




## Shaping Tomorrow's Built Environment Today

1791 Tullie Circle NE ▪ Atlanta, Georgia 30329-2305 ▪ Tel 678.539.1211 ▪ Fax 678.539.2211 ▪ <http://www.ashrae.org>

Michael R. Vaughn, P.E.  
Manager  
Research & Technical Services

[mvaughn@ashrae.org](mailto:mvaughn@ashrae.org)

TO: Wade Conlan, Chair TC 9.10, [wade.conlan@exp.com](mailto:wade.conlan@exp.com)  
Wayne Lawton, Research Subcommittee Chair TC 9.10, [wayne.lawton@merrick.com](mailto:wayne.lawton@merrick.com)  
Kishor Khankari, Research Liaison Section 9.0, [kkhankari@syska.com](mailto:kkhankari@syska.com)

FROM: Michael Vaughn, MORTS, [mvaughn@ashrae.org](mailto:mvaughn@ashrae.org) 

DATE: July 25, 2012

SUBJECT: Research Topic Acceptance Request (1573-RTAR), "Determination of Suitable Replacement for SF6 When Used As a Tracer Gas In Accordance With ANSI/ASHRAE Standard 110"

During their annual meeting, the Research Administration Committee (RAC) reviewed the subject Research Topic Acceptance Request (RTAR) and voted to conditionally accept it for further development into a work statement (WS) provided that the RAC approval condition(s) below are addressed to the satisfaction of your Research Liaison in a revision to the RTAR first.

1. Contact the U.S. EPA and NIST for suggested SF6 replacements – This will help to alert them to the issue and also put to rest the question that they may be aware of a suitable replacement already in the works.
2. Clarify project objectives further as noted in RTAR evaluation sheet (attached), particularly the second goal.
3. Update references as noted in RTAR evaluation sheet (attached), particularly with regard to the NIST report.
4. Secure at least one letter of support for project from a potential co-funder -- This condition can wait until work statement is submitted.

Please coordinate changes to the RTAR with the help of your Research Liaison, Kishor Khankari, [kkhankari@syska.com](mailto:kkhankari@syska.com) or [RL9@ashrae.net](mailto:RL9@ashrae.net), in response to the approval condition(s) only so that it can be submitted to the Manager of Research and Technical Services and posted by ASHRAE as part of the Society's Research Implementation Plan.

Once the revised RTAR is posted, please develop a work statement also with the help of your Research Liaison prior to submitting it to the Manager of Research and Technical Services for consideration by RAC. The work statement must be approved by the Research Liaison prior to submitting it to RAC.

An RTAR evaluation sheet is attached as additional information and it provides a breakdown of comments and questions from individual RAC members based on specific review criteria. This should give you an idea of how your RTAR is being interpreted and understood by others. Some of these comments may indicate areas of the RTAR and subsequent WS where readers require additional information or rewording for clarification.

The first draft of the work statement should be submitted to RAC no later than **May 15, 2014** or it will be dropped from display on the Society's Research Implementation Plan. The next submission deadline for work statements is **August 15, 2012** for consideration at the Society's 2012 fall meeting. The submission deadline after that for work statements is December 15, 2012 for consideration at RAC's 2013 winter meeting.

<b>Project ID</b>	<b>1573</b>	
<b>Project Title</b>	Determination of Suitable Replacement for SF6 When Used As a Tracer Gas In Accordance With ANSI/ASHRAE Standard 110	
<b>Sponsoring TC</b>	TC 9.10 - Laboratory Systems	
<b>Cost / Duration</b>	\$125,000/ 12M	
<b>Submission History</b>	3rd submission. 2nd submission Rejected Oct. 2009. 1st submission Returned Jan. 2009.	
<b>Classification: Research or Technology Transfer</b>	Basic/Applied Research	
<b>2012 Annual Meeting Review</b>	<b>RTAR SUMMARY VOTES &amp; COMMENTS - Version 1</b>	
<b>Check List Criteria</b>	<b>VOTED NO</b>	<b>Comments &amp; Suggestions</b>
<b>Is there a well-established need?</b> The RTAR should include some level of literature review that documents the importance/magnitude of a problem. If not, then the RTAR should be returned for revision.	<b>#7</b>	<b>#2</b> - With SF6 being phased out a new gas acceptable to be used as a tracer has to be found otherwise OSHA requirements will not be able to be met. 110 is the Std used in industry. <b>#10</b> - ASHRAE Standard 110 stipulates SF6 which is being phased out. The industry is in need of new, non-toxic, low GWP tracer gas options in specialized applications; i.e. nuclear power plants. etc. health, safety and GWP are key drivers. <b>#7</b> - I believe there is a well-established need for a replacement for SF6, but I'm not convinced this research project is needed to find it. The RTAR states "N2O has been investigated and used as a replacement for SF6 however there are questions as to how well it works and some of the results appear to be questionable." It's hard for me to believe that a small ASHRAE project is going to find a replacement for SF6 if none is known to exist, and if any are known to exist (besides N2O), why aren't they mentioned in the RTAR. <b>#8</b> - Seems to be a strong need for finding this alternative gas
<b>Is this appropriate for ASHRAE funding?</b> If not, then the RTAR should be rejected. Examples of projects that are not appropriate for ASHRAE funding would include: 1) research that is more appropriately performed by industry, 2) topics outside the scope of ASHRAE activities.	<b>#14</b>	<b>#14</b> - Given the information in the RTAR, I believe that it is more appropriate for the state of California to fund this work instead of ASHRAE. <b>#10</b> - Findings need to be tied into Standard 110. <b>#6</b> - Industry co-funding would represent appropriate support for this proposed study. <b>#3</b> -However I am still surprised that there is no direct support from the industry producing these potential gases,their potential contribution is not only important because of the dollars, but will also prove their commitment and confidence in this RTAR.
<b>Is there an adequate description of the approach in order for RAC to be able to evaluate the appropriateness of the budget?</b> If not, then the RTAR should be returned for revision.	<b>#6, #7, #8</b>	<b>#10</b> - The objectives are defined. <b>#6</b> - Recent changes to RTAR procedures require some detail on the timing and costs of each part of the suggested research in order to evaluate the appropriateness of the budget, which is not provided in this RTAR. <b>#7</b> - Perhaps it is clear to someone familiar with Standard 110, but I don't have a good feel for the validation that would be necessary assuming a suitable replacement is found. What if a suitable replacement isn't found? <b>#8</b> - The RTAR still suffers from the high uncertainty of whether a suitable alternative exists, and could end up with a lot of effort expended to conclude that no alternative exists. Examples of alternatives stated in the RTAR already do not meet the criteria set for acceptance. "Finding a gas" does not seem to be a goal that can be assigned any certainty of success
<b>Is the budget reasonable for the project scope?</b> If not, then RTAR could be returned for revision or conditionally accepted with a note that the budget should be revised for the WS.	<b>#7</b>	<b>#10</b> - Co-funding sources have been identified. <b>#6</b> - Cannot answer based on RTAR description. <b>#7</b> - Hard to determine. See previous comment.
<b>Have the proper administrative procedures been followed?</b> This includes recording of the TC vote, coordination with other TCs, proper citing of the Research Strategic Plan, etc. If not, then the RTAR could be returned for revision or possibly conditionally accepted based on adequately resolving these issues.		<b>#6</b> - Appears that the Research Strategic Plan elements are from the 2005-2010 Plan. Is this acceptable, or should the 2010-2015 Strategic Plan be used?
<b>Decision Options</b>	<b>Initial Decision</b>	<b>Additional Comments or Approval Conditions</b>
ACCEPT		<b>#10</b> - Work Statement should elaborate on the approach and the deliverables. <b>#6</b> - A previous RAC commenter asked if US EPA or NIST had been contacted for suggested SF6 replacements. There is a NIST report on possible replacements for SF6 which is not included in the references: NIST Technical Note 1425, Gases for Electrical Insulation and Arc Interruption: Possible Present and Future Alternatives to Pure SF6, Christophorou, Olthoff, and Green, NIST, Gaithersburg, MD, November 1997. Reference 10 in the RTAR on using N2O has the conclusion that N2O is a viable alternative for SF6, but per this RTAR there may be remaining questions about use of N2O. Have the RTAR authors considered the use of helium as a tracer gas? Helium is used for leak testing in the manufacture of refrigeration and air conditioning equipment and in chemical process vessels and piping. <b>#7</b> - The objectives are unclear to me. The RTAR states "The second goal is to develop a method of evaluating other tracer gas that can be included in the next revision of ASHRAE 110." Does the RTAR author mean the second goal is to develop a method of evaluating the performance of fume hoods using the alternative tracer gas? <b>#8</b> - I am still concerned that while the project objective are reasonable and even necessary, in an ASHRAE type project, the outcome may be that no such gas is found.
COND. ACCEPT	<b>X</b>	
RETURN		
REJECT		

**ACCEPT Vote** - Topic is ready for development into a work statement (WS).

**COND. ACCEPT Vote** - Minor Revision Required - RL can approve RTAR for development into WS without going back to RAC once TC satisfies RAC's approval condition(s)

**RETURN Vote** - Topic is probably acceptable for ASHRAE research, but RTAR is not quite ready.

**REJECT Vote** - Topic is not acceptable for the ASHRAE Research Program



## ASHRAE

*Technology for a Better Environment*

1791 Tullie Circle, NE • Atlanta, GA 30329-2305 USA • Tel 404.636.8400, Ext. 1211 • Fax 678.539.2211 •  
<http://www.ashrae.org>

Michael Vaughn, PE  
Manager of Research & Technical Services

email: [mvaughn@ashrae.org](mailto:mvaughn@ashrae.org)

TO: Frank Spevak, Chair TC 9.10, [fspevak@energyconservatory.com](mailto:fspevak@energyconservatory.com)

FROM: Mike Vaughn  
Manager of Research and Technical Services

CC: Carl Lawson, Research Liaison, 9.10, [Clawson@hanson-inc.com](mailto:Clawson@hanson-inc.com)  
George Sestak, Research Subcommittee Chair, [george.sestak@astrazeneca.com](mailto:george.sestak@astrazeneca.com)

DATE: February 13, 2009

SUBJECT: RTAR #1573, "Determination of Suitable Replacement for SF6 When Used as a Tracer Gas in Accordance with ASHRAE Methods of Test 110 and 129"

At their recent winter meeting in Chicago, Illinois, the Research Administration Committee (RAC) reviewed the subject Research Topic Acceptance Request (RTAR) and voted 5-0-0, to return it. The following comments and questions need to be fully addressed in the next submission for the RTAR:

1. The applicability of the project to the ASHRAE Research Strategic Plan 2005-2010 is not clearly stated. The authors should be specific about how the project addresses specific goals within the plan. See Research Manual for instructions on how to prepare RTAR sections. There should be more details in almost every section of this RTAR.
2. The TC vote must be included in the RTAR when submitted and not provided later via e-mail.
3. This does not appear to be within the competence of the ASHRAE community - Are tracer gases the purview of a Section 1 TC? EPA and/or NIST should be consulted to see if there are any replacements to SF6 that they have come up with. Some have also indicated that there are existing tracers that can be used instead of SF6 and that no research is needed.
4. Do you have any suggestions for the replacement gas? A proposed substitute could be tested for ASHRAE-related applications, but this RTAR calls for selection and testing of the gas. Suggest that TC do more research (or ASHRAE could co-sponsor research of a chemical nature) to identify possible substitutes, then ASHRAE could sponsor research to test them in SF6 applications.
5. What is Standard 110 and 129? Please cite full title in RTAR. Will other standards be affected?
6. The level of effort (Dollar value) seems too low for 18 months effort.
7. No references given in RTAR, not even to those ASHRAE test procedure standards mentioned in text that use SF6.

Please incorporate the above information into the revised RTAR with the help and approval of your Research Liaison, Carl Lawson, [RL9@ashrae.org](mailto:RL9@ashrae.org), prior to submitting it to the Manager of Research and Technical Services for further consideration by RAC.

If you wish this to be reconsidered at the winter /spring conference call meeting, a revised RTAR, with a new TC vote, together with a letter describing how each of the above items was addressed, should be sent

(electronically) to Mike Vaughn, Manager of Research and Technical Services ([morts@ashrae.net](mailto:morts@ashrae.net) ) by February 27, 2009. The deadline following this one is May 15, 2009 for consideration at the Society's 2009 annual meeting.

Unique Tracking Number Assigned by MORTS                     #1573                      
**RESEARCH TOPIC ACCEPTANCE REQUEST (RTAR) FORM**  
Sponsoring TC/TG/SSPC: TC 0910

**Title:**

Determination of Suitable Replacement for SF<sub>6</sub> When Used As A Tracer Gas In Accordance With ASHRAE Methods Of Test 110 and 129.

**Applicability to ASHRAE Research Strategic Plan:**

Assess the environmental impact and sustainability of engineering activities within and linked to ASHRAE.

**Research Classification:**

Basic/Applied Research

**TC/TG/SSPC Vote:**

(For –Against-Abstentions-Absent-Total)

**Reasons for Negative Votes and Abstentions:**

(Negative Votes)  
(Abstentions)

**Estimated Cost:**

\$60,000.00

**Estimated Duration:**

18 Months

**RTAR Lead Author**

Fred Lorch (florch@phoenixcontrols.com)

**Expected Work Statement Lead Author**

Fred Lorch ([florch@phoenixcontrols.com](mailto:florch@phoenixcontrols.com))

**Co-sponsoring TC/TG/SSPCs and votes:**

TC 0503

**Possible Co-funding Organizations:**

**Application of Results:**

ANSI/ASHRAE Standard 110, ANSI/ASHRAE Standard 129.

**State-of-the-Art (Background):**

Gaseous SF<sub>6</sub> is a commonly used tracer gas for use in short-term experiments of ventilation efficiency in buildings and indoor enclosures, and for determining infiltration rates. Two major factors recommend its use: Its concentration can be measured with satisfactory accuracy at very low concentrations, and the Earth's atmosphere has a negligible concentration of SF<sub>6</sub>.

SF<sub>6</sub> is one of the most popular insulating gases (next to air). It has a number of nice properties: it's not flammable, it's non-toxic, it's (moderately) inexpensive, it's a good insulator (being an electronegative gas), with a breakdown strength of about 3 times that of air. At normal temperatures, it is non-corrosive, and is fairly inert. It is available from most gas dealers, particularly those specializing in electronic gases.

**Advancement to the State-of-the-Art:**

According to the Intergovernmental Panel on Climate Change, SF<sub>6</sub> is the most potent greenhouse gas that it has evaluated, with a global warming potential 23,900 times greater than CO<sub>2</sub> and an atmospheric life of 3,200 years. One pound of SF<sub>6</sub> has the same global warming impact of 11 tons of CO<sub>2</sub>. It is estimated that this research will totally eliminate the ASHRAE related contribution of SF<sub>6</sub> to the atmosphere.

**Justification and Value to ASHRAE:**

ASHRAE members affiliated with testing ventilation efficiency in buildings and containment of fume hoods will be directly affected, and all ASHRAE members will be indirectly affected. The likelihood that this improvement would be adopted by industry is very high. There is a strong likelihood of ASHRAE's obtaining intellectual property rights from this project.

**Objectives:**

The goal of this project would be to identify and validate a substitute tracer gas which would not be detrimental to the Earth's atmosphere, and would provide the same results when used in accordance with ANSI/ASHRAE Standards 110 and 129.

The substitute tracer gas should have similar characteristic as SF<sub>6</sub> (Its concentration can be measured with

satisfactory accuracy at very low concentrations, and the Earth's atmosphere has a negligible concentration), and should be moderately inexpensive and readily available from most gas dealers. Validation will require comparison testing with SF<sub>6</sub> and with the substitute tracer gas in accordance with ASHRAE Standards 110 and 129.

**Key References:**