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TO: Michael Sheerin, Chair SSPC 170, michael.sheerin@tlc-eng.com
James Moore, Vice-chair SSPC 170,
CC: Paolo Tronville, Research Liaison Section 9.0, paolo.tronville@polito.it

FROM: Michael Vaughn, MORTS, mvaughn@ashrae.org

DATE: November 6, 2018

SUBJECT: Research Topic Acceptance Request (1864-RTAR), "Investigating the applicability of Standard 62.1's Ventilation Rate Procedure for Healthcare Rooms"

During their fall meeting, the Research Administration Committee (RAC) reviewed the subject Research Topic Acceptance Request (RTAR) and voted to accept it with comments for further development into a work statement (WS) provided that the key comment(s) and question(s) below are addressed to the satisfaction of your Research Liaison, Paolo Tronville, paolo.tronville@polito.it, or RL9@ashrae.net, in the work statement draft.

1. Reason for abstention vote is missing on the front page.
2. It is unclear why Standard 62.1 and Standard 170 should be harmonized.
3. The RTAR should be a more detailed in the approach envisioned.
4. The validation procedure should be described better. Clarify the approach and samples.

The work statement draft 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 **August 15, 2020** or it will be dropped from display on the Society's Research Implementation Plan. The next likely submission deadline for a new work statement on this topic is **May 15, 2019** for consideration at RAC's 2019 Annual meeting. The submission deadline after that for work statements is **August 15, 2019** for consideration at the RAC's 2019 fall meeting.

Project ID	**1864**	
Project Title	**Investigating the applicability of Standard 62.1's Ventilation Rate Procedure for Healthcare Rooms**	
Sponsoring TC	SSPC 170, Ventilation of Health Care Facilities	
Cost / Duration	$125,000 / 24 Months	
Submission History	**1st Submission**	
Classification: Research or Technology Transfer	Basic/Applied Research	
RAC 2018 Fall Meeting Review		
Essential Criteria	**Voted NO**	**Comments & Suggestions**
Background: The RTAR should describe current state of the art with some level of literature review that documents the importance/magnitude of a problem. References should be provided. If not, then note it in your comments.		**2** - Timely and well described RTAR. **9** - Clearly described, with refs. **10** - Reason for abstention vote is missing on the front page. It is not clear why ASHRAE Strategic plan is listed in the references. In the reference list there is just one ASHRAE Transactions paper and no peer-reviewed journal paper. It's hard to believe that there are no journal paper available on this topic. **8** - good discussion
Research Need: Based on the background provided is the need for additional research clearly identified? If not, then the RTAR should be rejected.		**2** - Quite logical. 9 - The question is clearly a valid one. **10** - To reach the goal of saving energy it is necessary to investigate whether the ventilation rates prescribed by Standard 170 are strictly necessary or not. If that was already investigated (and described in the scientific literature) then Standard 170 minimum requirements could be changed, regardless of what is prescribed by Standard 62.1. In other words, Standard 170 does not need to emulate Standard 62.1 for saving energy. SSPC 170 could go ahead and make the appropriate modifications based on scientific evidence. Therefore a research project focusing whether to replace some requirements of Standard 170 with Standard 62.1 ones is not needed. **8** - this environment is rich for reducing over-prescribed ventilation rates.
Relevance and Benefits to ASHRAE: Evaluate whether relevance and benefits are clearly explained in terms of: a. Leading to innovations in the field of HVAC & Refrigeration b. Valuable addition to the missing information which will lead to new design guidelines and valuable modifications to handbooks and standards. Is this research topic appropriate for ASHRAE funding? If not, Reject.		**9**- The work is based on RP CO-RP3, a lit review that showed the knowledge basis is incomplete. Definite benefit to ASHRAE by harmonizing different guidance in two standards, using solid scientific basis. **10** - Whether to replace parts of Standard 170 with others from Standard 62.1 is relevant for ASHRAE. However, as discussed above, such way to proceed is questionable.
IF ABOVE THREE CRITERION ARE NOT ALL SATISFIED - MARK "REJECT" BELOW & CONTINUE REVIEW BELOW		
Other Criteria	**Voted NO**	**Comments & Suggestions**
Project Objectives: Based on the background and need, evaluate whether the project objectives are: 1. Aligned with the need 2. Specific 3. Clear without ambiguity 4. Achievable If not, then appropriate feedback should be provided.		**9 -** Two objectives: I) identification of healthcare spaces for which full understanding of conditions can be found, and ii) determine whether 62's approach can be applied. **10 -** The objectives are not clearly defined. The preliminary objective is to obtain a "thorough understanding of the types and generation conditions of the healthcare-unique contaminants". What does that mean? What is the expected outcome? The second objective is to determine the value of a constant in an equation so that the new equation would adapt one of the equations in Standard 62.1. However, it is not mentioned what are the criteria for determining such constant. **8** - would like further details on room types, contaminants details, and possible descoping of complex cases.
Expected Approach and Budget: Is there an adequate description of the approach in order for RAC to be able to evaluate the appropriateness of the budget? If not, then the RTAR should be returned for revision. Anticipated funding level and duration:		**4** - Expected approach is unclear. It must be clearly specified which actions are field measurements, which are based on surveys etc. The minimum size of samples need to be provided. **9** - Approach is clear, but does not break down the $125k and 24 month request. **15**- While the need for this work is real, I think the RTAR should be a bit more detailed in the approach envisioned. **10** - Lab testing is checked among the activities without mentioning experimental activity in the text. The validation procedure should be described better.
References: Are the references provided?		**10** - There is a list of reference but no peer-reviewed journal paper present.
Decision Options	**Initial Decision?**	**Final Approval Conditions**
ACCEPT AS-IS		**4** - It is unclear why 62.1 and 170 should be harmonized. Although I understand the need to examine the potential benefits (for energy) by utilizing VRP in the scope of 170 62.1 and 170 refer to two completely different environments with different exposures and different methods protecting against the exposures as well as most likely use different endpoints. 62.1 use comfort endpoint in VRP which by default may not be sufficient in protecting against biological contaminants that may occur in healthcare facilities. **7** - RTAR is well written. Severability across the two primary objectives should be very clear in the Work Statement. **9** - There is a clear need for solid scientific-based guidance to re-concise guidance in Std 62 and 170. Whilst energy efficiency is important, the project should ensure that there is a 'safety net' ventilation rate so as not to compromise occupant health and safety. This aspect should be taken into account. **10** - If scientific evidence about minimum ventilation rates for healthcare facilities is not available yet, then a research project should investigate that, regardless of what is prescribed by Standard 62.1. An exhaustive literature search may help the authors to understand what are the research needs for Standard 170. The reduction in ventilation rates shall not affect the environmental quality of healthcare facilities. For this reason an experimental validation of the findings is important. **8** - address comments on project objectives
ACCEPT W/COMMENTS		
REJECT		

ACCEPT Vote - Topic is ready for development into a work statement (WS).
ACCEPT W/COMMENTS 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)
REJECT Vote - Topic is not acceptable for the ASHRAE Research Program

Research Topic Acceptance Request Cover Sheet

Date: April 26, 2018

(Please Check to Insure the Following Information is in the RTAR)

A. Title	✔
B Executive Summary	✔
C. Background	✔
D. Research Need	✔
E. Project Objectives	✔
F. Expected Approach	✔
G. Relevance and Benefits to ASHRAE	✔
H. Anticipated Funding Level and Duration	✔
I. References	✔

Title:

Investigating the applicability of Standard 62.1's Ventilation Rate Procedure for Healthcare Rooms

RTAR # 1864

(To be assigned by MORTS)

Results of this Project will affect the following Handbook Chapters, Special Publications, etc.:

-HVAC Applications Ch 8, Healthcare
-ASHRAE/ANSI/ASHE Standard 170, Ventilation of Health Care Facilities
-ASHRAE HVAC Design Manual for Hospitals and Clinics
- ASHRAE Std 62.1
-ASHRAE HVAC Applications: Fundamentals, Chapter 9 "indoor environmental health"

Research Classification:

Basic/Applied Research	✔
Advanced Concepts	
Technology Transfer	

Responsible Committee: SSPC 170, Ventilation of Health Care Facilities

Date of Vote: 06-25-2018

For		16
Against	*	0
Abstaining	*	0
Absent or not returning Ballot	*	7
Total Voting Members		23

RTAR Authors

Lead:
Kenneth R. Mead
Others:
Paul Ninomura

Co-sponsoring TC/TG/MTG/SSPCs (give vote and date)

-TC 9.6, Healthcare Facilities [9-0-0 CV, (yes-no-abstain), 07-11-18]
-SSPC 62.1 Ventilation for Acceptable Indoor Air Quality [19-0-0-1-2 CNV (yes-no-no without reason-abstain-not returned), 07/31/2018]

Expected Work Statement Authors

Lead:
Paul Ninomura
Others:
Kenneth Mead

Potential Co-funders (organization, contact person information):

	Yes	No
Has an electronic copy been furnished to the MORTS?	✔	
Has the Research Liaison reviewed the RTAR?	✔	

* Reasons for negative vote(s) and abstentions

RTAR # 1864

Title:

Insert proposed project title

Investigating the applicability of Standard 62.1's Ventilation Rate Procedure for Healthcare Rooms

Executive Summary

Describe in summary form the proposed research topic, including what is proposed, why this research is important, how it will be conducted, and why ASHRAE should fund it (50 words maximum)

ASHRAE Standards 62.1 and 170 seek to provide safe and acceptable indoor environments yet they employ very different approaches. This research investigates if/where the design flexibility in Standard 62.1's Ventilation Rate Procedure could be an appropriate and energy-conserving alternative to Standard 170's prescriptive air-change-per-hour approach to outdoor air ventilation requirements.

Background

Provide the state of the art with key references (at the end of this document) substantiating it (300 words maximum)

ASHRAE/ANSI/ASHE Standard 170, Ventilation of Healthcare Facilities, addresses ventilation requirements for healthcare spaces. Since the 1947 Hill-Burton Act, national standards for healthcare facilities have recognized an increased potential for and susceptibility to, airborne contaminants that impact occupant safety. Over time, the standards originated under Hill-Burton were published under various names and authorities. Since 2001, they are published by the Facility Guidelines Institute (FGI). ASHRAE began publishing ventilation standards for healthcare facilities in 2008. ASHRAE Standard 170 identifies healthcare spaces with specific ventilation requirements based upon room type & occupancy characteristics/activity, then prescribes a combination of ventilation attributes (outdoor air, total air, temperature, humidity, space pressurization, filtration, …) for each space type. Concurrent with the 2010 FGI Guidelines for Design and Construction of Health Care Facilities, FGI ceased specification of ventilation rates and adopted the 2008 ANSI/ASHRAE/ASHE Standard 170. The FGI-ASHRAE partnership continues to this date.

ASHRAE First Published Standard 62 in 1973. The current version is ASHRAE/ANSI Standard 62.1-2016, Ventilation for Acceptable Indoor Air Quality. Standard 62.1's purpose is to specify minimum ventilation (primarily outdoor air) rates and other measures intended to provide indoor air quality that is acceptable to human occupants and minimizes adverse health effects. Standard 62.1's scope applies to all non-vehicle structures/spaces intended for human occupancy, except those within single-family houses or multi family structures of three stories or fewer. Since 2010, Std 62.1 ceased specifically addressing healthcare unique spaces and has recognized the potential for their unique ventilation requirements. One Std 62.1 design approach is the Ventilation Rate Procedure (VRP). The VRP prescribes ventilation rates based on space type, occupancy, and floor area.

The research discussed in this proposal seeks to determine if the VRP can be made to apply, with or without modification, to the OA delivery requirements of healthcare spaces addressed in Standard 170.

Research Need

Use the state of the art described above as a basis to specify the need for the proposed effort (250 words maximum)

ASHRAE Standard 170 applies a prescriptive design approach for outdoor air (OA) supply, total air supply, temperature, humidity, space pressurization, filtration and local source control. While healthcare spaces have unique contaminants and especially susceptible occupants, the foundations behind the requirements vary, from research basis, clinical basis to expert opinions, and are based upon room type, occupancy characteristics and anticipated contaminant-generating activities. When occupied, the prescriptive flow rates must be maintained, regardless of activity variation or occupant density within the zone. Thus, it is often assumed that Std 170 results in over-prescribing ventilation rates when zone activity is less contaminant-producing then the zone classification assumptions. In lieu of government & industry initiatives to reduce energy consumption within healthcare facilities, the assumed over-prescription is a common target for energy conservation. Recent review articles plus ASHRAE research project CO-RP3: A Literature Review of ASHRAE Standard 170 Support brought the lack of documented foundational justifications for the prescribed requirements into question.

Standard 62.1's Ventilation Rate Procedure (VRP), while still prescriptive, offers a zone-specific design approach for OA requirements based upon the design equation: $V_{bz} = R_p \times P_z + R_a \times A_z$ (eqn 6.2.2.1) where V_{bz}= OA delivery rate required to the breathing zone, R_p=OA flow rate per person, P_z = zone population, R_a=OA flow rate required per unit area , A_z=floor area.

The proposed research seeks to determine if design flexibilities available in the VRP, offer an opportunity for significant energy savings through reduced OA requirements compared to Std 170's prescriptive requirements.

Project Objectives

Based on the identified research need(s), specify the objectives of the solicited effort that will address all or part of these needs (150 words maximum)

The overall proposed research objective is to determine if any room types covered under Standard 170 offer opportunity for energy savings from the design flexibility offered in the VRP, compared to the prescriptive Standard 170 design approach.

The preliminary objective is for researchers to identify the healthcare spaces from Std 170 Tables 7.1, 8.1 & 9.1 for which they can obtain a thorough understanding of the types and generation conditions of the healthcare-unique contaminants (including biological, chemical, physical) associated with the spaces. Admittedly, for some spaces, this won't be possible under the current research scope.

The second objective will be to determine whether Standard 62.1's equation 6.2.2.1 can be effectively applied or adapted for hospital-unique contaminant control in the identified spaces, through the use of a new contaminant factor "C" , such that the new equation might read: $V_{bz} = R_p \times P_z + R_a \times A_z + C$.

Expected Approach

Describe in a manner that may be used for assessment of project viability, cost, and duration, the approach that is expected to achieve the proposed objectives (200 words maximum).

Check all that apply: Lab testing ☑, Computations ☑, Surveys ☐, Field tests ☑, Analyses and modeling ☑, Validation efforts ☐ Other (specify) ( )

Researchers must initially review the spaces in Std 170's Tables 7.1, 8.1, and 9.1, seeking to identify the breadth of contaminants (biological, chemical, physical) reasonably associated with these spaces. Second, the researchers must attempt to characterize the generation parameters (e.g. source ID, frequency, duration) for each space:contaminant association. Some spaces will have multiple contaminants and varying generation rates, or, they may have contaminant generation characteristics which are not sufficiently understood to apply the VRP. Where generation characteristics are identified, acceptable exposure concentrations for these contaminants should be proposed (if possible) for occupational, general population and immunocompromised patient exposures.
Next, the researchers need to investigate if/how OA contributes to controlling exposure to the identified contaminants. Where OA plays a role in exposure control, either to room occupants or those exposed to

Relevance and Benefits to ASHRAE

Describe why this effort is of specific interest to ASHRAE, its impact, and how it will benefit ASHRAE and the society. How does it align with ASHRAE Strategic Plans and Initiatives? How does it advance the state of the art in this area in general? Are there other stakeholders that should be approached to obtain relevant information or co-funding? (350 words maximum)

This proposed research activity is important to ASHRAE on many levels. First, it is a direct and immediate response to ASHRAE Research Project CO-RP3: A Literature Review of ASHRAE Standard 170 Support. This research project (completed June 2018) identified several healthcare-unique spaces in Std 170 where the foundational support behind the guidance was either unknown or incomplete. The proposed research activity should put solid justification or reasoning behind the guidance for several of these spaces. In regards to energy conservation, areas identified for adaptation into Std 62.1's VRP are anticipated to provide opportunities for energy savings, primarily through reduced OA ventilation requirements. Lastly, there have been multiple requests to SSPC 170 over recent years to attempt to harmonize, wherever possible, the ventilation design criteria identified in Std 170 and Std 62.1. This research activity provides an earnest research-based determination of the breadth of feasibility of such harmonization goals.

ASHRAE Strategic Plan: the proposed research fits well into the ashrae mission and vision, improving upon HVAC design guidance and replacing insufficiently-documented design criteria through the application of ASHRAE-sponsored research findings.
The proposed research fits well within ASHRAE's strategic goal entitled Adapt, contributing to the translation of science and technology into practical tools and resources that drive effective building design, operations, and management and ensuring that ASHRAE's products, programs, and services align to meet the needs of the global building industry. The proposed research aligns with ASHRAE's Strategic Initiative 3: Applied Product Development. The objectives are responsible to the interests of owners and operators of healthcare facilities to best assist in achieving optimal building operation, without sacrificing Std 170's protective requirements. Furthermore, the proposed research is responsive to efforts within the world of prescriptive and performance based standards to identify language that addresses the standard objective while delivering the most positive impact to the market place.
Similarly, the proposed research objectives align well with the ASHRAE Research Strategic Plan. It directly contributes to the majority of the many energy conservation initiatives, as well as initiative #11, Understand influences of HVAC&R on airborne pathogen transmission in public spaces and develop effective control strategies.

Anticipated Funding Level and Duration

Funding Amount Range: $125,000 (Severable across the two primary research objectives)

Duration in Months: 24

References

List the key references cited in this RTAR

- ANSI/ASHRAE/ASHE Standard 170-2017, Ventilation of Health Care Facilities
- ANSI/ASHRAE Standard 62.1-2016, Ventilation for Acceptable Indoor Air Quality
- FGI 2018 Guidelines for the Design and Construction of Hospitals
- FGI 2018 Guidelines for Design and Construction of Outpatient Facilities
- FGI 2018 Guidelines for Design and Construction of Residential Health, Care, and Support Facilities
- Presentation: Academic Research to Support Facility Guidelines Institute & ANSI/ASHRAE/ASHE Standard 170, ASHRAE RP-03, Prepared By: Clemson University, University of Nebraska - Lincoln, Affiliated Engineers, Inc., Presented to ASHRAE SSPC 170 by Ehsan Mousavi & Fred Betz on June 25, 2018.
- English, T. R., P.E., Moeller, D., P.E., & Mills, F. (2015). Benchmarking the US healthcare ventilation standard with the UK healthcare ventilation standard. ASHRAE Transactions, 121, 8-1T,2T,3T,4T,5T,6T,7T,8T.
- ASHRAE Strategic Plan, https://www.ashrae.org/about/strategic-plan/ashrae-strategic-plan
- ASHRAE Research Strategic Plan 2010- 2018, https://www.ashrae.org/technical-resources/research/research-strategic-plan

Feedback to RAC and Suggested Improvements to RTAR Process

Now that you have completed the RTAR process, RAC is interested in getting your feedback and suggestions here on how we can improve the process.

Allow higher word count.