fields - CM	7/2001	Hans-Joakim Kretzschmar - Guest
Kevin Connor (Handbook) –CM	7/2010	Cynthia Gage - CM	7/1992	David Hinde - Guest
Sean Cunningham (Webmaster) – CM	7/2010	Richard Jacobsen - CM	7/1990	Scott Martin - Guest
Mike Vaughn (Staff Liaison) - NVM	6/2001	Jim Lavelle - CM	7/2010	Bianca Hydutsky - Guest
Bill Murphy (Section Head) – NVM	7/2010	Ken Lilje - CM	7/2001	Jeff Grible - Guest

MEMBERS PRESENT	YEAR APPTD	MEMBERS ABSENT	YEAR APPTD	EX-OFFICIO MEMBERS AND ADDITIONAL ATTENDANCE
		Bert McJimsey - CM	7/1997	Kenji Takizawa - Guest
		Nandini Mouli - CM	7/2003	Harrison Skye - Guest
		Sunil Nanjundaram - CM	7/2008	John Senediak - Guest
		Bjorn Palm - CM	7/2009	Rainer Jakobs – Guest
		Thomas Reinarts - CM	7/2002	
		Rajiv Singh - CM	7/2006	
		Steven Szymurski - CM	7/2000	
		Koichi Watanabe - CM	7/2003	
		Tom Watson - CM	7/2004	
		Andrzej Wesolowski - CM	7/1995	
		Xiaomei Yu – CM	7/2008	
		Jing Zheng – CM	7/2003	
		Marc Scancarello - CM	7/2010	
		Bruce Badger - CM	7/2010	
		Mark McLinden - CM	7/2002	
		Marc Scancarello - CM	7/2010	
		Charles Wilkin - NVM	7/2010	
		Jennifer Leach – NVM	7/2010	
		Raymond Cohen – NVM	7/2008	
		Filza Walters – NVM	7/2010	
		Jahn Clark – NVM	7/2010	
		Hassan Bagheri – NVM	7/2009	
		Douglass Abramson – NVM	7/2010	
		Stephanie Reiniche – NVM	7/2009	

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

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. Kennoy and seconded by B. Minor.
Motion passed: 7 / 0 / 0 / 7 (CV)
(For / Against / Abstain / Total [Chair Voting [CV] or Chair Not Voting [CNV]])

C. Establishment of a quorum – There were 7 to 9 voting members present out of 9, which constitutes a quorum.

Voting members for this meeting:
Steve Kujak - present (4:25)
Sonny Sundaresan - present (4:30)
Bill Walter - present
Dave Wilson - present
Maryline Rassi – present
Debra Kennoy – present
Umar Khokhar – present
Barbara Minor – present
Don Bivens – present

2. APPROVAL OF LAS VEGAS, NV JANUARY 2011 MEETING MINUTES

Motion to approve was made by W. Walter and seconded by B. Minor.
Motion passed: 8 / 0 / 0 / 8 (CV)

3. CHAIRMAN'S ANNOUNCEMENTS (D. Wilson)

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

i. Guideline 6
   i. TC needs to resolve whether to revise / reaffirm / withdraw this Guideline and send final vote, chair name to the TC Liaison.
ii. Lack of sessions of interest for TC s
   i. Suggested that organizations cannot justify sending many to ASHRAE based on lack of session content particularly for those newer to the industry.
   ii. ASHRAE CEC representative agreed to inform ASHRAE.
iii. Specialty conference on refrigeration in planning stage – preliminary info:
   i. Location: NIST in Gaithersburg
   ii. Timing: 2012 (possibly October 29and 30)
iv. Free wireless internet is available:
   i. Hilton: Hilton VIP code: Bonaventure

ii. Fairmont: supposed to have one – no information available

v. Registration fee for speakers:
   i. ASHRAE is again considering charging speakers a registration fee but at a discounted level (possibly 25%)

vi. Multidisciplinary Task Group (MTG)
   i. Intended to address topics that cut across different TCs
   ii. A finite activity to produce a document, research project, etc.

vii. Hightower Award
   i. Submit by 01 SEP 2011
   ii. Vote takes place in November
   iii. Presentation in January 2012

viii. Dates:

Conference paper / abstracts	**Full technical papers**	**Conference papers / submitted for review**	**Seminar and Forum session proposals**
JAN 2012 – Chicago (21-25 JAN 2012)			
Theme: High Performance Buildings, Integrated Design, Energy Modeling and Specialized Applications			
18 APR 2011	18 APR 2011	08 JUL 2011	12 AUG 2011
JUN 2012 – San Antonio (23-28 JUN 2012)			
Theme: none			
26SEP2011	26SEP2011	09 JAN 2012	13FEB2012

B. TC Membership action items: Vote to continue current TC 3.1 as a technical committee

Motion to approve was made by D. Wilson and seconded by B. Minor.
Motion passed: 9 / 0 / 0 / 9 (CV)

C. TC Annual Objectives for 2011-2012 Society Year (See Attachment 1)

Motion to approve was made by G. Sundaresan and seconded by W. Walter.
Motion passed: 9 / 0 / 0 / 9 (CV)

D. Roster Review Changes Effective 1JULY 2011:

- Added as voting members: Sean Cunningham, Kevin Connor, Samuel Sami
- Added as Corresponding Members: C. Seeton, A. Riemer, W. Clough, F. Flohr (rolling off from Intl. Member Non Quorum)

4. Research Subcommittee (Barbara Minor)

A. Report from Research Subcommittee Chairs Meeting

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:
iv. Project awarded to Safety Consulting Engineers (SCE): 4Q2009.
v. PMS to review data in update recently received and select additional binary pairs for testing.
vi. Target for completion was June 2011 and has been delayed because of variability discovered in test equipment / test results. It was projected that a new completion date would be September 2011. Bob Richard will draft in agreement with the Contractor a cost extension proposal for TC vote to cover the additional work required.
vii. It was also suggested that the TC may want to consider a new research project on measuring the LFLs of slow burning materials in the future.

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 started and is on track despite issues due to the earthquake in Japan. Expect completion on time March 2012. It was noted that for refrigerants with BV < 3 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.

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: Contractor bids received and reviewed by PMS. Discussion of proposals and selection of contractor was made during closed session of TC 3.1 in January

2011 (Las Vegas). Project started 01JUN2011 with expected completion date May 2012.

C. Approved Research Projects

a. 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, X. Wang (ARTI representative)

iii. Status: Contractor bids received and reviewed by PMS during closed session at the end of this meeting. Contractor was selected by TC and recommendation form submitted to RAC.

D. New Work Statements - None

E. Proposed RTARs

a. 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 RTAR 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. At the Montreal meeting, TC 8.2 decided to table the RTAR because a similar project is underway at AHRI. They will wait and make a decision whether to pursue based on outcome of AHRI work.

F. Research Plan (See Attachment 2)

Motion to accept the research plan was made by D. Kennoy and seconded by G. Sundaresan.
Motion passed: 9 / 0 / 0 / 9 (CV)

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 Halel (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.

b. Refrigerants and Their Use in Building Environments (W. Walter - liaison)
   i. Goal: new position document which will build upon previous position on Low GWP refrigerant alternatives and technologies. Tech Council approved going forward at the fall meeting.
   ii. Plan to have a draft position document for the January 2012 meeting in Chicago

c. Improve Specific Components of HVAC&R Systems (S. Sundaresan - liaison)
   i. Have not heard any input for the last few months.

5. HANDBOOK SUBCOMMITTEE (Kevin Connor)

A. A new team is in place. Additional volunteers will be welcomed. Early tasks are for proposals and first drafts to be started by the June 2011 (Montreal) ASHRAE meeting. The TC Handbook Chair has approximately one year from Montreal to get the handbook submissions to Hassan Bagheri for 2013 publication. The goal is to have the first draft available for the January 2012 meeting.

   a. Chapter 29 – S. Cunningham (lead reviewer) and Don Bivens
      i. From January 2011: 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. Consider deleting the old refrigerants and adding new fluids (e.g., HFOs) to the chapter.
      iii. Bill Walter will work through the environmental property information with TC 2.5.

   b. Chapter 30 – M. McLinden (lead reviewer)
      i. Should the number of fluids be reduced in the handbook?

   c. Chapter 31 – K. Connor (lead reviewer)
      i. Lithium Bromide data needs to be entered
      ii. Otherwise, there are minor editorial changes.

B. CD Plus is no longer available. The handbook on-line is available for spreadsheets, animation, etc. The first draft needs to be completed for January 2012 meeting in Chicago.

6. PROGRAM (Chris Seeton)

A. June 2011 Annual Conference (Montreal): nothing on the Technical Program

B. January 2012 Winter Conference (Chicago)

   a. 1484-TRP Transaction Paper (if it can fit in somewhere)
   b. Forum – Implementation of 2L Refrigerants (resubmit since not accepted for June 2011 conference)

i. Moderator:
    1. perhaps Dennis Dorman or Phil Johnson
    2. otherwise, Chris Seeton
ii. Will SPSC 15 co-sponsor?

c. Seminar – High Glide Refrigerants
    i. Chair: G. Sundaresan
    ii. Paperwork deadline is August 12.
    iii. Potential Session Presenters:
        1. Hill Phoenix – D. Hinde
        2. NIST
        3. Honeywell – S. Yana Motta
        4. Arkema – D. Kennoy for L. Abbas

d. Seminar – Advancements and Trends in Low Global Warming Impact (LGWI) Technologies
    i. Sponsored by Refrigeration Committee / co-sponsored by TC 10.7 and TC 3.1
    ii. Will not exclude low GWP refrigerants or ultra-low GWP refrigerants
    iii. Chair: Georgi Kazachki
    iv. Vote to co-sponsor

Motion to co-sponsor the above seminar was made by W. Walter and seconded by G. Sundaresan.
Motion passed: 9 / 0 / 0 / 9 (CV)

C. June 2012 Annual Conference (San Antonio)
    a. Seminar – Standards Development on Flammable Refrigerants
        i. Chair: W. Walter
        ii. Example standards: ISO 817. ISO 5129, Standard 15 ad hoc committee work, UL Joint Task Group

Motion to approve the Forum / Seminar proposals for January 2012 and June 2012 was made by W. Walter and seconded by G. Sundaresan..
Motion passed: 9 / 0 / 0 / 9 (CV)

7. STANDARDS (Bill Walter)

a. Standards Reaffirmation Subcommittee (SRS) needs an update from TC 3.1 on Guideline 6 – 2008: revise, reaffirm, or withdraw (W. Walter)

i. The content appears to be appropriate but there are a few questions about the references.
ii. 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.
iii. Results from letter ballot (Spring 2011): 4 to revise, 3 to withdraw, 1 no reply and 1 abstain.
iv. Volunteers to revise: D. Kennoy, D. Wilson, S. Kujak, M. Rassi, U. Khokhar. M. Rassi volunteered to chair the committee. Other volunteers would be sought.

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

i. The following addenda were approved and will be formally added to the standard:

34i-2010	Addition of R-1234ze(E) to the standard
34j-2010	Addition of R-511A to the standard
34k-2010	Delete the provisional status for R14, R115, R170, RC318, R1270, R405A, R416A, R417A, R424A, R426A, R504 and delete the provisional footnote designation in Table 1 and 2
34l-2010	Change the cardiac sensitization values for R-32 and subsequent RCL values for R-32 blends in Table 2
34n-2010	Modify Sections 9.5.2.1, 9.5.2.2, and 9.5.2.3 to include pressure at the critical point
34o-2010	Modify Section B.1 Flammability Testing

ii. SSPC 34 will review two applications in the full committee meeting following this meeting:

Applicant	**Refrigerant Component(s)**	**Proportions**
Lemy Corporation (Korea)	R-134a / 152a	5.0 / 95.0 %m/m (±1.0 / ±1.0)
Refrigerant Solutions	R-32 / 125 / 134a / 152a / 227ea	31.0 / 31.0 / 30.0 / 3.0 / 5.0 %m/m (±1.0 / ±1.0 / ±1.0 / ± 0.5 / ±1.0)

c. ISO Standard 817, *Refrigerants –Designation and Safety Classification* (W. Walter)
   i. ISO 817 is approaching circulation as an FDIS. A vote is expected in the next few months. Editorial comments, only, will be accepted.
   ii. Possible publication in early 2012.
   iii. A maintenance agency must still be formed.

d. SPC-177P, *MOT Fractionation Measurement of Refrigerant Blends* (R. Richard)
   i. MOT draft is currently under review
   ii. AHRTI agreed to fund a study on the apparatus assembly and error analysis. The report may be available by January 2012 and will be incorporated into the MOT.
   iii. In the future, it may be reasonable to consider variability and share best insights from this effort.
   iv. A public review of the MOT is anticipated for 2013.

8. WEB SITE (Sean Cunningham)

Meeting minutes and 4 presentations from Las Vegas are now posted on the ASHRAE website.

9. OTHER BUSINESS

a. Online Technical FAQs need to be reviewed and updated for TC 3.1 vote of approval. The following volunteers offered to propose a first draft:
   i. Number 24 - D. Wilson
   ii. Number 46 - B. Minor
   iii. Number 84 - G. Rolotti

b. Unsolicited Research Proposal Response
   i. The Technical Activities Committee (TAC) received an unsolicited book proposal, "**Mobile Cooling by Thermosyphoning of R-718**" and requested TC 3.1 assistance for technical evaluation and consideration of possible development or further communication. TC 3.1 Research Subcommittee discussed this request and the consensus was this topic was not in the scope or interest of the TC, so we are not planning on going further. Decision was based on the assessment that this is a heat rejection application related to mobile phones, and the cognizant TC should be TC 1.3, not TC 3.1.

10. MEETING ADJOURNED – 6:00 PM

Motion to adjourn was made by S. Kujak and seconded by G. Sundaresan. Motion passed by general consensus.

TC 3.1 went into a closed session meeting to review bids for 1584-RP.

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**	**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.	Project nearing completion, finish 9/2011 Contractor: Safety Consulting Engineers. PI is A. Kusmierz. PMS: R. Richard, D. Kennoy G. Sundaresan, X. Wang, T. Leck
	1583-TRP: Assessment of Burning Velocity Test Methods	Project in progress, finish 3/2012 Contractor: AIST PI: K. Takizawa PMS: B. Minor, D. Kennoy, R. Richard W. Walter,X. Wang
	1580-TRP: Risk Assessment of 2L Flammable Refrigerants in Stationary Applications **a) residential a/c & heat pumps** **b) small commercial refrigeration**	Project started June 1, 2011 Contractor: Navigant PI: W. Goetzler PMS subcommittee: B. Minor, D. Kennoy, C. Seeton, W. Walter, S. Sundaresan, and X Wang
	1584-TRP: Assessment of Alternative Approaches to Predict Burning Velocity of a Refrigerant	Bids received and contractor nominated PMS subcommittee: D. Kennoy, B. Minor, R. Richard, S. Cunningham, X. Wang
AHRTI	**Fractionation testing and error analysis for refrigerant blends in support of SSPC34** **SPC-177P title is:** MOT Fractionation Measurement of Refrigerant Blends	Project in progress with AHRTI Contractor - Safety Consulting Engineers AHRTI PMS R. Richard, B. Minor S. Kujak, M. Scancerello, X. Wang M. McLinden

Non-Prioritized Research Suggestions		
	Project Title	**Comments/Status**
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.
	What is required for design of equipment and rooms for safe use of low flammability refrigerants, particularly those classified as 2L?	More ideas may be found thru UL work
	Low GWP refrigerant properties: stability, materials compatibility, other data needs.	No further needs at this time as significant industry activity ongoing
	Implications for Use of High Glide Refrigerants	Proposed seminar for Chicago meeting. may obtain research ideas (Sundaresan - Seminar Chair)
	Phase 2 for RP-1484 - Energy and Performance of Secondary Coolant Low Temperature Refrigeration Systems	Phase 1 report will be presented in Chicago (Groll) then need for follow-up work will be determined
	Phase 2 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 research project to resolve