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.

These minutes are the official, approved record of the meeting.

TC/TG/TRG NO TC 3.1 Date: 29 January 2013

TC/TG/TRG TITLE Refrigerants and Secondary Coolants

DATE OF MEETING 28 January 2013 LOCATION Dallas, TX

MEMBERS PRESENT	YEAR APPTD	MEMBERS ABSENT	YEAR APPTD	EX-OFFICIO MEMBERS AND ADDITIONAL ATTENDANCE
Debra Kennoy (Chair) – voting	2010	Samuel Sami – voting	2011	Julie Majurin – Guest
Mark McLinden (Vice Chair) – voting	2012	Osami Kataoka – CM	2006	Kenji Takizawa – Guest
Sean Cunningham (Secretary) – voting	2011	Damon Johnson – CM	2010	Scott Macleod – Guest
Chris Seeton (Program) – voting	2012	Kapil Singhal – CM	2010	Derryl Wright – Guest
Barbara Minor (Research) – voting	2010	William Aloys Schulte – CM	2010	Helen Davis – Guest
Maryline Rassi – voting	2010	Karim Amrane – CM	1997	Joel Hall – Guest
Felix Flohr – voting	2012	John Andrepont – CM	2001	Hewitt Gaudin – Guest
Alice Riemer – voting	2012	Earl Clark – CM	1992	John Senediak –Guest
Kevin Connor (Handbook) – voting	2011	Thomas Clemens – CM	2001	Ed Hessel – Guest
Stephen Kujak – voting	2009	Denis Clodic – CM	2007	Dale Carr – Guest
Warren Clough – voting	2012	Alan Cohen – CM	1999	Michael Foster – Guest
Robert Richard – CM	2000	Bill Walter (Standards) – CM	2012	Roberto Vrrego - Guest
Marc Scancarello – CM	2010	Barry Fields – CM	2001	Jeff Newel – Guest
Mark Spatz – Research Liaison	2012	Cynthia Gage – CM	1992	Bianca Hydutsky - Guest
Dave Wilson – CM	2008	Richard Jacobsen – CM	1990	Shitong Zha – Guest
Sonny Sundaresan – CM	2012	Jim Lavelle – CM	2010	Tom Leck – Guest
Don Bivens – CM	2012	Ken Lilje – CM	2001	Neil Hayes - Guest
George Kazachki – CM	2008	Bert McJimsey – CM	1997	Dave Wrocklage - Guest
Bruce Badger – CM	2010	Nandini Mouli – CM	2003	Mark Baker - Guest
Knut Petry – CM	2012	Sunil Nanjundaram – CM	2008	Scott Wujek - Guest
		Bjorn Palm – CM	2009	Haus-Joadim Krelzschmar –

				Guest
		Thomas Reinarts – CM	2002	
		Rajiv Singh – CM	2006	
		Steven Szymurski – CM	2000	
		Koichi Watanabe – CM	2003	
		Tom Watson – CM	2004	
		Gus Rolotti - CM	2010	
		Xiaomei Yu – CM	2008	
		Jing Zheng – CM	2003	
		Changiz Tolouee – Provisional CM	2011	

KEY CONTACTS

SPLS Liaison*	Janice Peterson
TAC Chair:	William McQuade
TAC Section Head:	William Murphy
All Committee Liaisons As Shown On TC/TG/TRG Rosters:	RAC Research: Mark Spatz Special Pubs: Francis Mills Standards: Rick Larson Handbook: Hassan M. Bagheri Chapter Technology Transfer: Mark Tomb Professional Development: Donald Brandt
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

CALL TO ORDER (D Kennoy, Chair)

A. Introductions of members and guests – Chair called the meeting to order at 4:30 P.M. and attendees introduced themselves.

B. Agenda Revision/acceptance
Agenda was revised to remove duplicate topics

Motion to approve with revision was made by B. Minor and seconded by W. Clough.
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 12, which constitutes a quorum.

Voting members for this meeting:
Steve Kujak - present
Warren Clough - present
Mark McLinden - present
Chris Seeton - present
Maryline Rassi - present
Debra Kennoy - present
Sean Cunningham - present
Barbara Minor - present
Felix Flohr - present
Kevin Connor - present
Alice Riemer - present
Samuel Sami – absent

APPROVAL OF SAN ANTONIO, JUNE 2012 MEETING MINUTES

Motion to approve draft minutes was made by W. Clough and seconded by K. Connor.
Motion passed: 10 / 0 / 0 /1 (CV). (For / Against / Abstain / Total [Chair Voting [CV] or Chair Not Voting [CNV]])
S. Kujak abstained as he did not attend the San Antonio meeting

CHAIRMAN'S ANNOUNCEMENTS (D Kennoy)

A. **Section 3 Meeting Report**

1. ASHRAE continues to recommend conference paper presentations. One problem noted was the submission of incomplete papers. Please remember to submit final papers for consideration which require only minor tweaking. Selection will be based on conference tracks.

2. Tracks for the June 2013 conference (Denver):

   a. Track 1 Research Summit
   b. Track 2 Integrated Project Delivery (mini-conference)
   c. Track 3 Building Energy Modeling vs Measurement and Verification
   d. Track 4 Mile-High Efficiency and Equipment
   e. Track 5 Renewable and Alternative Energy Sources
   f. Track 6 HVAC&R Systems and Equipment

g. Track 7 HVAC&R Fundamentals and Applications

3. Hightower Award recipient - Lucas Hyman

4. YEA (Young Engineers of ASHRAE) – encourage participation in TCs

5. ASHRAE has published a Code of Ethics – will include a copy to the minutes of this meeting for review.

6. Employment Discipline has been added to the ASHRAE BIO Online Input Form. Allows members to "self-declare" their employment discipline prior to the June 2013 meeting.

7. E&P Meetings (Electronic and Present Meetings) are being tested in a few committees. Allows for remote participation.

8. AIRAH (Transition to Low Emission HVAC&R Issues and Solutions). This Australian document (~ 100 pages) is available for comment from 21 JAN 2013 through 08 FEB 2013. Contact is DD Latham (ASHRAE staff) at dlatham@ashrae.org.

9. Speaker registration fee now in effect. For this meeting, $95 member / non-member speaker registration fee.

i. Deadlines for Conference submissions:

Dates	June 22 – 26, 2013	January 18 – 22, 2014
Location	Denver, CO	New York, NY
Conference Website	www.ashrae.org/denver/	www.ashrae.org/newyork/
Conference paper abstract	24 September 2012	15 March 2013
Conference Paper Abstract accept/reject notifications	16 October 2013	5 April 2013
Conference papers submitted for review	7 January 2013	3 July 2013
Technical Papers Due for Review	24 September 2012	19 April 2013
Technical Paper Final Review	25 February 2013	12 August 2013
Seminar and Forum Session	11 February 2013	12 August 2013
Seminar/Forum accept/reject	25 March 2013	
All presentations due Online	3 June 2013	3 January 2014

B. Roster Review
Summary of TC3.1 membership and changes, effective July 1st 2013.

12 Voting members for Denver (June 2013): Debbie Kennoy (2014), Barbara Minor (2014), Samuel Sami (2015), Kevin Connor (2015), Sean Cunningham (2015), Steve Kujak (2013), Maryline Rassi (2014), Mark McLinden (2016), Chris Seeton (2016), Warren Clough (2016), Felix Flohr (Intl. NQM-2014), Alice Riemer (Intl. NQM-2014).

Officers serving from 2012-07-01 through 2014-06-30 are - Chair: Debbie Kennoy, Vice Chair: Mark McLinden, Secretary: Sean Cunningham.

Subcommittee chairs are - Research: Barbara Minor, Standards: Dave Wilson, Program: Chris Seeton, Handbook: Kevin Connor, Webmaster: Sean Cunningham.

Dropping off TC 3.1 Voting Members to Corresponding Members: Steve Kujak. Any Corressponding Member who wishes to become a voting member, contact TC Chair.

TC 3.1 Liaisons: Alternative Lower Global Warming Potential Refrigerants: B. Minor (Primary), S. Cunningham (Alternate).

4. Research Subcommittee (Barbara Minor)

A. Report from Research Subcommittee Chairs Meeting. Money is available for projects. Pipeline of projects for TC 3.1 starting to run dry, need more RTAR, WS submissions. There will be a Research Track at the ASHRAE 2013 annual meeting in Denver. Research manual has been updated and gives greater guidance on RTAR and Work Statement preparations.

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:Testing completed. Draft report 60% complete. Expect completion in six weeks.

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: Complete. Two Papers will be presented in Denver 2013.

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
Status: Complete. Project Report was approved in letter ballot. Paper being prepared.

d. 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: Draft report submitted for review.

C. New Work Statements - None

D. Proposed RTARs

a. Humidity effect on burning velocity measurement. Prepare a draft RTAR for Denver meeting. (S Cunningham / B Richards).

b. Theoretical and experimental study of 2L flame stability; ease of extinction with various ventilation Prepare draft RTAR for Denver (B Minor / D Kennoy / B Richard).

E. Research Plan (See Attachment 1)

Motion to approve Research Plan was made by M. McLinden and seconded by S. Kujak.
Motion passed: 11 / 0 / 0 /11 (CV) *(For / Against / Abstain / Total [Chair Voting [CV] or Chair Not Voting [CNV]])*

F. ASHRAE Research Goals Liaisons Reports

Alternative Lower Global Warming Potential Refrigerants - meeting was held Saturday, January 26th. The meeting focused on research and program activities in ASHRAE and AHRI related to lower GWP refrigerants.

5. HANDBOOK SUBCOMMITTEE (Kevin Connor)

A. The revision to chapters 29/30/31 have been approved by TC3.1. Galley Proofs of revised chapters are being reviewed

a. Chapter 29 – S. Cunningham (lead reviewer) and Don Bivens
b. Chapter 30 – M. McLinden (lead reviewer)
c. Chapter 31 – K. Connor (lead reviewer)

6. PROGRAM (Chris Seeton)

a) Dallas 26-30 January 2013. Program items related to TC 3.1:

i) Sponsoring Seminar 34: Industry-Wide Efforts to Evaluate Lower GWP Refrigerants:

1. AHRI Low GWP Alternative Refrigerants Evaluation Program – X. Wang.

2. Roadmap Towards Lower GWP Alternative solutions for HVAC&R – O. Abdelaziz.

ii) Co-sponsoring with TC 2.5 Seminar 23: The Future of Refrigerants: Policy and Technical Considerations:

1. European Experience of CFC, HCFC and HFC Restrictions – A. Pearson.

2. Domestic and International Policy for HFCs and Next Generation Refrigerants – M Ritter

3. Factors Driving Refrigerant Selection – D. Reindl.

iii) Co-sponsoring with Refrigeration Committee Seminar 44: System and Components Performance and Efficiency with Low-GWP Refrigerants

1. Testing of Low-GWP R-404A Alternatives in Commercial Refrigeration Systems (B. Minor).

2. Developments in very low GWP Refrigerants for Stationary HVAC&R Systems – L. Abbas.

3. Technology Issues Regarding Refrigerant blends – G. Pottker

4. A Multifunctional Two-Stage Transcritical CO_2 system with Parallel Compression – K. Visser

iv) Co-sponsoring with Refrigeration Committee Seminar 44: System and Components Performance and Efficiency with Low-GWP Refrigerants Part 2.

1. Cycle Efficiency, charge Minimization and Service of Household Refrigerators with R600a – B. Junge.
2. Minimum Energy Design Practice for Air Blast Freezing – K. Visser
3. Elimination of Condensation in Meat Packing Plants – K. Visser.

b) Denver (Seminar and Forum proposals due 2/11/2013)

i) Seminar – What code requirements are necessary for working with 2L refrigerants; what changes are necessary for the future - Chris Seeton

ii) Seminar - Understanding Refrigerant classification", Chair Sonny Sundaresan

iii) Co-sponsor. Seminar - Practical experiences with low GWP and natural refrigerants in Supermarkets – Refrigeration Committee.

Motion to approve Denver Program was made by M. McLinden and seconded by C. Seeton
Motion passed: 11 / 0 / 0 /11 (CV) *(For / Against / Abstain / Total [Chair Voting [CV] or Chair Not Voting [CNV]])*

c) Other Program Ideas

i) "Working with Blends" to coincide with contractors attending Expo.

ii) Other TCs have used their committee time for Seminars, etc. These are included in the Technical program. Larger rooms can be assigned to accommodate the audience.

7. STANDARDS (Bill Walter)

a. Guideline 6

i. Team met yesterday. All sections have been through an initial revision. First draft target date is January 2014.

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

i. Three public review drafts being resolved.
ii. Standards Committee approved addendum ac (R-444 table addition), ad (modifies 6.1.3.5a Heat of Combustion calculation), ae (R-30 change B2 to B1), af (RCL value corrections).
iii. Addenda z (Bubble point / dew point definitions), aa (Azeotropic evidence requirement), ab (R-433A table addition) have been added to the ASHRAE website
iv. An updated list of refrigerants was accepted by the IMC, with a footnote for 2L classified refrigerants. UMC submission in progress. Code Hearing April 2013.

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

i. FDIS disapproved by multiple countries. Team working through the issues to find resolutions.

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

i. Waiting for completion of AHRTI project

8. WEB SITE (Sean Cunningham)

a. Meeting minutes and presentations are posted on the ASHRAE website.
http://tc31.ashraetcs.org/meetings.html

9. OTHER BUSINESS

a. FAQ (Frequently Asked Question) Three FAQs are assigned to TC3.1 (See attachment 2). The following people agreed to update the responses.

i) #24: Where can I find more design information on a new refrigerant? M. McLinden

ii) #46: What research is ASHRAE conducting regarding new, natural, or alternative refrigerants? B. Minor

iii) #84: Where can I find information on new refrigerants? S. Cunningham

10. MEETING ADJOURNED

Motion to adjourn was made by K. Connor and seconded by M. McLinden
Motion passed: 11 / 0 / 0 /11 (CV) *(For / Against / Abstain / Total [Chair Voting [CV] or Chair Not Voting [CNV]])*

ATTACHMENT 1: Current TC 3.1 Research Plan 2013

ASHRAE Research Projects		Updated June 25, 2012
	Project Title	**Comments/Status**
Current Research ASHRAE	**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.	60% of report is complete. Delayed due to other work by contractor. Expect draft report in 6 weeks, no cost extension. PMS: Bob Richard, Debra Kennoy, Sonny Sundaresan, Xudong Wang and Tom Leck
	1583-TRP: Assessment of Burning Velocity Test Methods	Project completed and two papers have been prepared by contractor to present in Denver. Project monitoring subcommittee: B. Minor, D. Kennoy, R. Richard, W. Walter, X. Wang
	1580-TRP: Input Parameters for Risk Assessment of 2L Flammable Refrigerants in Stationary Applications; a) residential a/c & heat pumps, b) small commercial refrigeration	Project completed, final report approved and published. Paper preparation in progress. 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	Draft report submitted which needs revisions. Meeting with contractor scheduled in February. PMS subcommittee: D. Kennoy, B. Minor, R. Richard, S. Cunningham, Xudong Wang, Kenji Takizawa
AHRTI	**Fractionation testing and error analysis for refrigerant blends in support of SSPC34. SPC-177P title is: MOT Fractionation Measurement of Refrigerant Blends**	Work completed. Draft report under review. Contractor - Safety Consulting Engineers. AHRTI PMS R. Richard, B. Minor, S. Kujak, M. Scancerello, X. Wang, M. McLinden

Non-Prioritized Research Suggestions	Updated January 28, 2013
Project Title	**Comments/Status**
Phase II of 1584-RP to investigate more deeply MIE, hot surface ignition, 2L flame instability, kinetic mechanisms and/or other flammability characteristics flammable refrigerants which would be useful to understand relevant to 2L risks. Also relevant for 1580-RP	Two potential RTARs were proposed :(1) Determine effect of humidity on burning velocity testing. Sean Cunningham and Bob Richard to prepare RTAR to be ready for Denver in case more testing is needed (2) potential RTAR to study on a theoretical and experimental basis the stability of 2L flames and ease of extinction with various degrees of ventilation. Barbara Minor, Bob Richard and Debra Kennoy to prepare RTAR
Implications for Use of High Glide Refrigerants	HW has published some information to address this question. May be need for further research. Omar Abdelaziz to ask further research. Omar Abdelaziz to ask TC 10.7 if research is warranted
Phase II for RP-1484 - Energy and Performance of Secondary Coolant Low Temperature Refrigeration Systems	Working to finalize paper for ASHRAE presentation (Groll). Don Bivens to follow up
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. Next step is round robin testing
Ignition potential of Off-Design ignition sources	Ignition sources can change/deteriorate over time. Mark Spatz to check with TC 8.11 to gauge interest

ATTACHMENT 2: FAQs

ID	24 –
Question	Where can I find more design information on a new refrigerant?
Answer	The 2009 ASHRAE Handbook - Fundamentals has two chapters devoted to refrigerants. Chapter F29 provides a general discussion of the different refrigerants, and Chapter F30 provides pressure-enthalpy diagrams and summary tables of the thermodynamic and transport properties of the more common refrigerants. Chapters R06, R07, and R12 of the 2010 ASHRAE Handbook - Refrigeration provide information on refrigerant system chemistry, the control of moisture, and lubricants for use with refrigeration systems. The "NIST Reference Fluid Thermodynamic and Transport Properties Database (REFPROP, Standard Reference Database 23), Version 9.0", provides more detailed properties for 39 pure fluids, 35 predefined mixtures (such as R410A) and allows the user to obtain properties for any arbitrary mixture with up to 20 components. ASHRAE Standard 34-2010 defines the nomenclature used to name refrigerants and provides safety (flammability and toxicity) classifications for 53 pure fluids and 45 blends. These classifications are referenced by ASHRAE Standard 15-2010, which defines allowable refrigerants in different applications. The "NIST Leak/Recharge Simulation Program for Refrigerant Mixtures (RELEAK, Standard Reference Database 73), Version 4.0," allows the user to conduct fractionation analyses on refrigerant blends. Extensive data on lubricants and materials compatibility are available in the reports resulting from the Materials Compatibility and Lubricants Research Program of the Air-Conditioning and Refrigeration Technology Institute, similar work continues under the ARTI Research Program, see: www.arti-research.org. Some of the equipment and refrigerant manufacturers provide their customers design data and/or computer programs for their equipment and fluids. When new refrigerants (especially blends) are introduced, design data can be obtained from the refrigerant manufacturer. The handbook and other publications may be purchased and/or individual chapters of the handbook may be purchased and downloaded on-line at our website, www.ashrae.org or by calling 1-800-527-4723 in the USA and Canada or 1-404-636-8400 worldwide. NIST - National Institute of Standards and Technology, www.nist.gov ARTI - Air-Conditioning and Refrigeration Technology Institute, www.arti-research.org.
ASHRAE Pubs	ASHRAE Standard 34-2010, "Designation and Safety Classification of Refrigerants", plus ASHRAE BOD approved addenda. ASHRAE Standard 15-2010, "Safety Standard for Refrigeration Systems", plus ASHRAE BOD approved addenda. 2009 ASHRAE Handbook - Fundamentals, Chapter F29 & F30 2010 ASHRAE Handbook - Refrigeration, Chapters R06, R07, & R12

Topic References Refrigerants, Thermodynamic properties, Transport properties, Lubricants

	Cognizant ASHRAE Committees	Refer to Organization
1	TC 3.1	NIST
2	TC 3.2	ARTI
3	TC 3.3	
4	TC 3.4	
5	SSPC 34	

ID	FAQ 46 –
Question	What research is ASHRAE conducting regarding new, natural, or alternative refrigerants?
Answer	New refrigerants are not typically developed through ASHRAE research. Manufacturers may submit new refrigerant formulations to SSPC 34, Designation and Safety Classification of Refrigerants, to obtain an ASHRAE number designation based on criteria in the standard. In the United States, most approved refrigerants are non-flammable blends with HFCs as the major components. Each year ASHRAE devotes the October issue of the ASHRAE Journal to that year's Research Report. The following active projects regarding air filtration are listed in the October 2011 issue: 1327-RP Flow Regime and Pressure Drop Determination for Two-Phase Ammonia Upward Flow in Various Riser Sizes 1409-RP Stability of Candidate Lubricants for CO_2 Refrigeration 1410-RP Effect of System Chemicals Toward the Breakdown of Lubricants and Refrigerants 1444-RP Experimental Evaluation of Two Phase Pressure Drops and Flow Patterns in U-Bends for R-134a, R-410a, and Ammonia 1472-RP Experimental Validation of Modeling Tools for Mixed Gas Refrigeration Cycles 1476-RP Woven Compressor Enabling Economic and Scalable R718 Chillers – Phase I: Proof of Concept 1495-RP Effect of Lubricant on the Distribution of Water Between Vapor and Liquid Phases of Refrigerants 1507-RP Binary Refrigerant Flame Boundary Concentrations 1580-RP Study of Input Parameters for Risk Assessment of 2L Flammable Refrigerants in Residential Air Conditioning and Small Commercial Refrigeration Applications 1583-RP Assessment of Burning Velocity Test Methods 1584-RP Assessment of Alternative Approaches to Predicting the Burning Velocity of a Refrigerants Final reports to completed ASHRAE research projects related to air filtration, and all other topics, are available (for free to ASHRAE members) at the Research page of www.ashrae.org.

ASHRAE Pubs	The October issue of the ASHRAE Journal each year summarizes ASHRAE's current research efforts.

Topic References Air filtration, research

	Cognizant ASHRAE Committees	Refer to Organization
1	TC 3.1	
2	RAC	
3		
4		
5		

ID	FAQ 84 -
Question	Where can I find information on new refrigerants?
Long Answer	ASHRAE Standard 34-2010 plus ASHRAE BOD approved addenda establishes a simple means of referring to common refrigerants instead of using the chemical name, formula, or trade name. It also establishes a uniform system for assigning reference numbers and safety classifications to refrigerants. The standard identifies requirements to apply for designations and safety classifications for refrigerants, including blends, in addenda or revisions to the standard. The 2009 ASHRAE Handbook - Fundamentals also has two chapters devoted to refrigerants. Chapter F29 provides a general discussion of the different refrigerants, and Chapter F30 provides pressure-enthalpy diagrams and summary tables of the thermodynamic and transport properties of refrigerants. The standard may be purchased and downloaded on-line at our website, www.ashrae.org or by calling 1-800-527-4723 in the USA and Canada or 1-404-636-8400 worldwide.
ASHRAE Pubs	ASHRAE Standard 34-2010, "Designation and Safety Classification of Refrigerants", plus ASHRAE BOD approved addenda. 2009 ASHRAE Handbook - Fundamentals, Chapter F29 & F30
Topic References	refrigerants

	Cognizant ASHRAE Committees	Refer to Organization
1	TC 3.1	
2	SSPC 34	
3		
4		
5		