

RESEARCH MANUAL SY 20-21 EDITION

PROPOSED REVISIONS

Summary of Changes for 2020 Fall Revision

Added new sections and forms to the Research Manual outlining the new Publication Topic Acceptance Request (PTAR) process for developing new technical publications for the Society in partnership with ASHRAE Publications Committee and for updating past ASHRAE technical publication deliverables from a past research project that are now out-of-date, but still useful to design practitioners if publication is updated.

RESEARCH PROJECT MANUAL

OVERVIEW

The purpose of this manual is to present, in one document, all of the information and procedures needed by individuals who initiate, approve, conduct, monitor and utilize ASHRAE research.

ASHRAE has been sponsoring research to advance the arts and sciences of HVAC&R for the benefit of the public since 1919. It is a unique program that depends on voluntary funding and the many volunteers who plan and monitor the research. ASHRAE research has grown steadily over the years to the current commitment of more than \$10 million for over 100 projects. Research findings have truly benefited our members, our industry and the public. The Research Administration Committee (RAC) is committed to finding ways to improve the operation of the system and to focus research on those areas of technology critical to ASHRAE.

This document details all aspects of ASHRAE research projects from the strategic plan for the program to the dissemination of the information generated. Sample forms and examples of well-done documents are included.

It is intended to supplement, not supplant, the official ASHRAE documentation such as the Rules of the Board, and Manuals of Procedures.

The subject of Special Projects (projects sponsored by or co-sponsored by outside organizations) is not covered in this manual. A document entitled "Policy and Procedures for ASHRAE Special Projects" covers this subject in detail.

YOUR COMMENTS ARE WELCOME

Should you have a comment on this Research Manual, please submit it electronically to the ASHRAE Manager of Research and Technical Services (MORTS).

E-mail: MORTS@ashrae.net

The MORTS will consolidate comments for RAC. RAC intends to maintain the Research Manual as a "living document" and update it as it is needed and practical.

GLOSSARY OF ASHRAE RESEARCH ACRONYMS

ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
BOD	Board of Directors
СРМ	Critical Project Milestone
DAL	Director at Large
EX-O	Ex-Officio Member from the Board of Directors
EXCOM	Executive Committee
GIA	Grant-In-Aid
HVAC&R	Heating, Ventilating, Air-Conditioning and Refrigeration
IRG	Innovative Research Grant
МОР	Manual of Procedures
MORTS	Manager of Research and Technical Services
MTG	Multidisciplinary Task Group
NIA	New Investigator Award
PI	Principal Investigator
PES	Proposal Evaluation Subcommittee
PMS	Project Monitoring Subcommittee
PTAR	Publication Topic Acceptance Request
RAC	Research Administration Committee
RAS	Research Activities Subcommittee
RAP	Research Advisory Panel
RFP	Request-For-Proposal
RIP	Research Implementation Plan
RL	Research Liaison
RP	Research Project
RPS	Research Planning Subcommittee

RTAR	Research Topic Acceptance Request
SSPC	Standing Standard Project Committee
ТАС	Technical Activities Committee
тс	Technical Committee
TG	Task Group
тос	Table of Contents
TRP	Tentative Research Project
URP	Unsolicited Research Proposal
WS	Work Statement
WSP	Work Statement for Publication

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1. RESEARCH STRATEGIC PLANNING AND OVERALL APPROVAL PROCESS

ASHRAE Research Strategic Plan

The ASHRAE Research Strategic Plan is updated every eight years by the Research Advisory Panel with input solicited from the TCs (and TGs, MTGs w/research authority, SSPCs, and other committees authorized to sponsor research projects), standing committees/councils and from individuals and organizations outside ASHRAE but with the same or related interests to ASHRAE. The Plan is approved by the Technology Council. The Society's Officers and Board members receive counsel on the strategic plan from the members through the Region-Chapter organization and through the Council-Committee organization.

The Society's Research Strategic Plan covers an eight-year period. Between major updates, RAC will review the plan on an annual basis to identify needs for modification, addition, or deletion of goals. The review process will include tracking of alignment of RSP goals with Societies Strategic Plan and with the goals of RTARs generated by TCs, TGs, and MTGs. Based on this review, funding priorities may be changed to encourage under-represented project topics. The current Research Strategic Plan, which is available from ASHRAE Headquarters and posted on the Research Page of the ASHRAE Web site, should be consulted for the latest information on the overall research goals of the Society. The research priorities and broad themes/topics outlined in the strategic plan are communicated to the TCs to guide them in their planning and development of specific research project topics.

Research Advisory Panel

The Research Advisory Panel (RAP) consists of a mixed group of ten experienced design engineers, educators, policy makers, and/or researchers who are all forward-thinking individuals appointed by the ASHRAE President. Their mission is to develop the research strategic plan for the Society by examining research frontiers and critical issues that may form barriers to progress and developing a strategic plan for the benefit of the HVAC&R industry and the general public. RAP makes recommendations to the Research Administration Committee (RAC), TCs and others regarding research, technologies and concepts that the Society should be investigating. Their work is of an advisory nature, and they work within the other procedures outlined in this manual.

Research Priorities

The purpose of the Research Strategic Plan is to identify key HVAC&R research needs and to provide that information to ASHRAE members and Technical Committees as guidance while they develop research projects and to the Research Administration Committee as it approves and funds research proposals. The Research Plan is not meant to take the initiative for research design from the cognizant committees, but rather to use input from ASHRAE members to identify strategic research needs that are appropriate for many committees to collaborate on, that may require larger budgets, and for which additional outside funding may be available to supplement ASHRAE's budget. Proposed research topics that address in part or whole the broad themes/topics of the Society's Research Strategic Plan will receive priority in research funding if approved by RAC. Project topics not related to the strategic plan can still be submitted for review and may be approved for funding if, in the opinion of RAC membership, the topic is timely and needed.

Each year RAC develops a priority list of research topics for further development that have been proposed by TCs to RAC in the form of a "Research Topic Acceptance Request (RTAR)." This list is called

the "ASHRAE Research Implementation Plan," and it represents the Society's efforts to implement the Research Strategic Plan's goals.

In addition to projects originated by TCs in the form of RTARs and Work Statements, ASHRAE also supports projects originated by individual researchers in the form of Unsolicited Research Proposal or International

Research Proposal. In either case, projects that address the goals of the ASHRAE Research Strategic Plan have a higher probability of being approved for ASHRAE funding.

Research Classifications

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ASHRAE Research Projects are classified as follows:

- Basic and Applied Research, which constitute the majority of the projects and utilize the majority of the research funding.
- Advanced Concepts Research that has been allocated up to 10% of research funding.
- Research Related to Technology Transfer as described in Appendix 1

Research Approval Process for Projects Initiated by RTARs

(Note: Currently, for projects up to \$150k only approval by RAC is needed. For projects between \$150k and \$250k required approval by both RAC and Technology Council. Projects above \$250k require approval by RAC, Technology Council, and Board of Directors. The flowchart below will be revised to reflect the above change in the approval level required.)

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1.1 ASHRAE Research Process Flowchart – January 2021



2. GUIDELINES FOR DEVELOPMENT OF SPECIAL PUBLICATIONS AS ASHRAE RESEARCH PROJECTS

2.1 Background

ASHRAE research funding can be used to support development publications intended for commercial sale through the ASHRAE Book Store. The intent is to rely on this funding for the development of a publication where there is an industry need and a commercial value for it and where development of the publication requires an effort beyond what can be expected from a volunteer effort. In addition, the publication should serve to disseminate prior research or otherwise be related to past or ongoing ASHRAE Research.

The Research Administration Committee (RAC) will appropriate approximately 10% of the research budget for developing guidance publications for engineers and/or researchers. The 10% number is not meant to be a strict allocation; in some years research funding for design guide development may be significantly greater or less than 10%.

2.2 Types of Publications Considered

The primary goal of this program is to provide funding for design guides or manuals that will provide state of the art guidance to engineers and/or researchers. These guides should support energy efficiency, indoor air quality improvement or otherwise promote the goals of ASHRAE. There are other types of publications that could be considered, and it is not the intent to limit funding to only design guides. Funding can be requested for new publications, or where appropriate for revisions or updates to existing publications.

2.3 Approval Procedure

The procedure required to initiate a publication project is similar to the procedure required to initiate a research project. The first step in developing a funded publication project is to fill out the Publication Topic Acceptance Request (PTAR) form, which serves the same purpose as the RTAR form used for research projects. The information provided as part of the PTAR submission must describe the need and intended audience for the publication, describe why the effort cannot be completed through a volunteer effort, describe how the publication will serve to disseminate prior ASHRAE Research, and otherwise describe why the publication will be of value to ASHRAE. This form will be used to inform both the Research Administration Committee (RAC) and the Publications Committee (under Publishing and Education Council) of the value of this publication to the society. It is important to note that the PTAR is a necessary step and cannot be skipped because it is used to coordinate the efforts of multiple committees.

Approval of a Publication Topic is obtained by submitting a PTAR form to MORTS by May 15, August 15, or December 15 to be considered during the Annual, Fall, or Winter Meeting, respectively. MORTS will assign an ID number to submitted PTARs and forward them on to the Publications Committee through ASHRAE Editor, Special Publications. In submitting the PTAR requesting a publication, the TC (or other ASHRAE committee) must make the case that this is appropriate for ASHRAE <u>Research</u> funding, as opposed to other publication funding mechanisms. The PTAR will be evaluated by the Publications Committee, who will either approve or reject it based on the evaluation criteria. If approved, it will be forwarded to the RAC for concurrence. The PTAR template and the evaluation form used by the Publications Committee and RAC are shown at the end of this section.

Once the PTAR is approved by both the Publications Committee and RAC, the TC (or other committee) will prepare and submit a Work Statement for Publication (WSP) form to RAC who will administer the funding and the execution of the project. The main purpose of the WSP is to articulate the committee's expectation for the final work product. The WSP will be used by potential bidders to develop and submit their approach to complete a publication with the correct scope, appropriate level of detail, quality, and timeline. The WSP also lists the membership of the subcommittee that will oversee the project during its duration and the criteria that they will use to evaluate proposals from bidders.

RAC will evaluate each WSP using the criteria shown in the evaluation form at the end of this section. In evaluating the WSP, RAC may:

- ACCEPT the WSP, in which case the WSP will be added to the Society's Research Implementation Plan.
- CONDITIONALLY ACCEPT the WSP, in which case it will be returned to the TC (or other committee) that submitted the WSP for a minor revision; a conditionally accepted WSP may be approved by the RL and does not have to be reevaluated by RAC.
- RETURN the WSP to the TC, signifying that major revisions are necessary; a returned WSP must be reevaluated by RAC.
- REJECT the WSP signifying that RAC does not consider it acceptable for research funding.

The WSP will form the basis for the contract awarded to the successful bidder, therefore a high quality WSP is critical to ensuring a successful publication project. Competing bids responding to this WSP will be evaluated by a proposal evaluation subcommittee as described below, using the criteria and weighting elements that the TC sets in the WSP. The TC should develop proposal evaluation criteria and weights that best suits their needs, an example of a set of criteria is shown below:

Element Number	Proposal Review Criterion	Weighting Factor
1	Contractor's understanding of topic	30 %
2	Plan for completing the project	20 %
3	Contractor's experience with technology central to the	20 %
	publication	
4	Clarity of contractor's written publications	20 %
5	Student involvement	10 %

The WSP template and the evaluation form used by RAC are shown at the end of the Manual as an Appendix.

The expectation is that publications produced through this process and with research funding will be factual, relevant, and fully supported by previously cited or new research. The PMS will have an oversight role in assuring that publications are technically sound and absent of commercial bias (see below). The WSP must make clear to the bidders that their final product must fulfill this expectation.

Proposal Evaluation Subcommittee (PES)

The TC or other committee will form a PES as described in section 6.2 of this research manual. It is expected that the PES process will be similar to that used for a research project.

Project Monitoring Subcommittee (PMS)

The PMS for a publication project will function as described in section 9.1. It is important that the PMS monitor the technical quality of the publication with special consideration for ensuring that there is no commercial bias being propagated within the publication. The PMS needs to assure that the technical basis for recommendations is documented and wherever possible, based on findings supported by published research or accepted industry practice. Where necessary, formal external peer reviews should be included in the review and approval process for any new publication or any publication that goes through a significant upgrade.

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3. RESEARCH IMPLEMENTATION PLAN & RESEARCH TOPIC ACCEPTANCE REQUEST (RTARS)

3.1 Relationship between TC/TG/MTG/SSPCs and Society Research Plans

Each TC (TG, MTG w/research authority, SSPC, and other committees authorized to sponsor research projects) should develop and maintain a long-range research plan, which is a prioritized list of prospective research topics. These "Research Plans" should be continually updated and documented in the TC's minutes for the benefit of incoming Chairs and other interested parties.

Research Topic Acceptance Requests (RTARs) are used by the TC to advance research topics from the TC's long-range research plans to the ASHRAE Research Implementation Plan. Among other things, the RTAR should demonstrate the research topic supports the ASHRAE Research Strategic Plan, or if this is not the case, provide a strong justification for the need for the proposed research.

Work Statements (WSs) are the means by which TCs transform approved topics on the ASHRAE Research Implementation Plan into research projects, for which the Society solicits bids. Projects with WSs approved for funding by the Society but not yet awarded to the contractor are referred to as Tentative Research Projects (TRPs). Projects awarded to the contractor but not yet completed are classified as Research Projects (RPs).

Within ASHRAE the term "Sponsoring TC" is used to designate the committee which is putting forward first the RTAR, then the WS, and is responsible for selecting the contractor (with assistance of a Proposal Evaluation Subcommittee) and oversight of the project (with assistance of a Project Monitoring Subcommittee). Other committees may assist the Sponsoring TC in this effort; they are referred to as Co-Sponsoring TC(s).

The products of ASHRAE research include improved standards, handbooks, guidelines, codes; special publications, software, web-based tools; and papers and journal articles that advance HVAC&R science and technology. ASHRAE research is the technical underpinning of the Society. It all starts with ideas for research to satisfy a Society need, and these ideas generally originate in the TCs. The bottom-up process just described, and the relationships between TC and Society research plans are summarized in the table below.

ASHRAE Research is the Technical Underpinning of the Society

3.2 RTAR Submission and Approval Process

a) Pick a topic that ranks highly on the TC's long-range research plan (if topics have little support at the TC level they are unlikely to be approved by the Society) and can be described in a manner that demonstrates clear support of the ASHRAE Research Strategic Plan (*Navigation for a Sustainable Future*). The topic need not contribute directly to the goals identified in the Research Strategic Plan; however, those that do will likely be given a higher priority for funding when research funds are limited.

b) Do your homework:

- Review the key literature and demonstrate you have done so by citing the key references.
- Demonstrate a firm grasp of relevant prior work.
- Clearly define the state-of-the-art and information gaps.
- Define a valuable and doable objective.
- Identify the specific goals served within the ASHRAE Research Strategic Plan, to what degree and why. If none of the goals in the Research Strategic Plan are supported by the topic, the proposed research will likely receive greater scrutiny by RAC.
- Clearly define the advancement to the state-of-the-art and provide quantitative estimates of the improvement expected wherever possible.
- Clearly define the justification and value to ASHRAE, being as quantitative and specific as possible.
- Obtain TC vote and address all negative and abstention votes by providing the reasons for those votes and, if appropriate, a response to the concern(s) expressed in those votes.

- Provide realistic estimated project costs and duration. To do this, the RTAR must contain a description of the approach envisioned for the research. For instance, the RTAR should indicate if the project is primarily a paper study, or whether it involves computer simulations, laboratory testing, and/or field measurements. For simulations, laboratory or field testing, describe the size of the anticipated test matrix (e.g., two different ventilation strategies will be tested in four buildings).
- Coordinate with other relevant TC and seek a letter of support from the interested TC Chairs.
- Actively solicit interest among possible co-funding organizations and seek a letter of support from an authorized representative. ASHRAE's Manager of Research and Technical Services (MORTS) can assist with this.
- Provide <u>ALL</u> required information.

c) To help ensure your RTAR is accepted, make sure it satisfies the following RAC review criteria (which are taken from the RTAR review ballot form used by RAC; see Section 3.4):

- Is there a well-established need?
- Is this appropriate for ASHRAE funding?
- Is there an adequate description of the approach in order for RAC to be able to evaluate the appropriateness of the budget?
- Is the budget reasonable for the project scope?
- Have the proper administrative procedures been followed?

d) Work with your Research Liaison:

- Have your RAC Liaison review the RTAR before the TC vote. Liaisons can identify reasons the RTAR might be returned, so reduce cycle time to approval by obtaining this feedback before voting the RTAR forward and submitting it to MORTS/RAC.
- Make sure your Research Liaison is informed. A Liaison knowledgeable about your project is better able to be a proponent for the approval of your project at RAC.
- If your project is sufficiently unusual, controversial, or urgent, notify your Liaison that you intend to send a TC emissary to the RAC meeting to speak directly to RAC on the project's behalf, and to answer questions.

e) Submit RTARs by May 15, August 15 or December 15 to be considered by RAC at the Annual Meeting, Fall Meeting, or Winter Meeting, respectively. May – August – December (MAD-15)

f) There is no limit to the number of RTARs that a TC can submit. However, approved topics are taken off of the Society's Research Implementation Plan two years after approval unless a WS based on the RTAR has been submitted. Therefore, it is recommended that RTAR submittals be limited to those where timely WS submittal is likely.

g) Since the purpose of submitting RTARs is inclusion of the topic in the Society's Research Implementation Plan, it is pointless to submit RTARs for topics already on the Society's Research Implementation Plan that have been submitted by another TC. If you have suggestions about such a topic on the Plan, you may contact the cognizant TC Chair to discuss preparation of a joint Work Statement.

h) Topics that expire from the Society's Research Implementation Plan may be resubmitted for approval to be reinstated.

i) MORTS assigns I.D. numbers to submitted RTARs. Individual RAC members grade them "Accept", "Accept with comments", or "Reject". MORTS distributes the consolidated grades and comments to all the RAC members, and RAC convenes (Spring Meeting, Annual Meeting, Fall Meeting, or Winter Meeting) to discuss the RTARs and votes to "Accept", "Accept with comments", or "Reject" each RTAR.

- "Accept" means that RAC accepts the RTAR for further development into a work statement and for inclusion on the Society's Research Implementation Plan.
- "Accept with comments" means that only minor edits to the RTAR are required, and once these edits
 have been made to the satisfaction of your Research Liaison, the RTAR is considered accepted by RAC
 for further development into a work statement and for inclusion on the Society's Research Implementation

Plan without further consideration by the full RAC.

• "**Reject**" means that RAC does not believe the topic is appropriate for ASHRAE research based upon the information submitted in the RTAR and the TC is encouraged to drop the topic.

j) In the case of "**Accept with comments**" by RAC, the Research Liaison has the discretion to determine whether a full TC re-vote is required on the edited RTAR that is "Accepted" by RAC.

k) If RAC recommends "Accept", then the topic is added to the Society's Research Implementation Plan. RAC members may still have comments or suggestions about Accepted RTARs. These comments are conveyed to the TC in a letter from MORTS informing the Committee the RTAR has been accepted. It is RAC's intent to approve RTARs whenever possible. This means that an accepted RTAR is likely to have comments, and the TC should address these when the WS is prepared.

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3.3 Research Topic Acceptance Requests (RTARs) Coversheet

Research Topic Acc	eptance Request Cover Sheet	Date: month, day, year		
(Please Check to Insure the	(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 H. Funding Level & Duratio References	* * * * * * n	Title: XXXXXX RTAR# #### (To be assigned by MORTS) Results of this Project will affect the following Handbook Chapters, Special Publications, etc.:		
Responsible TC/TG: Date of Vote:	X Month, day, year For X Against * Abstaining * X Absent or not returning Ballot Total Voting Members X	Co-sponsoring TC/TG/SSPC (give vote and date): TC 0.0 (#-#-#-# CNV) month, day, year TC 0.0 (#-##-# CNV) month, day, year Supports ASHRAE Research Strategic Plan Goals?		
RTAR Lead Authors: Expected Work Statement	Lead Author: XXXXX	Goal # Goal # Goal #		
Research Classification: Basic/Applied Research: Advanced Concepts: Technology Transfer:	X X X	Potential Co-funders (organization, contact person information):		
Has an electronic copy bee Has the Research Liaison r	n furnished to the MORTS? eviewed RTAR?	Yes No		
* Reasons for negative vo One voter who abstained si One voter who abstained m Negative voter felt project b	te(s) and abstentions mply did not feel familiar enough with this topic and issues. ay bid on the project. uudget should be larger.	<u>S.</u>		

DRAFT RTAR Template

Title

Summary

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

Background

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

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Research Need

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

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)

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) ()

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)

Anticipated Funding Level and Duration

Funding Amount Range: \$ _____

Duration in Months: _____

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References

List the key references cited in this RTAR

3.4 Example RTAR Review Ballot Form used by RAC

RAC members use the form below to record their review comments and initial disposition decision on the RTAR prior to the RAC meeting to discuss the RTAR. The completed form is submitted to ASHRAE staff, who in turn incorporates this information into the RTAR Review Summary form.

Example RTAR Review Ballot Used by Individual RAC Members Prior to Meeting

	r	
Project ID	0007	
Project Title	Design on a Di	me
Sponsoring TC	TC 12.5 (Building	g Information Modeling - BIM)
	\$70.000 / 12M	
Cost / Duration	2nd Submissio	n, 1st RTAR returned 2011 July
Submission History	Basic/Applied R	esearch
Cassification: Research of Technology Transfer		
	Satisfied2	Comments & Suggestions
Background: The RTAR should describe current state of the art with some level of literature review	Gatianeu	Commenta & Suggestiona
that documents the importance/magnitude of a problem. References should be provided. If not, then note it in your comments.	YES	Datailad list of references provided
Research Need: Based on the background provided is the need for additional research clearly identified? If not, then the RTAR should be rejected.	YES	Critical need for Society
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.	YES	Potential labor saving technology for industry
IF ABOVE THREE CRITERION ARE NOT ALL SATISFIED - MARK "REJ	ECT" BELOW &	CONTINUE REVIEW BELOW
Other Criteria		
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.	NO	This project would greatly benefit the handbook chapter noted, but there is no mention of the related standard XXX in devicement.
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:	YES	
References: Are the references provided?		
Decision Options	Decision?	Suggested Approval Conditions
ACCEPT AS-IS		RTAR must mention Standard XXX and how this project is
ACCEPT W/COMMENTS	ACCEPT	likely to benefit it too.

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

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3.5 Example RTAR Review Summary from RAC

When RAC meets, they use the RTAR Review Summary form below to help guide their discussion of the RTAR. In many cases, a RAC member's initial disposition decision on a particular RTAR may change after reading other member's comments on the summary form and after participating to the meeting discussion of the RTAR. A final version of the review summary form, which reflects the discussion and final decision that was made by RAC on the RTAR during the meeting, is developed and used as the basis for the return letter to the TC/TG/MTG w/ research authority/SSPC or other committees authorized to sponsor research projects. Example RTAR Review Summary Used by RAC during Meeting and for Return Letter to TC

Project ID	0007		
Project Title	Design on a Dime		
Sponsoring TC	TC 12.5 (Building Information Modeling - BIM)		
Cost / Duration	\$70,000 / 12M		
Submission History	2nd Submission,	1st RTAR returned 2011 July	
Classification: Research or Technology Transfer	Basic/Applied Rese	earch	
RAC 2016 Winter 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.	CD	AB - Detailed list of references provided. CD - RTAR is missing several key references that I have provided to MORTS for transmittal to TC.	
Research Need: Based on the background provided is the need for additional research clearly identified? If not, then the RTAR should be rejected.		AB - Critical need for Society. CD - Need not well justified. What about the ISO BIM project? GH - Good project!	
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.			
		AB - Potential labor saving technology for industry EF - Smoke control equipment is difficult for the typical HVAC designer document with the current BIM guidance. That said, could the National Fire Protection Research Foundation be contacted regarding possible co-sponsorship?	
IF ABOVE THREE CRITERION ARE NOT AL	L SATISFIED - MAR	RK "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.	AB	AB - This project would greatly benefit the handbook chapter noted, but there is no mention of the related standard XXX in devicement.	
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:	CD	CD - 12 months seems too short given scope. 18 months more feasible.	
References: Are the references provided?	EF	EF - Check the references on BIM standards	
Decision Options	Initial Decision	Final Approval Conditions	
ACCEPT AS-IS	EF, IJ	AB - RTAR must mention Standard XXX and how this project is likely to benefit it too.	
ACCEPT W/COMMENTS	AB, GH]	
REJECT	CD	1	
ACCEPT Vote - Topic is ready for development into a work statement (WS).			

ACCEPT W/COMMENTS Voide - Minor Revision Required - RL can approx RTAR for development into WS without going back to RAC once TC satisfies RAC's approx REJECT Vote - Topic is not acceptable for the ASHRAE Research Program

4. WORK STATEMENTS

4.1 Work Statement Development and Approval Process

The Work Statement (WS) is normally the responsibility of the Research Subcommittee of a TC (or TG, MTG w/research authority, SSPC, and other committees authorized to sponsor research projects), which should prepare Work Statements for each approved RTAR. The RTARs are developed into Work Statements and are sent to the ASHRAE MORTS. These work statements will be reviewed by RAC to determine if they define a clear and obtainable research result, propose a viable technical approach, and are likely to interest several competitive bidders. A biddable Work Statement clearly explains the objectives, scope, and deliverables. A WS derived from a RAC-approved RTAR has already been determined to be an appropriate research project for ASHRAE. This means that it will advance the state of the art, provide value to ASHRAE membership, and either support the ASHRAE Research Strategic Plan but deemed timely and important. The ASHRAE Research Implementation Plan (RIP) lists all approved RTARs and all pending and approved for bid work statements submitted to RAC. The RIP is posted on the ASHRAE Website for reference.

A Work Statement should be prepared immediately after the RTAR is approved by RAC. A Work Statement may be prepared and submitted without a preliminary RTAR approval if, for example, there is an extremely time-critical need for results. There should be a strong justification for this. However, the TC risks having its basic research goal not approved or needing to rewrite the WS extensively. The RTAR approval is designed:

- To ensure that the topic is suitable for ASHRAE research and the TC addresses the goals of the ASHRAE Research Strategic Plan or provides a strong justification for topics that do not directly support the goals of the Research Strategic Plan.
- To allow RAC and Tech Council to review the approach and suggest additional references, identify other TCs that should be consulted, and/or suggest enhancements or refinements to the suggested technical approach.

Submission of the RTAR is designed to speed the overall process – reducing the time to go from research idea to release of the Request for Bids.

When preparing a WS, the TC may ask specialists in the area of the Work Statement to assist, even potential bidders. Care must be taken to avoid actual or perceived conflicts of interest. To do this, the principal authors of the Work Statement will be identified on the Work Statement Cover Sheet. Subsequently, bidders who assisted in Work Statement preparation will identify themselves as such in their proposal, and evaluators will satisfy themselves that these preparers did not gain an unfair advantage. The TC should also consider other TCs, which have direct or related interest in the subject project and invite them to participate in the Work Statement preparation, to vote to endorse the WS, and to have representatives on the Proposal Evaluation Subcommittee (PES) and the Project Monitoring Subcommittee (PMS).

In preparing a Work Statement for a project dealing with the monitoring of buildings in the field, the "Recommendations for the Design of ASHRAE Sponsored Field Monitoring Projects" contained in Appendix 2 should be considered. In preparing a Work Statement associated with Computational Fluid Dynamics, the "Guidelines for the Selection and Use of Computational Fluid Dynamics," in Appendix 3 should be reviewed and considered.

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The TC Research Subcommittee members shall forward a draft of the Work Statement to their Research Liaison who will provide suggestions for improvement or compliance with ASHRAE practices. They then present the Work Statement to the full TC at one of the semi-annual meetings, or by letter or e-mail ballot, for a vote of approval. The TC members should have received the Work Statement sufficiently prior to the meeting so that each member can review it in depth and comment and vote intelligently. Any negative votes or abstentions from the TC members should be explained. Any dissenting member or corresponding member should be invited to submit comments that will be conveyed to RAC with the WS and cover letter.

After approval by the TC, a copy of the Work Statement and a completed Work Statement Cover Sheet shall be sent to the ASHRAE Manager of Research and Technical Services (MORTS) and to the TC's Research Liaison by May 15, August 15, or December 15. The submittals should be in electronic format, preferably in Microsoft Word and Excel. The MORTS distributes the Work Statements to the members of RAC.

RAC's evaluation of a Work Statement may result in one of four possible outcomes:

-RAC approves the WS.

-RAC approves the WS conditionally with comments.

The Research Liaison then has the authority to approve the WS after RAC's comments have been implemented. The Research Liaison also has the discretion to decide whether the modified WS needs a full TC re-vote, based on the extent of modifications.

-RAC returns the WS with comments.

TC needs to implement the RAC comments and approve the modified WS by a vote. A cover letter explaining how the RAC comments were implemented should accompany the WS sent back to MORTS and RAC. If the TC disagrees with the RAC on any of the comments, the cover letter should also explain the reasons for not implementing the RAC comment. -RAC rejects the WS with comments.

RAC-approved Work Statements are designated as Tentative Research Projects (TRPs). When deciding which TRPs will be sent out for bid, RAC considers the pool of all TRPs (currently approved Work Statements and previously approved Work Statements that were not released for bid due to insufficient funding), and RAC-approved Unsolicited Research Proposals. Table-A is the RAC prioritization criteria for Work Statements when funding is limited and not all.

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Table A. Factors for Prioritization of Work Statements for Funding

Status of TRP

• Is this a project rebid?

Newly approved TRPs?

• Age of Project – Based on date of work statement approval Co-Sponsorship

- Multiple TC sponsors/Co-sponsors
- Single TC Sponsor

Co-funding – is there a firm co-funding commitment (e.g., from AHRI)? Cost of Project

• Should we fund more and smaller projects or fewer and larger ones?

Does it require RAC Level Approval, Tech Council approval, Board approval?

Overall value of the project and the research, as well as contribution to ASHRAE's Research Plan(s), to ASHRAE and Society

Note: the above factors are not listed in any particular order or level or importance

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4.2 Work Statement Preparation

The Work Statement submitted by a TC (TG, MTG w/research authority, SSPC or other committees authorized to sponsor a research project) expands the RTAR and is the only technical document that potential bidders will receive. The WS must contain all of the following sixteen elements, eight of which are either imported directly or expanded from RTAR elements.

- 1. Title: (from RTAR)
- 2. Executive Summary:
- 3. Applicability to ASHRAE Research Strategic Plan: (from RTAR)
- 4. Application of Results: (from RTAR)
- 5. State-of-the-Art (Background): (from RTAR)
- 6. Advancement to the State-of-the-Art: (from RTAR)
- 7. Justification and Value to ASHRAE: (from RTAR)
- 8. Objectives: (from RTAR)
- 9. Scope/Technical Approach:
- 10. Deliverables/Where Results Will Be Published:
- 11. Level of Effort:
- 12. Proposal Evaluation Criteria & Weighting Factors:
- 13. Critical Project Milestones
- 14. Authors
- 15. References: (from RTAR)
- 16. Other Information to Bidders (Optional):

The TC needs to put enough information into the Work Statement to explain to people not familiar with the TC's deliberations what the problem is, why this research is needed, what types of results are expected and how they will be used, and indicate what methods and scope of research the TC expects from the contractor.

The Work Statement should be accompanied by a Cover Sheet as shown in Section 4.3. Section 4.4 contains a Work Statement outline, which explains each element in detail. Appendix 4 is an example of a Cover Sheet and well-written Work Statement.

4.3 Work Statement Cover Sheet

The purpose of the Work Statement Cover Sheet is to ensure that all WS items are complete. Also, the Cover Sheet:

- records the votes of the sponsoring and all co-sponsoring TCs on the Work Statement
- lists the members of the subcommittees which will evaluate the proposals and monitor the project,
- recommends suggested bidders,
- denotes which Handbook chapters or other ASHRAE publications will be affected by the results of the research,
- lists the Work Statement's authors,

 lists at least three prospective bidders in addition to any Work Statement authors who may bid

It is preferable, but not required, that the authors of the Work Statement also serve on the Proposal Evaluation Subcommittee (PES) and Project Monitoring Subcommittee (PMS). Any persons who bid on the WS, or who are members of organizations who bid on the WS, cannot serve on the PES or PMS. While desirable, it is not necessary that the PES and PMS be comprised of the same people. The PES/PMS should be composed of 3 to 5 sponsoring or co-sponsoring TC members with knowledge and experience in the subject of the project, but who do not plan to submit a proposal on the work. In special cases, persons other than TC members may be appointed as PES/PMS members if their expertise is not available within the TC or if a co-funding agency is also supporting the project. They are named by the TC Chairman and approved by the Research Liaison or MORTS. The Research Liaison and MORTS are ex-officio non-voting members of the PES and PMS.

If interest by other organizations in co-sponsoring the project is known, suspected, or even considered a possibility, the name, address, and phone number of the proper contact should be furnished on the Work Statement Cover Sheet as a "potential" sponsor. Once a written letter of support is obtained by a TC from a potential co-sponsor, the ASHRAE MORTS will finalize a co-sponsorship agreement with that organization or individual for the project.

Normally about 60 days is allowed for proposal preparation by potential bidders. Certain projects by their nature may require longer proposal preparation time. This may be due to the need to establish relationships with co-investigators, subcontractors, material or equipment suppliers or owners of test sites. If this is anticipated, the TC should request an extended bidding period. This will delay the start of the project but will result in better proposals and better results. Where needed, TC should request this on the Work Statement Cover Sheet.

To minimize the occurrence of single bidders, the TC shall provide on the Cover Sheet the names of at least three *qualified* potential bidders who were *not involved* in development of the WS. If a WS is not accompanied by the names of at least three such individuals, it shall not be approved by RAC but sent back to the TC for this information. In addition to the usual process of posting the WS to solicit bids, these recommended bidders shall be individually notified by the MORTS when the project is put out for bid.

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ASHRAE RESEARCH MANUAL

WORK STATEMENT COVER SHEET	Date:
(Please Check to Insure the Following Information is in the Work Statement) A. Title B. Executive Summary C. Applicability to ASHRAE Research Strategic Plan D. Application of Results E. State-of-the-Art (background) F. Advancement to State-of-the-Art G. Justification and Value to ASHRAE H. Objectives I. Scope/Technical Approach J. Deliverables/Where Results will be Published K. Level of Effort[] Professional-Months: Total Estimated \$ Value L. Other Information to Bidders (optional) M. Proposal Evaluation Criteria & Weighting Factors N. References	Title: WS # (To be assigned by MORTS - Same as RTAR #) Results of this Project will affect the following Handbook Chapters, Special Publications, etc.:
Sponsoring TC/TG/SSPC:	Date of Vote: This WS has been coordinated with TC/TG/SSPC (give vote and date): Has RTAR been submitted ? Strategic Plan Theme/Goals:
Proposal Evaluation Subcommittee: Chair: Members:	Project Monitoring Subcommittee: (If different from Proposal Evaluation Subcommittee)
Recommended Bidders (name, address, e-mail, tel. number): **	Potential Co-funders (organization, contact person information):
(Three qualified bidders must be recommended, not including WS authors.) Is an extended bidding period needed? Has an electronic copy been furnished to the MORTS? Will this project result in a special publication? Has the Research Liaison reviewed work statement? * Reasons for negative vote(s) and abstentions	Yes No How Long (Weeks)

** Denotes WS author is affiliated with this recommended bidder Use additional sheet if needed

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4.4 Work Statement Outline

WORK STATEMENT# (Same as RTAR#) SPONSORING TC/TG/MTG/SSPC:# & NAME

CO-SPONSORING TC/TG/MTG/SSPCs (List only TC/TG/MTG/SSPCs that have voted formal support)

Title: (Same as RTAR)

Executive Summary:

(100-word statement that could be used at the BOD level to succinctly summarize the current state-of-theart, the advancement this project is expected to accomplish, and its value to ASHRAE and society in general.)

Applicability to the ASHRAE Research Strategic Plan:

(List the specific goals from the current ASHRAE Research Strategic Plan that this project will support by name and/or number. State how the proposed project will help achieve each of these goals. Projects are not required to contribute directly to the strategic goals, but those that do will likely be given a higher priority for funding when research funds are limited.)

Application of Results:

(Import RTAR list of handbook chapters/special publications etc. to be affected by results of this project. Explain how the results of the proposed project will be disseminated by the TC in practical terms to general ASHRAE membership and society in general. What are the practical benefits expected from this research? Is this project one piece of a larger plan of action developed by the TC?)

State-of-the-Art (Background):

(Import RTAR description of the amount and quality of past research and quantify existing gaps.)

Advancement to the State-of-the-Art:

(Import RTAR description or quantitative estimate of the improvement expected from this research [i.e. x% energy reduction in product y or building type z, x% increase in heat transfer coefficient between y and z, or x% reduction in design time to do y, etc.], and explain why this information is needed by the public or by industry.)

Justification and Value to ASHRAE:

(Import RTAR identification by number, profession, or industry the ASHRAE members who will benefit. State the likelihood and how the improvement would be adopted by industry.)

Objectives:

(Import RTAR explanation of project's goals and how this project will accomplish its intended advancement to the state-of-the-art [i.e. a computer simulation will be used to do x, a computer simulation will be developed for x and verified using laboratory data from tests y and z, field test data will be obtained from x and used to do y].)

Scope/Technical Approach:

(Provide a complete description of technical approach and task statement. Describe the parameters of the research project, including such items as: subject matter to be explored; materials, equipment, literature or other variables to be researched; materials, equipment, etc. to be excluded from the project; outline the research methods to be used; description of the standards to be followed; discussion of how the data is to be reduced, analyzed and presented; description of the format for the reported results; if appropriate, describe project phases.

It is important for the scope of a research project to be broken down into tasks or phases, where a task will yield results of interest to the TC and the PMS, or where the results of a task will significantly define how subsequent tasks will be carried out. Make sure that the project objectives are reflected in the tasks. The Work Statement should specify deliverables corresponding to these tasks in the "Deliverables" section to facilitate project monitoring by the PMS.)

Deliverables/Where Results Will Be Published:

Insert generic ASHRAE requirements (listed below) as well as and any project-specific requirements defined in the "Scope" section. Each major task or phase of the research method outlined in the Scope should be linked to a deliverable report, memorandum, or summary.

Items *a* through *e* below are generic ASHRAE requirements a contractor is required to provide on every ASHRAE research project. These covers:

- Quarterly progress and financial reports to MORTS (to be reviewed by the Project Monitoring Subcommittee (PMS)).
- A final report.
- A research or technical paper submitted for peer review and publication in the ASHRAE *Transactions* or *Science and Technology for the Built Environment.*
- Any data obtained from the research.
- A project summary.

Progress, Financial and Final Reports, Research or Technical Paper(s), and Data shall constitute required deliverables ("Deliverables") under this Agreement and shall be provided as follows:

a. Progress and Financial Reports

Progress and Financial Reports, in a form approved by the Society, shall be made to the Society through its Manager of Research and Technical Services at quarterly intervals; specifically, on or before each January 1, April 1, June 10, and October 1 of the contract period.

Furthermore, the Institution's Principal Investigator, subject to the Society's approval, shall, during the period of performance and after the Final Report has been submitted, report in person to the sponsoring Technical Committee/Task Group (TC/TG) at the annual and winter meetings, and be available to answer such questions regarding the research as may arise.

b. Final Report

A written report, design guide, or manual, (collectively, "Final Report"), in a form approved by the Society, shall be prepared by the Institution and submitted to the Society's Manager of Research and Technical Services by the end of the Agreement term, containing complete details of all research carried out under this Agreement. Unless otherwise specified, six copies of the final report shall be furnished for review by the Society's Project Monitoring Subcommittee (PMS).

Following approval by the PMS and the TC/TG, in their sole discretion, final copies of the Final Report will be furnished by the Institution as follows:

- An executive summary in a form suitable for wide distribution to the industry and to the public.
- Two bound copies
- One unbound copy, printed on one side only, suitable for reproduction.
- Two copies on CD-ROM; one in PDF format and one in Microsoft Word.
- c. Science and Technology for the Built Environment or ASHRAE Transactions Technical Paper

One or more papers shall be submitted first to the ASHRAE Manager of Research and Technical Services (MORTS) and then to the "ASHRAE Manuscript Central" website-based manuscript review system in a form and containing such information as designated by the Society suitable for publication. Papers specified as deliverables should be submitted as either Research Papers for Science and Technology for the Built Environment or Technical Paper(s) for ASHRAE Transactions. Research papers contain generalized results of long-term archival value, whereas technical papers are appropriate for applied research of shorter-term value, ASHRAE Conference papers are not acceptable as deliverables from ASHRAE research projects. The paper(s) shall conform to the instructions posted in "Manuscript Central" for an ASHRAE Transactions Technical or Science and Technology for the Built Environment paper. The paper title shall contain the research project number (XXXX-RP) at the end of the title in parentheses, e.g., (XXXX-RP).

Note: A research or technical paper describing the research project must be submitted after the TC has approved the Final Report. Research or technical papers may also be prepared before the project's completion, if it is desired to disseminate interim results of the project. Contractor shall submit any interim papers to MORTS and the PMS for review and approval before the papers are submitted to ASHRAE Manuscript Central for review.

d. Data

The Institution agrees to maintain true and complete books and records, including but not limited to notebooks, reports, charts, graphs, analyses, computer programs, visual representations etc., (collectively, the "Data"), generated in connection with the Services. Society representatives shall have access to all such Data for examination and review at reasonable times. The Data shall be held in strict confidence by the Institution and shall not be released to third parties without prior authorization from the Society, except as provided by GENERAL CONDITION VII, PUBLICATION. The original Data shall be kept on file by the Institution for a period of two years after receipt of the final payment and upon request the Institution will make a copy available to the Society upon the Society's request.

e. Project Synopsis

A written synopsis totaling approximately 100 words in length and written for a broad technical audience, which documents 1. Main findings of research project, 2. Why findings are significant, and 3. How the findings benefit ASHRAE membership and/or society in general shall be submitted to the Manager of Research and Technical Services by the end of the Agreement term for publication in ASHRAE *Insights*

The Society may request the Institution submit a technical article suitable for publication in the Society's *ASHRAE JOURNAL*. This is considered a voluntary submission and not a Deliverable.

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All Deliverables under this Agreement and voluntary technical articles shall be prepared using dual units; e.g., rational inch-pound with equivalent SI units shown parenthetically. SI usage shall be in accordance with IEEE/ASTM Standard SI-10.

The above deliverables are necessary, *but not sufficient*, to monitor a research project. The PMS and the sponsoring TC have the responsibility to review the contractor's on-going activities and intermediate results, to ensure that the methods used, and results obtained will be valid and well-enough substantiated to be labeled as "ASHRAE-approved findings." Proper oversight cannot wait until the final report, when most of the budget has already been expended.

Therefore, each major task or phase of the research method outlined in the Scope should also be linked to a deliverable report, memorandum, or summary. These in-progress deliverables should not add to the cost of the project, as they will most likely become chapters of the final report. However, they should help the TC avoid unpleasant surprises due to the research not being conducted according to the TC's expectations. Examples of deliverables that could be required during the project include:

- If one task is a literature review, then the deliverable could be an annotated list of references and conclusions/summary of the current state of the art.
- If the contractor must propose specific sites (e.g., buildings), experiment topologies (e.g., duct configurations), materials (e.g., refrigerants, appliances, insulation or building materials), experiment protocols, and/or instrumentation, then short memos describing those proposed methods, materials, etc. should be deliverables to be reviewed and approved by the PMS before moving on to the next research task.
- If analysis of preliminary data or results will decide how to proceed (e.g., CFD models of 12 duct configurations will be used to select 2 duct configurations to be built and subjected to wind tunnel tests), then the contractor should write up the results of the initial analysis, recommend the areas for further more detailed investigation, and justify those recommendations.
- If data from the research are expected to modify or update a *Handbook* table, then the procedure for developing the updated table from the data should be specified and provided to the PMS as a deliverable. (The final report may also require the contractor to prepare a proposed updated table based on the observed data.)

In short, the technical approach for a research project should be broken down into tasks or phases, and where a task will yield results of interest to the TC and the PMS, or where the results of a task will significantly define how subsequent tasks will be carried out. The Work Statement should specify such deliverables for the PMS to review. This approach will make it easier for the PMS and MORTS to gauge progress and technical merit of on-going ASHRAE research projects and will provide a framework for the cognizant TCs to provide technical oversight and assistance to identify and correct problems as they occur.)

Level of Effort:

(Include estimates of professional-months by category, calendar-months, and total dollars. An example is:

The project anticipates 3 professional-months for the principal investigator and 8 professionalmonths for a research technician. The estimated cost is \$60,000 and the project is expected to take 12 months.)

Proposal Evaluation Criteria:

(Include specific list of criteria and weighting factors that will be used to evaluate proposals.

This section should also include a list of the criteria the PES will use to evaluate proposals and select a contractor to recommend. This must include Weighting Factors for the Evaluation Form. It may be the basic list or a subset of the list in the Proposal Evaluation Form and can also include additional categories such as special experience, credentials, equipment or facilities the WS authors think are necessary.)

The commonly used evaluation criteria (and sample weighting factors) are listed below. The WS may include some or all of these criteria, using whatever weighting factors the TC feels are appropriate. For example, a project involving simulation models may not depend upon "facilities," while experience of the PI in simulation modeling may be crucial. For performance testing of appliances, however, the quality of the Contractor's facilities may be very important.

1.	Contractor's understanding of Work Statement as revealed in proposal.a) Logistical problems associatedb) Technical problems associated	15%
2.	Quality of methodology proposed for conducting research.a) Organization of projectb) Management plan	25%
3.	 Contractor's capability in terms of facilities. a) Managerial support b) Data collection c) Technical expertise 	15%
4.	 Qualifications of personnel for this project. a) Project team 'well rounded' in terms of qualifications and experience in related work b) Project manager person directly responsible, experience and corporate position c) Team members' qualifications and experience d) Time commitment of Principal Investigator 	20%
5.	 Student involvement a) Extent of student participation on contractor's team b) Likelihood that involvement in project will encourage entry into HVAC&R industry 	5%
6.	 Probability of contractor's research plan meeting the objectives of the Work Statement. a) Detailed and logical work plan with major tasks and key milestones b) All technical and logistic factors considered c) Reasonableness of project schedule 	15%
7.	Performance of contractor on prior ASHRAE or other projects. (No penalty for new contractors.)	5%

8. Other_____

Critical Project Milestones

(List for example <u>major project intermediate deliverables</u> such as a completed literature review or the availability of initial test results or <u>major project events</u> such as the completion of the test fixture or access granted to field site as a critical project milestone that could have a significant negative impact on the overall project if missed or significantly increase the risk that the project will fail and in what month it is likely to expect completion of the critical project milestone based upon the estimated duration of the project)

Authors:

(List those individuals who were principal authors of the Work Statement.)

If any of the Work Statement authors plan to bid on the project, care must be taken to avoid actual or perceived conflict of interest. In particular, the requirements of the Work Statement should not be tailored to a unique Work Statement author's facility, equipment, or capability that is not reasonably available to other bidders. If WS authors bid on the project, they must identify themselves as such in their proposals, and the evaluators must satisfy themselves that these preparers did not gain an unfair advantage before their proposal may be considered. If it is determined that a submitted proposal does exhibit a conflict of interest, then that proposal should be identified, not evaluated, and written reasons given along with evaluations of the other proposals.

References:

(Import or expand the RTAR list of references to any articles, papers, books, etc., that were used in preparing the Work Statement and/or that would be of assistance to the bidders. All listed references should be readily available to contractors.)

Other Information for Bidders (Optional):

(This section should contain any other information that is not contained elsewhere. This could include information about relationships with the monitoring subcommittee, reports other than the normal quarterly progress reports, special personnel or facilities required by the proposer, special instructions regarding what the proposal should contain, or information as to how the proposals will be evaluated. It is not necessary to include references to quarterly progress reports, semi-annual reports in person to the TC final reports or papers.)
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4.5 Tips for Writing an Effective Work Statement

A Work Statement is a document that is utilized to convince ASHRAE to fund research projects and inform the bidders what is expected to be in the final results. The Work Statement contains different items and is found in the Work Statement outline in Section 3.4 of this manual. Incomplete (unclear) entries in these items will lead to delays in approving the Work Statement.

Project Justification

Is the project included in the ASHRAE Research Implementation Plan (i.e., was an RTAR submitted and approved by RAC), or is there a strong rationale provided for submitting the Work Statement without a prior RTAR submittal?

The Executive Summary, Application of Results, State of the Art (background and advancement) sections shall be brief and right to the point about how the project will be a benefit to ASHRAE Society and its members.

Are project benefits evident? Alternatively, are adverse impacts of not pursuing the project apparent? Will the results still be useful when completed?

Do the project objectives fall within ASHRAE's Scope? Involvement of outside professions in performing all or part of the work does not necessarily negate pertinence.

Is the project consistent with the Society's current Research Strategic Plan? List specific goals in the Plan that are addressed by the proposed research.

Is the project original (e.g., not an unnecessary duplication of another research project completed or underway)? Repetition of prior research may be desirable if pertinent facets have changed, the results are not publicly available, or confirmation is justified. Projects resulting in products that compete with commercial offerings are generally not approved. If previous projects need updating, has the sponsoring TC (original project) been contacted?

Project Definition

If there is more than one objective to the project, is the sequence defined?

Have all avenues been examined to determine a more economical alternate to achieving the objective?

Is there a contingency plan, in case the objectives are not met?

Subsequent phases or follow-on projects are not precluded, but specific projects should provide at least interim results that are beneficial on their own (e.g., no half tunnels).

Would segmenting the project preclude useful interim results or degrade effective procurement of the research needed?

Is the work or likely results free of potential legal problems and of prejudicial implications to a single manufacturer or class of manufacturers?

Are the recommended bidders knowledgeable enough about subject matters of the project to ensure success of the project?

Are proposal options recommended for inclusion clearly justified?

<u>Cos</u>t

Is the proposed level of effort and funding commensurate with work required? Is the proposed level of effort and funding commensurate with the project's expected benefits?

Can the ASHRAE research budget afford the project for its duration? Consider whether the project can or should be funded protracted for budgetary reasons.

Is there a commitment for co-funding? Did ASHRAE receive a letter (on company letterhead) with the amount of co-funding?

Suitability

Is the background adequately presented?

Are the individual tasks understandable and achievable (e.g., not seeking impossible or improbable results)? Note that high risk (with commensurate high benefits if successful) research is allowable, but it should be so noted in the TC's cover letter conveying the WS to MORTS.

Are the tasks likely to satisfy the project objectives?

Does the work statement foster fair competition?

Is sufficient detail provided to enable competitive pricing?

Are ambiguous tasks (e.g., scope determinations by the Project Monitoring Subcommittee) that could alter contractor costs avoided? No implication is intended that the PMS cannot or should not review the work and approve scheduled decisions or selections, provided that such alternatives entail similar effort and costs.

Is the justification adequate for required use of specified proprietary products or methods?

Are all of the tasks appropriate for ASHRAE research?

Are the products to be delivered clearly identified?

Are appropriate references adequately cited and available? Have copies of unpublished references been provided for distribution with the request for proposals?

Are at least three prospective bidders that were not involved in preparation of work statement identified?

Is a realistic project duration indicated?

Has the Work Statement been reviewed by other related TCs for accuracy and determination whether other previous projects were completed requesting similar results?

Has a Project Evaluation Subcommittee (PES) been proposed for approval? If other TCs co-authored the Work Statement, are they included in this Subcommittee?

Has a Project Monitoring Subcommittee been proposed for approval? If other TCs co-authored the Work Statement, are they included in this Subcommittee?

Has the work statement been coordinated with other organizations' committees? Have they been asked for co-funding?

Other Considerations

Are there other reasons to support the project (e.g., Presidential goals, emerging societal issues, requests from ASHRAE affiliates or other organizations)?

Is the project likely to contribute to a Handbook update, a proposed ASHRAE or industry standard, or a ASHRAE Journal article of broad interest?

For projects involving Special Publications, is/are the sponsoring committee(s) qualified and prepared to provide adequate review of the work to imply endorsement of the resulting document by ASHRAE as an accepted reference?

Is the project likely to provide an educational opportunity for HVAC&R students?

Is the project likely to enhance the Society's image (e.g., will ASHRAE gain recognition for pursuing it or, alternately, incur censure if ASHRAE ignores it?)

Additional Tips

RAC provides training at the Society's meetings for individuals involved in initiating research projects. RAC welcomes suggestions on topics to be covered.

Each TC has a Research Liaison that is a member of RAC. The Work Statement should be reviewed by the liaison prior to submitting the Work Statement to headquarters. This person will provide assistance in making sure that the Work Statement contains the required information for review.

RAC encourages TCs to prepare and submit Work Statements responsive to "Needed Research" listed in the ASHRAE Research Strategic Plan. Work Statements for projects not listed in the Plan may be prepared and submitted, but a strong justification for approval should be included. RAC is obligated to meet the funding guidelines set by the Board and reflected in the annual Research Budget. If considerably more Work Statements have been approved for bid than the research funding available, bidding on those Work Statements that are less responsive to the ASHRAE Research Strategic Plan may be delayed.

Below is a list of common reasons for returning a Work Statement.

- Need for Coordination
- Cost Problems
- Weak Justification
- Scope Lacks Clarity
- Unable to Bid
- Missing Information
- Critical Project Milestones not included
- Does not Conform to ASHRAE Policy

The need for coordination among pertinent TCs, TGs, TRGs, MTGs, SSPCs, and standing committees. Authors must realize that many projects have a rather broad technical base. For instance, a project by a TC concerned with equipment design may cover the development of computer algorithms for operating energy calculations. The project could benefit from coordination with a TC that is expert on energy calculations and may have already developed standardized algorithm formats on other projects. If a TC proposes work in a technical area that falls partly or totally under the scope of another TC, both TCs should review the work statement before it is submitted to RAC. This would help assure RAC that the work had not already been done, the plan is technically correct, and there is a need for research. It would also be an advantage to have a technical expert from the other TC on the project monitoring subcommittee.

The cost caused return of work statements. ASHRAE expects to get a good value from the approved projects. The sponsoring committee should conduct a critical review of the estimated cost before the work statement is submitted. Sometimes the scope is too broad and can be reduced to those items that are of immediate need to the TC.

Also, unnecessary travel or equipment expenses should be omitted. ASHRAE expects contractors to provide test facilities and equipment in most cases. If the level can't be reduced, it would be advantageous to either suggest additional sources of funding or to segment the project into two or more individually funded phases. RAC Research Liaisons can be a good source of advice on this subject.

<u>Weak justification and value to ASHRAE, industry and society.</u> It is extremely important to state your case for the proposed work clearly and completely. RAC members who review work statements normally are not as knowledgeable in the proposed area of technology as are the authors. RAC members depend on information provided in the background and justification sections of the work statement to understand the need for the research and the benefits to ASHRAE, the public or the industry.

If RAC is not convinced by the work statement that there is a need commensurate with the proposed level of effort and cost, the committee may reject a work statement outright or return it for clarification. Typically, the authors of a returned work statement and TC discuss new arguments justifying their revised work statement to carefully resolve issues raised by RAC. RAC requests that these new arguments be added to the revised justification so there is a good written record to benefit all parties who will be using the work statement in the future.

<u>The scopes lack clarity.</u> Many times, the tasks do not satisfy the stated objectives of the research, nor are they related to the objectives. The scope is the heart of the work statement and contains key information the contractor needs to prepare a bid. It should describe in some detail the parameters of the research, including items such as:

- The subject matter to be explored;
- Materials, equipment literature or other variables to be researched;
- An outline of the research method(s) to be used;
- A discussion of any standards to be followed in conducting the research;
- Consideration of how the data obtained might be reduced, analyzed and presented;
- A description of the form in which the results will be reported; and,
- A description of each task and each distinct phase of the project.

<u>The work statements were not biddable.</u> Authors should put themselves in the bidder's position and ask, "Can I bid this project? Is there enough information? Are the tasks clear and logical or are they ambiguous?" If one task depends on the results of another, it would be very difficult for the contractor to estimate the second task. It might be better, under the circumstances, to write the work statement to do the earlier task as the first phase. Then, after the results are known, write a follow-on work statement for a second phase.

<u>The Work Statement is missing information.</u> To help solve this problem, RAC implemented a Work Statement Cover Sheet that must be completed and submitted with the work statement. It has a checklist for outline items and provides a good place for recording other required information such as the TC vote record, the work statement authors and the proposed project monitoring committee members.

The Project's Critical Milestones not included

List for example major project intermediate deliverables such as a completed literature review or the availability of initial test results or major project events such as the completion of the test fixture or access granted to field site as a critical project milestone that could have a significant negative impact on the overall project if missed or significantly increase the risk that the project will fail and in what month it is likely to expect completion of the critical project milestone based upon the estimated duration of the project.

<u>The work statements didn't conform to ASHRAE policy</u>. For instance, work statements to develop computer algorithms must comply with ASHRAE's policy on algorithms.

In other instances, work statements have had the objective of developing computer software. If the authors had recognized in the beginning that it is ASHRAE policy not to develop and market software, the work statement could have been written to develop only the basic computational techniques, which would have satisfied the research need.

Another example is the work statement that proposes to develop a product, such as a sensor. Understanding that it is against ASHRAE policy to do research for product development, the authors could have directed the proposal toward developing the basic principles of an expanded sensing capability.

The work statement proposes to evaluate products or proprietary technologies. Again, this is against ASHRAE's policy on commercialism, and should be avoided. Research Liaisons should be able to help with policy questions before work statements are approved by the TC.

4.6 Examples of WS Review Ballot form & WS Review Summary used by RAC

RAC members use the form below to record their review comments and initial disposition decision on the WS prior to the RAC meeting to discuss the WS. The completed form is submitted to ASHRAE staff, which in turn incorporates this information into the WS Review Summary form as shown below.

4.6.1 Example WS Review Ballot used by Individual RAC Members Prior to Meeting

Project ID	0007		
Project Title	Design on a Dime		
Sponsoring TC	TC 12.5 – (Building Information Modeling – BIM)		
Cost / Duration	\$250,000/24M		
Submission History	1 st Submission	as WS, RTAR Accepted 10.06	
Classifications: Research or Technology Transfer	Basic/Applied F	Research	
Winter 2010 Meeting Review		Reviewer's Name: AA	
Check List Criteria		Additional Comments & Suggestions	
	Satisfied?		
Detailed Bidders List Provided? The contact information in the bidder list should be complete so that each potential bidder can be contacted without difficulty.	N	AA – No bidder list or contact information	
Proposed Project Description Correct? Are there technical errors and/or technical omissions that the WS has that prevents it from correctly describing the project? If there are, than the WS needs major revision.	Y		
Task Breakdown Reasonable? Is the project divided into tasks that make technical and practical sense? Are the results of each task such that the results of the former naturally flow into the latter? If not, then major revisions are needed to the WS that would include: adding tasks, removing tasks, and re-structuring tasks among others.	Ν		
Adequate Intermediate Deliverables & Critical Project Milestones Identified? The project should include the review of intermediate results by the PMS at logical and critical milestone points during the project. Before project work continues, the PMS must approve the intermediate results.	Ν		
Proposed Project Doable? Can the project as described in the WS be accomplished? If difficulties exist in the project's WS that prevent a successful conclusion of the project, then the project is not doable. In this situation, major revision of the WS is needed to resolve the issues that cause the difficulty.	Y		
Time and Cost Estimate Reasonable? The time duration and total cost of the project should be reasonable so that the project can be as it is described in the WS.	Y		
Proposed Project Biddable? Examining the WS as a whole, is the project described in the WS of sufficient clarity and detail such a potential bidder can actually understand and develop a proposal for the project? This criterion combines the previous three criteria into an overall question concerning the usefulness of the WS. If the WS is considered to not be biddable, then either major revisions are in order or the WS should be rejected.	Y		
Decision Options	Decision?	Additional Comments or Approval Conditions	
ACCEPT			
COND. ACCEPT	X	Specify results and deliverables from each task that will be reviewed and approved by the PMS before proceeding to the next task.	
RETURN			
REJECT			

ACCEPT Vote - Work statement (WS) ready to bid as-is

CONDITIONAL ACCEPT Vote - Minor Revision Required - RL can approve WS for bid without going back to RAC once TC satisfies RAC's approval condition(s) to his/her satisfaction RETURN Vote - WS requires major revision before it can bid

REJECT Vote - Topic is no longer considered acceptable for the ASHRAE Research Program due to duplication of work by another project or because the work statement has a fatal flaw(s) that makes it unbiddable.

5. PROJECT APPROVED FOR BIDDING

Following approval by RAC, the Work Statement, now designated a Tentative Research Project (TRP), is edited by the Manager of Research and Technical Services, incorporated into a request for proposal (RFP) and made available to potential contractors. A sample of the other material, which normally is distributed with the TRP, is shown on the following pages.

The Manager of Research and Technical Services maintains a listserv of research project potential contractors who have expressed interest and expertise in various fields of research interest to ASHRAE (<u>https://www.ashrae.org/research</u>) These contractors are informed by an e-mail as to the availability of new RFPs posted for bid by ASHRAE. The TC/TG is encouraged to designate other qualified contractors who may wish to receive the RFP.

When the schedule permits, a notice is placed in the ASHRAE JOURNAL/INSIGHTS, and a release made to the trade press, to advertise the RFP to a larger audience who may not be on the list of potential contractors.

The RFPs are also listed on the "Research" Page of the ASHRAE website (<u>https://www.ashrae.org/research</u>) and may be downloaded by interested bidders.

At the time the RFP is sent to potential contractors, a copy is sent to the Chairman of the sponsoring TC/TG. He/she is asked to confirm that the Technical Contact for bidder's technical questions and the Proposal Evaluation Subcommittee (PES) membership has not changed and that they will evaluate the proposals received in response to the RFP.

The Technical Contact is usually a member of the TC and he or she is available and qualified to answer technical questions regarding the RFP from potential bidders during the bid period (60 days typically). The ideal candidate for this position is a WS author who also serves on the PES. In addition to answering technical questions, the Technical Contact must also record all questions and responses so that this information can be relayed to all registered bidders one week prior to the due date for bids. The MORTS will obtain this information from the Technical Contact approximately one week prior to the bid due date and distribute it to all potential bidders that have registered their interest in the project.

(Sample RFP Notice) INVITATION TO SUBMIT A RESEARCH PROPOSAL ON AN ASHRAE RESEARCH PROJECT

1111-TRP, "Research Project Title"

Attached is a Request-for-Proposal (RFP) for a project dealing with a subject in which you, or your institution have expressed interest. Should you decide not to submit a proposal, please circulate it to any colleague who might have interest in this subject.

Sponsoring Committee: TC 000

Budget Range: \$xxxx may be more or less as determined by value of proposal and competing proposals.

Scheduled Project Start Date: April 1, 2014 or later.

All proposals must be received at ASHRAE Headquarters by start of business 8:00 AM, EST, December 16, 2013. <u>NO EXCEPTIONS!</u> Electronic copies must be sent to <u>rpbids@ashrae.org</u>. Electronic signatures must be scanned and added to the file before submitting. <u>DO NOT ADD SECURITY</u> <u>BLOCKS ON DOCUMENTS</u>. The submission title line should read: XXXX-TRP, "Research Project Title" and "Bidding Institutions Name" (electronic pdf format, ASHRAE's server will accept up to 10MB)

If you have questions concerning the Project, we suggest you contact one of the individuals listed below:

For Technical Matters

Technical Contact XXXX ABC DRIVE HOMETOWN, GA 12345 Phone: 000- 000-0000 E-Mail:

For Administrative or Procedural Matters:

Manager of Research & Technical Services (MORTS) Michael R. Vaughn ASHRAE, Inc. 180 Technology Parkway Peachtree Corners, GA 30392 Phone: 404-636-8400 E-Mail: MORTS@ashrae.net

Contractors intending to submit a proposal should so notify, by mail, or e-mail, the Manager of Research and Technical Services, (MORTS) by November 15, 201X in order that any late or additional information on the RFP may be furnished to them prior to the bid due date.

All proposals must be submitted electronically. Electronic submissions require a PDF file containing the complete proposal preceded by signed copies of the two forms listed below in the order listed below. <u>ALL electronic</u> <u>proposals are to be sent to</u> <u>RPBids@ASHRAE.org.</u>

All other correspondence must be sent to <u>ddaniel@ashrae.org</u> and MORTS@ashrae.net. Hardcopy submissions are <u>not</u> permitted. In all cases, the proposal must be submitted to ASHRAE by start of business 8:00 AM, EST, December 16, 201X. NO EXCEPTION

The following forms (Application for Grant of Funds and the Additional Information form have been combined) and must accompany the proposal:

	ASHRAE APPLICATIO	ON FOR GRANT OF FUNDS (SAMPLE Form)
1.0	Title:	
2.0	Principal Investigator (P.I.):	
3.0	Name of Contracting Institution: Mailing Address of P.I.:	
	E-mail address of P.I.: Phone No. of P.I.: Fax No. of P.I.:	
	Other Key Personnel:	
4.0	Any subcontractors:	
5.0	Objective & Scope:*	
6.0	Project Start Date:	Total Project Length:
7.0	Total Cost: US\$	ASHRAE Funding Requested: US\$
8.0	Details of Financial Support: a) Professional Salaries b) Research Assistants c) Fringe Benefits (%) d) Equipment e) Supplies & Materials f) Computer Costs g) Travel & Communications h) i) Total Direct Costs j) Indirect Costs (% k) TOTAL	\$ Person Months P.I. Time P.I. Time
9.0	Qualifications of Principal Invest	igator:*
10.0	Signature of Project Manager or	P.I.:
	Title:	Date:
	Signature of Executive Officer of	f Institution:
	Title:	Date:

Key personnel were () were not () involved in writing the ASHRAE's Request for Proposal Document for this project. *All sections must be completed. Use of terms such as "See Attached Proposal" may result in rejection of proposal.

(SAMPLE Form) ADDITIONAL INFORMATION FOR CONTRACTORS

In preparing a response to this request-for-proposal, contractors should be aware of, and be agreeable to, the following ASHRAE policies, procedures, traditions and contractual requirements. Costs for meeting these should be considered when preparing research proposal budgets.

By submitting a proposal, the Principal Investigator is acknowledging he/she understands and agrees to comply with the policies listed below. The inability or unwillingness to comply should be pointed out in the transmittal letter accompanying any proposal or should result in no proposal being submitted.

- 1. It is the practice of ASHRAE to use fixed price contracts for research projects. Other contract forms, such as cost-plus fixed fee, will be considered only in exceptional cases, and such proposals are discouraged. Unlike some other government or foundation research sponsors, ASHRAE does not approve cost extensions nor accept scope reductions except in the most unusual of cases. Such cases reflect unfavorably on the contractor with regard to future work.
- 2. All fiscal values should be stated in U.S. dollars.
- 3. Twenty five percent of the contracted sum will be withheld pending completion of the work. Fifteen percent will be paid upon submission of the final report and the remaining ten percent upon completion and acceptance of all contract requirements. The initial seventy-five percent of the total sum is paid in equal quarterly progress payments during the period of performance. Except for the first payment, which is made within thirty days of contract initiation, all progress payments are made contingent upon receipt of a quarterly progress report.
- 4. The winning bidder is required to meet with the PMS via a site-visit or a conference call at the start of the project to review the project's scope. The results of this meeting shall be summarized by the contractor in the first progress report.
- 5. During the period of the contract and following submission of the Final Report, the Principal Investigator is expected to personally address the sponsoring Technical Committee or Task Group and report on the progress of the project at each Annual and Winter ASHRAE meeting.
- 6. A Technical Paper shall be prepared in a form suitable for presentation at a Society meeting and the author should be prepared to attend such a meeting to make the presentation. In the abstract of this paper, the author should refer to the volume(s) and chapter(s) of the ASHRAE Handbook series related to the work reported and state in the conclusion the possible effect of the research on the technological base.

All Deliverables under this Agreement and voluntary technical articles shall be prepared using dual units; e.g., rational inch-pound with equivalent SI units shown parenthetically. SI usage shall be in accordance with IEEE/ASTM Standard SI-10.

7. ASHRAE, in return for their financial support, expects that the sponsored research will be reported first at an ASHRAE meeting and in an ASHRAE publication. This may be ASHRAE *Transactions*, the ASHRAE *Journal*, or the *International Journal of Heating, Ventilation, Air-Conditioning and Refrigerating Research*. The Principal Investigator should be willing to wait for

this to take place before presenting the work elsewhere. The submission of papers for publication by ASHRAE shall be made to the Manager of Research and Technical Services.

- 8. Any patentable inventions or copy write protected computer programs developed as a result of this research shall be made available to ASHRAE in recognition of their financial support of the work
- 9. Proposers are encouraged to utilize undergraduate or graduate engineering students where appropriate in conducting this research in order to assist them professionally and financially in their education and in increasing their interest in the HVAC&R industry.
- 10. ASHRAE's proposal evaluation committee will make the primary recommendation regarding the selection of a contractor. While bidders may be given some information on their and competitors' scores, ASHRAE is not obligated to do so and will not become involved in negotiating, explaining or defending the decisions made.
- 11. One section of the final report will be entitled "Utilization" and will state:
 - a. ASHRAE Handbook volume(s) and chapter(s) to which the research is related.
 - b. Aspects of the research confirming present knowledge or extending present knowledge.
 - c. Suggestions for change in the Handbook attributed to the research conducted.
 - d. Suggestions for further research identified through that completed.
- 12. If invited, the Principle Investigator shall speak at an ASHRAE chapter or regional meeting about his/her research or research in general. The chapter or region extending the invitation shall reimburse out-of-pocket expenses incurred.
- 13. The signed original of this document should be enclosed with the proposal's letter of transmittal. Multiple copies are not desired.

The above conditions are acceptable:

Principal Investigator (date)

Institution Authority (date)

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PROPOSAL FORMATTING GUIDELINES

- a. Enclosed with the Request for Proposal (RFP) are copies of two forms, *Application for Grant of Funds* and *Additional Information for Potential Contractors*. These forms must be completed and <u>signed copies</u> of each must be included with your proposal submission. Proposals <u>must</u> be submitted in electronic format. Electronic submissions are sent to rpbids@ashrae.org.
- b. The Proposal should include data in sufficient detail for proper evaluation, covering your approach to the subject, an estimate of the time and cost involved, a work completion schedule, which denotes the Bidder's proposed Critical Project Milestones and the estimated month of completion based upon Bidder's proposed project duration, and the qualifications of the person, or persons, who would accept responsibility for the Project. All units should be reported in the inch-pound system, with SI units shown parenthetically, in accordance with the ASHRAE Metric Guide.
- c. All proposals shall contain the following statement at the bottom of the title page:

"Members of the research team did not participate in the preparation of the ASHRAE's Request for Proposal on which this proposal is based."

- d. In order to facilitate the receipt, processing, distribution and evaluation of proposals in electronic format, the following are strongly suggested:
 - Submit the proposal as a single .pdf file, preferably, with the "Application for Grant of Funds" form first followed by "Additional Information for Potential Contractors" form and then the proposal.
 - All electronic submissions must be sent to rpbids@ashrae.org.
 - Faxed copies of the two signed forms are acceptable if proper advance notification is given to the MORTS that the forms will arrive separate from the proposal and the forms and proposal will both arrive before the bid due date.
- e. ASHRAE will acknowledge the receipt of all proposals received via e-mail. Please include the email address to be used for this acknowledgement in your transmittal letter or transmittal message.

6. Solicited Proposals

6.1 Evaluation of Solicited Proposals

Following the deadline for receipt of proposals, the Manager of Research and Technical Services (MORTS) records certain salient information about each response and forwards copies of all proposals received to members of the Proposal Evaluation Subcommittee (PES), the TC Chair (or Chair of TG, MTG w/research authority, SSPC, or other committee authorized to sponsor research), and the appropriate Research Liaison. <u>The proposals are confidential and not to be shared outside the PES and above-mentioned individuals</u>.

Evaluation Criteria

The PES uses evaluation criteria and weighting factors as specified in the Work Statement (WS) and applies them to compare the proposals received. Typically, the Evaluation Criteria include "Performance of Contractor on Prior ASHRAE or Other Projects." The MORTS provides the PES with information on performance, including unsatisfactory performance, on previous ASHRAE research projects. A bidder who did not have a prior ASHRAE research project should not be penalized in the evaluation process, i.e., his/her proposal should receive the maximum score for this evaluation criterion.

Section 6.2 provides instructions regarding the contractor selection process by the PES. After deliberations, the PES completes the Summary Sheet for Reporting Evaluations of Proposals. The criteria for proposal selection are:

1) By default, select the proposal with the lowest cost that was responsive (i.e., an average score of 70 points or higher),

OR

- 2) Select the proposal that the PES feels is the best value when ALL the criteria below are also satisfied:
 - a. The proposal has the lowest cost to ASHRAE per point (using average score) among all responsive proposals
 - b. The average proposal score is 5 points higher than the score for the lowest-cost responsive proposal
 - c. The proposal was scored higher than the lowest-cost responsive proposal by at least 2/3 of PES members
 - d. The PES members feel selection of the higher cost proposal is justified and the PES chair provides a written explanation of their reasons.

Approval Process

The PES presents its recommendation and justification for the selection during executive session of the sponsoring committee for the project (TC, TG, MTG w/research authority, SSPC or other committee authorized to sponsor research). The vote of the sponsoring committee is recorded on the Summary Sheet in the form of "For - Against - Abstain - Not Voting - Total." The reasons for negative votes and abstentions on these types of motions shall be recorded on the same form or accompany sheet and transmitted as additional information to RAC. The minimum number of affirmative votes required for approval is at least 2/3 of the eligible voters present and expressing a preference. Please note a) an eligible voter who abstains is expressing no preference and thus is excluded from the 2/3 vote tally check, and b) 'eligible voters' are voting members of the body, including "Members Non-Quorum" when present. A 2/3 vote is required to authorize expenditure of funds (such as recommendation of a contractor or final report approval) (Rules of Board - ROB 2.104.006). Section 6.2 provides instructions for maintaining confidentiality of information during TC discussion of the PES recommendation, particularly by limiting attendance during the executive session.

The sponsoring committee's chair or another committee member designated by the chair is responsible for submitting hardcopies of: 1) Summary Sheet for Reporting Evaluations of Proposals, 2) copies of all PEFs or other review sheets used by individual PES members, and 3) any other documentation that the committee believes might help to support the committee's recommendation to the MORTS Mailbox by Tuesday night of the ASHRAE Meeting.

A member of Research Administration Committee (RAC) (usually the Research Liaison for the TC) will independently evaluate each proposal using the same weighting factors used by the PES. The Research Liaison's evaluation scores will be used by RAC in their deliberations prior to approval of the TC's contractor recommendation. The Research Liaison is the TC's champion at the RAC meeting, and therefore, the liaison must be fully confident and supportive of their position. Consequently, only the TC/PES can provide the needed supporting information to the liaison. If the TC does not provide enough information to properly answer the questioning likely to result at the RAC meeting, the project may be delayed or the TC's recommendation is not approved. This may introduce at least a six-month delay in proceeding with the project.

<u>The proposals submitted to ASHRAE are the official documents to be evaluated</u>. All actions taken by the PES and the TC are to be based on these proposals as written. The recommended contractor's proposal (and **not** the Work Statement prepared by the TC) will be used as the statement of work in the agreement between the contractor and ASHRAE. Written clarification questions of the contractor's proposal and the contractor's responses to these questions (conducted by the office of the MORTS), however, can also be referenced as the basis for the contract's scope of work, if required.

There shall be no direct communication between the PES or TC and the proposers until after the contract with the selected contractor is fully executed. If the PES or TC requests further information or clarification, the PES or TC shall notify the MORTS. The MORTS will then contact all proposers to obtain the requested information.

Under exceptional conditions, e.g., when a single bid is received or funding is limited, the Research Administration Committee may authorize the MORTS to negotiate the price or technical content of a contract with the proposed contractor. The PES should contact the MORTS and research liaison to discuss the feasibility of this approach for a project before formally submitting their recommendation to RAC. <u>In all cases</u>, care must be exercised to see that no unfair advantage is given to one bidder over another.

If recommended by RAC for funding, a Research Project Analysis Sheet is prepared by the MORTS to accompany the Application for Grant of Funds of the recommended contractor when it is forwarded to Technology Council and the Board of Directors. The Project Analysis Sheet contains information to assist these bodies in evaluating the recommendation.

RAC has the authority to approve for funding projects less than \$150,000. Technology Council has authority to approve funding for projects costing from \$150,001 to \$250,000. For projects costing over \$250,000, Technology Council forwards its recommendation to the Board of Directors for their final approval.

Disapproval of any recommendation by either RAC, Technology Council or the Board of Directors results in the proposal's being returned to the next lower body for reconsideration.

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Special Considerations:

(i) Only one proposal received

If only one proposal is received when a Work Statement is put out for bid, then MORTS shall contact the other listed potential bidders to determine why they did not bid. Based on the responses received or other considerations, MORTS may decide, without evaluation of the proposal itself, not to accept the single bid received.

If the MORTS does forward a single proposal to the PES for evaluation, then both the PES and RAC must give the proposal a score of 80 or higher, and the proposed budget must be equal or less than 110% of the cost estimate in the WS in order to be considered for acceptance.

If the two criteria above are met, but the other bidders stated that they did not bid because they felt only one institution had the qualifications or facilities to do the research, then the MORTS shall negotiate with the bidder to ensure the project will be conducted at the lowest possible cost to ASHRAE, if the project is approved for award.

(ii) Work Statement author bids on the project

Proposals submitted by teams that include a Work Statement (WS) author may be acceptable if the proposal was not selected because of unique information available to the WS authors but not to all prospective bidders.

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6.2 Instructions for Proposal Evaluation Subcommittee

Purpose:

The purpose of the Proposal Evaluation Subcommittee (PES) is to provide recommendations and guidance to the TC (or TG, MTG w/research authority, SSPC or other committees authorized to sponsor research) members relative to their evaluation of proposals received, both solicited and unsolicited.

Scope:

Inclusions - these instructions apply to ASHRAE Research and Technical Projects.

Exclusions - The scope of these instructions does not include provisions for ASHRAE Special Projects as covered in either the Policy or Procedures for ASHRAE Special Projects or Manual of Procedures for Technology Council Special Projects Subcommittee.

Members:

At least three (3) members, but not more than five (5) including a PES Chair, shall be appointed by the Chair of the sponsoring TC to form the Proposal Evaluation Subcommittee (PES). The TC chair may seek volunteers or suggestions from the TC regarding PES and PMS appointments. Whenever possible, the Work Statement authors should be members of the PES. Cosponsoring TCs and co-funding organizations (e.g., AHRTI, CIBSE, etc.) may also be members of the PES. A preferred maximum number of PES members is seven, but in some cases, such as significant co-funding of high cost projects, the maximum number could be increased. The Chair(s) of the cosponsoring TC(s) shall inform the Chair of the lead TC of appointed members. The co-funding organization(s) shall be invited to participate by the Manager of Research and Technical Services (MORTS), who shall inform the TC Chair of the representative(s) appointed from the organization(s) to the PES and Project Monitoring Subcommittee (PMS). Individuals from an organization included in a team bidding on the project cannot be members of the PES or PMS. All appointments to the PES (and PMS) are subject to the approval of the Research Liaison.

Any TC members or guests at a TC meeting, who may bid on the project, shall not participate in discussions about membership of the PES or PMS. All such prospective bidders shall leave the meeting during the discussion of PES or PMS membership. If the TC Chair is considering bidding on the project, the Vice Chair shall assume responsibility for appointing the PES members. If the Vice Chair is also considering bidding on the WS, then those TC members without a conflict of interest (i.e., those who will definitely not bid on the project) shall select an individual on the TC to solicit the TC's input on PES and PMS members and to appoint members of the PES and PMS. All appointments to the PES are subject to the approval of the Research Liaison.

The PES shall be tentatively appointed prior to initial submittal of proposed Work Statements to the Manager of Research and Technical Services (MORTS) and shall be finalized when members have determined if they are bidders or otherwise have conflicts of interest.

The MORTS and the Research Liaison shall be ex officio, non-voting members of the PES and shall receive copies of all PES correspondence and prior notification of all meetings.

Evaluation and Selection of Contractor:

The PES will be responsible for evaluating proposals and for recommending to the TC the contractor to perform the research. The Research Liaison shall be present during the PES evaluation meetings to assist with evaluation procedures.

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Before the PES meets:

- Each PES member shall individually review and score all proposals received for the project. They shall score each proposal using the proposal evaluation criteria published in the Request for Proposal, which was posted on the ASHRAE website to solicit the proposals. These scores shall be transmitted to the PES Chair by the start of the meeting.
- The PES shall then meet in executive session to discuss the proposals, either in person or by a conference call with prior approval by the Research Liaison.

During the PES meeting:

- Each PES member shall discuss with the other PES members the merits and weaknesses of each proposal, as they perceive them. They may reveal the initial scores they gave each proposal individually per the project's evaluation criteria.
- After the discussion has been completed, the PES members shall complete or revise individually their Proposal Evaluation Form (PEF) based on their personal knowledge, understanding, and preference. (The scores they enter on the PEF may be adjusted from their original scores based on information learned during the PES discussion). It is essential that PES members follow their obligations to score each proposal according to the several elements of the proposal evaluation criteria. If a PES member submits scores that appear to have been generated without regard for the specified scoring elements, the member will be given the opportunity to have a scoring procedure discussion with the PES Chair and/or Research Liaison, then allowing a rescoring by the PES member, if in agreement. Failure to provide credible proposal evaluations may result in removal from the PES.
- The PES Chair shall use the completed PEFs from all PES members to calculate average scores for each proposal and shall fill out the Summary Sheet for Reporting Evaluation of Proposals.
- Once the PEFs are tabulated and the average scores are calculated to judge the quality of each proposal, the PES chair will open (document from MORTS) the proposed cost of each bid, and will calculate the value of each proposal by dividing the cost by the total points for each bid.
- As the final step, the PES shall vote in order to select a bidder to be recommended to the TC. This may be the lowest cost responsive bidder, or a best value bidder based on the criteria presented in Section 6.1. If a higher cost proposal is recommended based on its value, the PES chair shall provide an explanation on the Summary Sheet for why this recommendation is justified by the merits of the proposal over other lower cost proposals that are rated responsive by the PES summary scores.
- As noted in Section 6.1 Approval Process, the Summary Sheet and copies of all PEFs and supporting documentation shall be provided to the sponsoring committee for submittal to MORTS.

Failure to follow the procedures may result in rejection of a TC recommendation by the Research Administration Committee (RAC) or Technology Council.

The TC shall vote on the selection of the contractor prior to the recommendation being forwarded to the Research Administration Committee (RAC).

Confidentiality of information contained in proposals and the evaluation of such proposals shall be maintained through appropriate measures, including the following:

- Prior to final selection of the contractor, the flow of information shall be restricted to the PES, the TC chair, RAC, and ASHRAE staff. All those affiliated with any of the bidders shall not receive any information related to the bids or the selection of a recommended bidder.
- 2) All discussions and evaluations of sensitive information such as costs and qualifications of respondents to an RFP shall be conducted only in executive session of the sponsoring committee, which shall consist only of committee voting members, PES members, the Research Liaison and ASHRAE staff, and exclude those affiliated with bidding organizations. Recorded votes of the PES, sponsoring committee, or RAC shall be cast in executive session.
- 3) Minutes of meetings shall report only the action taken without identifying the recommended contractor. Other details of the executive session may be appended to minutes, but these shall be distributed only to those persons who participated in the executive session or who have a direct Society role in the awarding of a contract for the project.
- The identity of the recommended contractor shall be kept confidential until approved by RAC, Technology Council and the Board of Directors.

Procedures:

The PES shall follow all procedures as described herein (in Section 6 of the Research Manual).

The PES shall coordinate all activities with the MORTS and Research Liaison.

Only the office of the MORTS can relay questions of clarification and comments from the PES or TC to the proposers. The MORTS may request the assistance of the PES Chair when communicating with the proposers.

The PES is responsible for assuring the two-way flow of information so that the TC can make informed decisions relative to PES recommendations.

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DDODOCAL		
PROPUSAL	EVALUATION	FURIN

(SAMPLE FORM	I)
--------------	----

Pro Su	oject # bmitted by:			
Tit	le:	Factor <u>Weight x R</u>	ating =	Score
1.	Contractor's understanding of Work Statement as in proposal. a) Logistical problems associated b) Technical problems associated			revealed
2.	Quality of methodology proposed for conducting research.a)Organization of projectb)Management plan			
3.	Contractor's capability in terms of facilities. a) Managerial support b) Data collection c) Technical expertise			-
4.	 Qualifications of personnel for this project. a) Project team 'well rounded' in terms of qualifications and experience in related work b) Project manager person directly responsible; experience and corporate position c) Team members' qualifications and experience d) Time commitment of Principal Investigator 			
5.	Student involvement			
6.	 Probability of contractor's research plan meeting the objectives of the Work Statement. a) Detailed and logical work plan with major tasks and key Critical Project milestones identified b) All technical and logistic factors considered c) Reasonableness of project schedule 			
7.	Performance of contractor on prior ASHRAE or other projects (No penalty for new contractors.)			
8.	Other			_
	TOTAL			<u>100</u>

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ASHRAE RESEARCH MANUAL

Note: Evaluation criteria and factor weights should be those specified in the Work Statement. Factors should be selected such that maximum score totals 100 points.

ASHRAE RESEARCH PROJECT ANALYSIS

(Completed by Staff January)

Project Number & Title: "

<u>Responsible TC/TG/MTG/SSPC</u>: Justification of Need:

Work Statement Authors:

Research Strategic Plan Goals Applicable to this Research:

RTAR Submitted:	Position on Implementation Plan:		
Coordinated with TC/TG/MTG:	Relates to Previous Project:		
Vote of TC/TG/TG/MTG/SSPC:	Vote of RAC:		
Vote of RAS:	Vote of Tech Council:		
Allocation of ASHRAE Funds Per Fiscal Year	<u>201X-201X</u> <u>201X-201X</u> <u>201X-201X</u> \$TBD \$TBD \$TBD		

CRITERIA A: Best Value for ASHRAE:

Was the lowest cost responsive bid selected? TBD If YES, then go to CRITERIA B.

If NO, then all four of the following conditions should be satisfied for the recommended bidder to be approved

- 1) The recommended proposal has the lowest cost to ASHRAE per point (\$/point using average score) among all responsive proposals TBD
- 2) The average proposal score is five points or more higher than the average score for the lowest-cost <u>responsive</u> proposal TBD
- The proposal was scored higher than the lowest-cost <u>responsive</u> proposal by at least 2/3 of the PES members -TBD
- The PES members feel selection of the higher cost recommended proposal is justified and a written explanation of their reasons has been provided - TBD

CRITERIA B. Actual or Perceived Conflicts of Interest:

Was the selected bidder a WS author? TBD If NO then stop.

If YES, the following two additional questions should be answered as TRUE for the recommended bidder to be approved:

1) The selected bidder's proposal does not include material that exceeds what was requested in the WS? TBD

2) The WS does not specify unique facilities or equipment that only the selected bidder can provide? TBD

ESTIMATED	<u>18M</u>	<u>\$50,000</u>	<u>SCORE</u>	\$/POINT
Bidder 1	Μ	\$		
Bidder 2				

RAC/Tech Council Conflicts-of-Interest: TBD

MORTS NOTES:

Reasons Why Other Recommended or Registered Bidders Did Not Bid:

Potential Bidders:

Bids Due: December 15, 201X Total Number of Bids: Bidders: PES: Research Subcommittee Chair: TC Recommended Contractor: TBD

P.I. & Track Record(s): 1. XXXXX XXXXXX, <u>Other Key Personnel</u>: XXXXy-<u>Subcontractor: None</u>

<u>Proposal Evaluation Criteria Used:</u> Proposals will be evaluated according to the following criteria:

EXAMPLE SUMMARY SHEET FOR REPORTING EVALUATION OF PROPOSALS (TOC)

(Project # same as RTAR & WS, assigned by MORT	S)	TRP	RECO	MMENDED	BIDDER			_
Evaluation Criteria ⁽¹⁾	Weight	Bidder 1	Bidder 2	Bidder 3	Bidder 4	Bidder 5	Bidder 6	Bidder 7
	Factor							
1. Contractor's understanding of Work Statement as revealed in proposal.								
2. Quality of methodology proposed for conducting research.								
3. Contractor's capability in terms of facilities.								
4. Qualifications of personnel for this project.								
5. Student involvement.								
6. Probability of Contractor's research plan meeting the objectives of the Work Statement.								
 Performance of Contractor on prior ASHRAE or other projects⁽³⁾. 								
8. Other.								
TOTAL SCORE ⁽³⁾ (0-100 pts)								
TOTAL COST TO ASHRAE (\$)								
COST TO ASHRAE / SCORED POINTS (\$/pt)								
TC/TG/MTG/SSPC VOTE: For: Against:		Absta	ain:	Not	t voting:		Total:	
Reason for each negative vote or abstention ⁽⁴⁾ :	Reason for each negative vote or abstention ⁽⁴⁾ :							
Justification for not selecting lower-cost responsive bids (scoring 70 or more points								
Submitted by:	Submitted by: Date: Date:							
IOTE: ⁽¹⁾ These Evaluation Criteria are examples. Evaluation Criteria and Weighting Factors must be those specified in the Work Statement.								

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⁽²⁾ The minimum score for considering the award of a contract is 70 points. Justification for not selecting lower-cost responsive bids must include specific reasons ⁽³⁾ No penalty for new contractors.⁽⁴⁾ Attach a separate sheet if necessary.

7. UNSOLICITED RESEARCH PROPOSALS

An unsolicited research proposal (URP) is a research proposal initiated by a proposer seeking funding from ASHRAE. In order to be considered for funding, URPs should fall within the general research goals of the Society but not overlap significantly with ongoing or planned research activities of individual TC (or TG, MTG w/research authority, SSPC or other committees authorized to sponsor research projects). Unique and innovative projects that cut across research activities within different TCs are especially welcomed.

Unsolicited proposals should be submitted in electronic format to the Manager of Research and Technical Services (MORTS) at MORTS@ashrae.net, who assigns the URP a number and logs it into the project control system. Included with the unsolicited research proposal (URP) submission should be copies of three ASHRAE forms, Application for Grant of Funds, Procedure Statement Regarding Unsolicited Research Proposals (URPs) and Additional Information for Potential Contractors. These forms must be completed and signed by an individual having the authority to commit the institution contractually. Electronic signature is enough. Since the ASHRAE review process cannot guarantee the confidentiality of any material contained in a URP and since ideas, processes and/or techniques described may already be under consideration by a TC, the author of any URP is requested to sign the Procedure Statement Regarding Unsolicited Research Proposals (URPs) form releasing ASHRAE from responsibility for proprietary or confidential material in the URP. (See Guidelines for Unsolicited Research Proposals)

7.1 Evaluation of Unsolicited Research Proposal (URP)

The MORTS will work with the Chair of Research Activities Subcommittee (RAS) of Research Administration Committee (RAC) to identify an appropriate liaison from RAC, who will have responsibility for guiding the URP through the evaluation process. In most cases, the URP liaison will be the Research Liaison for the section of TCs that best aligns with the focus of the URP. However, in some cases, the MORTS and RAS Chair may choose a URP liaison from RAC who has unique expertise for evaluating the URP. The following process will be followed in evaluating URPs:

- 1) The URP liaison shall form a review committee of 3-5 additional RAC reviewers and will perform an initial evaluation of the URP using the URP review form from Section 7.2 of this manual to determine whether it should be considered for funding by ASHRAE as a URP:
 - a. Innovation: Is the proposed research innovative in concept and application?
 - b. <u>**Distinctiveness**</u>: Does the proposed research involve unique approach, skills, equipment which otherwise are not available to any other researchers?
 - c. <u>New Research Topic</u>: Is this a new subject of research which TCs have not proposed yet?
 - d. <u>**Timeliness**</u>: Would a significant opportunity be lost if the project had to go through ASHRAE Research process?
 - e. **<u>Co-Funding</u>**: Is significant co-funding or cost sharing available for the proposed research?

AT LEAST ONE QUESTION ABOVE MUST BE ANSWERED "YES" IN ORDER TO QUALIFY THE PROPOSAL AS A URP.

(TOC)

IF THE PROPOSED RESEARCH DOES NOT QUALIFY FOR URP FUNDING IN OPINION OF THE RAC REVIEWER(S) - MARK "REJECT" AND NOTIFY MORTS SO PROPOSER CAN BE NOTIFIED THAT THEIR PROPOSAL HAS BEEN REJECTED FOR FUNDING BY RAC AS A URP, AND IF APPROPRIATE, THE PROPOSER WILL INSTEAD BE ENCOURAGED TO HELP DEVELOP THE PROJECT TOPIC AS A WORK STATEMENT WITH A TC FOR AN OPEN BID SOLICITATION PROCESS, ON WHICH URP PROPOSER CAN ALSO BID.

If URP passes the initial RAC evaluation, URP next goes to subject matter expert (SME) TC(s) for technical review and possible approval as described below for funding using the same URP review form from Section 7.2.

- 2) If the URP liaison determines that the URP should be considered for funding, then the liaison should identify an appropriate lead TC and ask the TC chair to form a Proposal Evaluation Subcommittee (PES) headed by the TC's Research Subcommittee Chair to evaluate the URP. If a PES is appointed, the URP liaison will next follow-up with the TC Chair and Research Subcommittee Chair to monitor the timeliness of their evaluation.
- 3) The TC's PES should use the same URP review form from Section 7.2 but must also consider whether the unsolicited work is of equal or greater importance than that already planned by the TC. The TC must consider the cost and benefit of the URP to the TC, the Society and the public to establish the advisability of recommending funding.
- 4) Should the PES recommend that the project be funded, the subsequent approval steps are identical to those of a solicited proposal. If the TC rejects the URP, it shall provide a brief explanation to the MORTS. In some cases, the PES may be empowered by the TC to work with the author of the URP proposal to make modifications to the scope and deliverables to better meet the TC needs. The proposed budget can also be adjusted to accommodate these changes. The TC must vote to authorize the PES to negotiate with the proposal author and then must approve any revised URP.
- 5) If disapproved at any level, the MORTS will return the URP to the proposer with a brief explanation for the reason for the rejection. A copy of this communication is sent to the TC.

Following approval and contract finalization, the sponsoring TC will establish a Project Monitoring Subcommittee (PMS) to oversee the progress of the project and to approve the final report

7.2 URP Review form used by RAC and PES Reviewers

Project ID		
Project Title		
Principal Investigator (PI)		
Cost / Duration		
Classification: Research or Technology Transfer		
		LIDD Critoria
Chack List Critoria		Commonts & Suggestions
Check List Childhad	VUIEDINU	
Distinctiveness: Does the proposed research involve unique approach, skills equipment which otherwise		
are not available to any other researchers?		
New Research Topic: In this a new subject of research which TCs have not yet proposed?		
Timeliness : Would a significant opportunity be lost if the project had to go through ASHRAE Research open bid process?		
Co-funding: Is significant co-funding or cost sharing available for the proposed research?		
AT LEAST ONE "YES" VOTE ABOVE IS REQUIRED TO QUALIFY FOR FURTHER CONS	SIDERATION AS	A URP. IF THERE IS NOT AT LEAST ONE "YES" VOTE ABOVE, MARK "REJECT" BELOW
State-of-the-Art (Background): The proposal should include some level of literature review that		
documents the importance / magnitude of a problem.		
Advancement to the State-of-the-Art: Is there enough justification for the need of the proposed research?		
Will this research significantly contribute to the advancement of the State-of-the Art?		
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.		
IF ADOVE THREE RTAR REVIEW CRITE		ALL SATISFIED - WARK REJECT BELOW
has that project description correctly describing the project? If there are then reject the properal		
Task that prevents it from contextly describing the project. If there are, then reject the proposal		
has breakdown reasonabler is the project divided into tasks that make technical and practical senser		
Are the results of each task such that the results of the former naturally now into the fatter? If not, then		
reject the proposal.		
Adequate intermediate betwerables & Critical Project whilestones identified in the project should include the service and the service and the service of the project should include the service of the se		
work continues the PMS must approve the intermediate results		
Proposed Project Doable? Can the project as described in the proposal be accomplished? If difficulties		
exist in the proposal that prevent a successful conclusion of the project, then the project is not doable. In		
this situation, reject the proposal		
Time and Cost Estimate Reasonable? The time duration and total cost of the project should be reasonable		
so that the project can be as it is described in the proposal.		
PI Qualifications: Is PI adequately qualified to successfully complete the proposed research? Does PI has		
enough resources and access to suitable laboratory and equipment to perform the research? If not, then		
reject the proposal.		
THE ABOVE CRITERIA ARE SIMILAR TO THOSE FOR WORK ST	ATEMENT EVA	LUATIONS. PLEASE EVALUATE SIMILAR TO WORK STATEMENT
Decision Options	Decision	Approval Conditions
ACCEPT		
REJECT		1

7.3 Guidelines for Unsolicited Research Proposals

One of the ways in which ASHRAE research projects are initiated is through the Unsolicited Research Proposal (URP). These are proposals, which are developed and planned by a researcher and then presented to ASHRAE with a request for full or partial funding. The URP should include the following information.

<u>1. Title</u>

2. Executive Summary

(100-word statement that could be used at the BOD level to succinctly summarize the current state-of-the-art, the advancement this project is expected to accomplish, and its value to ASHRAE and society in general.)

3. Applicability to ASHRAE Research Strategic Plan

(List specific goals of the current ASHRAE Research Strategic Plan this project will support by name and number (e.g., Goal 3 - To reduce significantly the energy consumption for HVAC&R, water heating and lighting in existing homes). State how the proposed project will help achieve the goals. If the project does not contribute to any of the goals in the ASHRAE Research Strategic Plan, a strong justification of the need for the research must be provided, and the proposal will have a lower likelihood of success. The current ASHRAE Research Strategic Plan can be found on the ASHRAE.

4. Application of Results

(List handbook chapters/special publications etc. to be affected by results of this project, if known. Explain how the results of the proposed project will be disseminated to HVAC&R industry and society in general. What are the practical benefits expected from this research?)

5. State-of-the-Art (Background)

(Description of the amount and quality of past research and quantify existing gaps.)

6. Advancement of the State-of-the-Art

(Quantitative estimate of the improvement expected from this research [i.e. x% energy reduction in product y or building type z, x% increase in heat transfer coefficient between y and z, or x% reduction in design time to do y, etc.], and explain why this information is needed by the public or by industry.)

7. Justification and Value to ASHRAE

(Identification by number, profession, or industry the ASHRAE members who will benefit. State the likelihood and how the improvement would be adopted by industry.)

8. Objectives - A paragraph describing what this URP intends to accomplish.

(Explanation of project's goals and how this project will accomplish its intended advancement to the state-of-theart [i.e. a computer simulation will be used to do x, a computer simulation will be developed for x and verified using laboratory data from tests y and z, field test data will be obtained from x and used to do y].)

9. Scope/Technical Approach

(Provide a complete description of technical approach and task statement. Describe the parameters of the research project, including such items as: subject matter to be explored; materials, equipment, literature or other variables to be researched; materials, equipment, etc. to be excluded from the project; outline the research methods to be used; description of the standards to be followed; discussion of how the data is to be reduced, analyzed and presented; description of the format for the reported results; if appropriate, describe project phases.

It is important for the scope of a research project to be broken down into tasks or phases, where a task will yield results of interest to the TC/TG/MTG/SSPC and the Project Monitoring Subcommittee (PMS), or where the results of a task will significantly define how subsequent tasks will be carried out. Make sure that the project objectives are reflected in the tasks. The URP should specify deliverables corresponding to these tasks in the "Deliverables" section to facilitate project monitoring by the PMS.)

10. Deliverables

(Insert generic ASHRAE requirements listed below plus any project specific requirements.)

Progress, Financial and Final Reports, Research or Technical Paper(s), and Data shall constitute the only deliverables ("Deliverables") under this Agreement and shall be provided as follows:

a. Progress and Financial Reports

Progress and Financial Reports, in a form approved by the Society, shall be made to the Society through its Manager of Research and Technical Services at quarterly intervals; specifically, on or before each January 1, April 1, June 10, and October 1 of the contract period.

Furthermore, the Institution's Principal Investigator, subject to the Society's approval, shall, during the period of performance and after the Final Report has been submitted, report in person to the most applicable Technical Committee/Task Group (TC/TG or Committee) at the annual and winter meetings, and be available to answer such questions regarding the research as may arise.

b. Final Report

A written report, design guide, or manual, (collectively, "Final Report"), in a form approved by the Society, shall be prepared by the Institution and submitted to the Society's Manager of Research and Technical Services by the end of the Agreement term, containing complete details of all research carried out under this Agreement. Unless otherwise specified, six copies of the final report shall be furnished for review by the Society's Project Monitoring Subcommittee (PMS).

The Final Report shall include an Executive Summary of approximately 800 words that includes the need that initiated the project, a brief description of the technical approach, the results and how the results will benefit the industry and/or the public.

Following approval by the PMS and the TC/TG/MTG/SSPC, in their sole discretion, final copies of the Final Report will be furnished by the Institution as follows:

- An executive summary in a form suitable for wide distribution to the industry and to the public.
- Two bound copies
- One unbound copy, printed on one side only, suitable for reproduction.

paper(s) shall conform to the instructions posted in "Manuscript

- Two copies on disk or CD-ROM; one in PDF format and one in Microsoft Word.
- c. Science and Technology for the Built Environment or ASHRAE Transactions Technical Paper One or more papers shall be submitted first to the ASHRAE Manager of Research and Technical Services (MORTS) and then to the "ASHRAE Manuscript Central" Website-based manuscript review system in a form and containing such information as designated by the Society suitable for publication. The papers should be submitted as either Research Papers for Science and Technology for the Built Environment or Technical Paper(s) for ASHRAE Transactions. Research papers contain generalized results of long-term archival value, whereas technical papers are appropriate for applied research of shorter-term value, ASHRAE Conference papers are not acceptable as deliverables from ASHRAE research projects. The

Central" for an ASHRAE Transactions Technical or Science and Technology for the Built Environment paper. The paper title shall contain the research project number at the end of the title in parentheses, e.g., (xxxx-RP).

Note: A research or technical paper describing the research project must be submitted after the TC has approved the Final Report. Research papers may also be prepared before the project's completion, if it is desired to disseminate interim results of the project. Contractor shall submit any interim papers to MORTS and the PMS for review and approval before the papers are submitted to ASHRAE Manuscript Central for review.

d. Data

The Institution agrees to maintain true and complete books and records, including but not limited to notebooks, reports, charts, graphs, analyses, computer programs, visual representations etc., (collectively, the "Data"), generated in connection with the Services. Society representatives shall have access to all such Data for examination and review at reasonable times. The Data shall be held in strict confidence by the Institution and shall not be released to third parties without prior authorization from the Society, except as provided by GENERAL CONDITION VII, PUBLICATION. The original Data shall be kept on file by the Institution for a period of two years after receipt of the final payment and upon request the Institution will make a copy available to the Society upon the Society's request.

e. Project Synopsis

In addition to the approximately 800-word summary in the final report, Contractor will prepare a written synopsis totaling approximately 100 words in length and written for a broad technical audience. The synopsis shall document 1. Main findings of research project, 2. Why findings are significant, and 3. How the findings benefit ASHRAE membership and/or society in general. The synopsis shall be submitted to the MORTS by the end of the Agreement term for publication in ASHRAE Insights and on the Research Page of the ASHRAE Website (for keyword searches but Internet users).

The Society may also request the Institution submit a technical article suitable for publication in the Society's ASHRAE Journal. This is considered a voluntary submission and not a Deliverable. Technical articles shall be prepared using dual units; e.g., rational inch-pound with equivalent SI units shown parenthetically. SI usage shall be in accordance with IEEE/ASTM Standard SI-10.

(The above deliverables are necessary, but not sufficient, to monitor a research project. The PMS and the sponsoring TC have the responsibility to review the contractor's on-going activities and intermediate results, to ensure that the methods used, and results obtained will be valid and well-enough substantiated to be labeled as "ASHRAE-approved findings." Proper oversight cannot wait until the final report, when most of the budget has already been expended.

Therefore, each major task or phase of the research method outlined in the Scope should also be linked to a deliverable report, memorandum, or summary. These in-progress deliverables should not add to the cost of the project, as they will most likely become chapters of the final report. However, they should help the TC avoid unpleasant surprises due to the research not being conducted according to the TC's expectations. Examples of deliverables that could be required during the project include:

- If one task is a literature review, then the deliverable could be an annotated list of references and conclusions/summary of the current state of the art.
- If the contractor must propose specific sites (e.g., buildings), experiment topologies (e.g., duct configurations), materials (e.g., refrigerants, appliances, insulation or building materials), experiment protocols, and/or instrumentation, then short memos describing those proposed methods, materials, etc. should be deliverables to be reviewed and approved by the PMS before moving on to the next research task.
- If analysis of preliminary data or results will decide how to proceed (e.g., CFD models of 12 duct configurations will be used to select 2 duct configurations to be built and subjected to wind tunnel tests), then the contractor should write up the results of the initial analysis, recommend the areas for further more detailed investigation, and justify those recommendations.
- If data from the research are expected to modify or update a Handbook table, then the procedure for developing the updated table from the data should be specified and provided to the PMS as a deliverable. (The final report may also require the contractor to prepare a proposed updated table based on the observed data.)

In short, the technical approach for a research project should be broken down into tasks or phases, and where a task will yield results of interest to the TC and the PMS, or where the results of a task will significantly define how subsequent tasks will be carried out. The URP should specify such intermediate deliverables for the PMS to review. This approach will make it easier for the PMS and MORTS to gauge progress and technical merit of on-going ASHRAE research projects and will provide a framework for the cognizant TCs to provide technical oversight and assistance to identify and correct problems as they occur.)

11. Schedule

Provide a description of Critical Project Milestones and the likely month of completion based upon project's duration. List for example major project intermediate deliverables such as a completed literature review or the availability of initial test results or major project events such as the completion of the test fixture or access granted to field site as a critical project milestone that could have a significant negative impact on the overall project if missed or significantly increase the risk that the project will fail and in what month it is likely to expect completion of the critical project milestone based upon the contractor's estimated duration of the project

12. Costs

Detail breakdown of expenses into categories and itemized list of equipment, travel, subcontracts, and other direct expenses; Timing of expenditures; Description of cost sharing of proposing organization or others.

13. Personnel

Education, experience and expertise of researchers that qualifies them to perform the work.

14. References

List references cited in the proposal.

A copy of the URP, containing a completed "Application for Grant of Funds" form, should be submitted to the Manager of Research & Technical Services (MORTS), who will then distribute it to the appropriate research liaison for review and evaluation.

The Research Administration Committee (RAC) normally meets in late June and late January of each year, so URP's should be submitted by mid-May or by mid-December to be considered for the next meeting. The results of the reviewing committees' actions will be made known to the project proposer by mid-February or mid-July. Proposals should be submitted to:

MANAGER OF RESEARCH & TECHNICAL SERVICES ASHRAE 180 Technology Parkway, Peachtree Corners, GA 30092 <u>MORTS@ashrae.net</u>

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UNSOLICITED RESEARCH PROPOSAL (URP) DISCLOSURE ACKNOWLEDGEMENT

- ASHRAE recognizes the need to encourage innovative research proposals which address the needs of ASHRAE members and society in general. In order to be considered for funding, URPs should fall within the general research goals of the Society but not overlap significantly with ongoing or planned research activities of individual TC (or TG, MTG w/research authority, SSPCs or other committees authorized to sponsor research projects). Unique and innovative projects that cut across research activities within different TCs are especially welcomed.
- 2. URPs will be accepted only with the understanding that they are non-confidential, although every attempt will be made to respect the proprietary nature of the proposal. This non-confidentiality will permit, if need be, a modification of the URP into a Work Statement which better meets the needs of the Society and which may be distributed as part of a Request for Proposal to numerous researchers for competitive bidding.
- 3. If a URP is received which addresses a topic already contained in the ASHRAE Research Implementation Plan or under development within a TC, the URP will be returned to the proposer with an explanation as to its status in the Research Implementation Plan or applicable TC research plan unless the interests of the Society are better served by its consideration.
- 4. If the URP is considered for funding, then the Research Activities Committee (RAC) will be responsible for managing the evaluation process.
- 5. Unsolicited proposals will only be accepted by the Society upon receipt of a signed acknowledgment of this Procedure.

I have read and understand the above policy on disclosure of Unsolicited Research Proposals (URPs) submitted to ASHRAE

Signed: Principal Investigator	Date:	
Printed Name and Title:		
Signed: Authorized Representative of Proposing Institution	Date:	
Printed Name and Title:		
Institution (if applicable):		
Title of Proposal:		

7.4 ASHRAE Innovative Research Grant Program

Purpose:

The ASHRAE Innovative Research Grant was established to provide seed funding for novel research deemed to have the potential to significantly advance the state-of-the-art in heating, ventilating, air-conditioning and refrigeration engineering. The idea is to encourage out-of-the-box research to complement the research proposed and guided by technical committees.

Description of the Grant:

The award carries a base grant of \$50,000 per year for two years, with an additional \$25,000 available in the third year if it is matched by an industrial contributor. The maximum award from ASHRAE would be \$125,000 and the maximum available to the recipient would be \$150,000. The industrial support must be from industries engaged in activities related to ASHRAE's areas of interest.

The intent is to fund one (1) award each year subject the following conditions:

- Suitability of Proposals A competitive process will be used to evaluate research proposals. If, each year, there are no proposals that meet the criteria for the award, an award will not be made.
- Funding Constraints The amount of research funding available for initiating new research projects is highly variable from one year to the next. When research funds are limited, ASHRAE's Research Administration Committee (RAC) may opt to forego requesting proposals for this grant.

The grant will have very little oversight from ASHRAE and is intended to enable the investigator to perform enough work to complete an initial evaluation of the feasibility of a new concept, process, methodology, technology, etc. Projects producing promising results could lead to additional research on a larger scale through a URP or a TC-sponsored RTAR and work statement.

Selection Process:

A two-phase process managed by RAC will be used to select grant awardees. The initial phase will entail the evaluation of pre-proposals consisting of a two-page whitepaper and a two-page curriculum vitae for the principal investigator. Pre-proposals will be invited once a year when funding is adequate to support the award. The evaluation of pre-proposals will be organized through RAC's Research Planning Subcommittee and will be performed in conjunction with the RAC Fall meeting held each year.

Full proposals will be invited from five or fewer individuals each year, and the possibility exists that there will be no invited full proposals if the pre-proposals fail to identify a project of enough novelty and merit. Evaluation of the full proposals will be organized through RAC's Research Activities Subcommittee and will be performed in conjunction with the RAC Spring meeting each year. As in the case of the pre-proposals, the possibility exists that all the invited full proposals could be rejected, in which case there would be no grant awarded in that particular year.

Selection Criteria:

The criteria for selecting projects for funding consists of the following: 1) novelty of the research; 2) importance of the problem; 3) potential for success; 4) student involvement; and 5) cost sharing.

Schedule:

Pre-proposals are due August 15 and should be submitted to ASHRAE's Manager of Research & Technical Services, 180 Technology Parkway, Peachtree Corners, GA 30092. Full proposals are due March 15.

8. RESEARCH AGREEMENT

Once a project, from whatever source, has been approved for funding, the Principal Investigator is notified and sent a sample of the standard ASHRAE Research Agreement. (See attached copy – the latest approved version of the agreement can be found in Appendix A of the RAC Manual of Procedures and on the "Research" page of the ASHRAE website.) This gives the institution the opportunity to object to any provisions. In the few instances where objections have been raised, they have usually been easily negotiated.

After 2 to 3 weeks, if no objections are received or when objections have been resolved, a final copy of the research agreement is prepared for the specific project listing the cost, payment schedule, report schedule and list of deliverables. Two copies are signed by the President and Executive Vice-President of ASHRAE and forwarded to the institution. Upon receipt of a copy signed by authorities of the institution, the initial payment is made, and the project begun.

Subsequent payments are made upon receipt of the quarterly progress reports, the final report (15% of total contract) and upon receipt and acceptance of all deliverables (10% of total contract).

RESEARCH AGREEMENT

This Research Agreement (the "Agreement") with an effective date of XXX is between American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., (the "Society") with a principal place of business at 1791 Tullie Circle, NE, Atlanta, GA 30329 and (the "Institution") XXX, with a principal place of business at XXXX.

Whereas, the Society has indicated a desire to undertake a research project relating to "XXX; and,

WHEREAS, the Institution represents that they have the necessary knowledge, expertise and capability to perform the Services;

NOW, THEREFORE, the parties hereto, in consideration of the mutual promises and undertakings herein contained do thereby mutually promise and agree as follows:

ARTICLE I - STATEMENT OF WORK

The Institution shall perform the Services described in the proposal entitled, "XXX)," dated XXX. The proposal is hereby made a part of this Agreement by reference and designated Appendix A.

ARTICLE II - TYPE OF AGREEMENT

This Agreement shall be a fixed sum contract in the amount of \$XXX which shall include, but not necessarily be limited to: actual direct labor, materials, travel, subcontracts, employee benefits, general and administrative expenses and overhead, as specified in the proposal.

ARTICLE III - PERIOD OF PERFORMANCE

The period of performance shall be from XXX to XXX unless terminated at an earlier date pursuant to the general provision of GENERAL CONDITION IX, TERMINATION, or extended to a later date in accordance with GENERAL CONDITION V, CHANGES IN SCOPE OF SERVICES.

ARTICLE IV - PAYMENTS

During the period of performance, the Society agrees to pay the sum of \$XX to the Institution in [(A)] equal installments of \$[B]. The first installment shall be paid on or within thirty days after the execution of the Agreement. Subsequent payments shall be made within thirty days of the Society's acceptance of Progress and Financial Reports described in GENERAL CONDITION IV, DELIVERABLES, during the term of the Agreement. In addition, a payment of \$XX shall be made contingent upon submission of the Final Report described in GENERAL CONDITION IV, and the final payment of \$XX shall be made contingent upon completion of all Services, the acceptance of the Final Report and the receipt of the Research or Technical Paper described in GENERAL CONDITION IV.

Payment of each installment, except the first and final two, shall be contingent upon receipt and acceptance, in the Society's sole discretion, of the Progress Reports described in GENERAL CONDITION IV.

ARTICLE V - COMPLETE AGREEMENT

This Agreement plus the attached GENERAL CONDITIONS I through XVII constitute the complete agreement of the parties hereto with respect to the Services listed herein and supersedes all prior statements oral or written. This Agreement may be modified only by mutual written agreement of the parties.

IN WITNESS WHEREOF, the said parties have caused their corporate names and seals to be affixed hereto by the duly authorized officers.

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

Name:	Name:
Date:	Date: Jeff H. Littleton
Title: President	Title: Executive Vice President
(Seal)	
INSTITUTION	
Name:	
Date:	
Title:	
(Seal)	
GENERAL CONDITIONS

GENERAL CONDITION I - WORK PERFORMANCE

The Institution shall perform the Services by the utilization of its best efforts, in a workmanlike manner by qualified personnel, in accordance with standard scientific and technical procedures, and practices.

GENERAL CONDITION II - LIMITATION OF OBLIGATION

Neither party shall be obligated to incur costs (excluding any previously agreed to shared amount) beyond those shown in ARTICLE II, unless agreed to in writing by the parties.

GENERAL CONDITION III - DISBURSEMENTS

The Institution agrees that disposition of the funds paid them for the Services shall be generally in accordance with that outlined in the Application for Grant of Funds previously submitted by the Institution and attached hereto. No expenditures in excess of \$1,000.00 beyond that so defined in the proposal shall be made for equipment or supplies except on written approval by the Society's Manager of Research and Technical Services.

GENERAL CONDITION IV - DELIVERABLES

Progress, Financial and Final Reports, Research or Technical Paper(s), and Data shall constitute the only deliverables ("Deliverables") under this Agreement and shall be provided as follows:

a. Progress and Financial Reports

Progress and Financial Reports, in a form approved by the Society, shall be made to the Society through its Manager of Research and Technical Services at quarterly intervals; specifically, on or before each January 1, April 1, June 10, and October 1 of the contract period.

Furthermore, the Institution's Principal Investigator, subject to the Society's approval, shall, during the period of performance and after the Final Report has been submitted, report in person to the sponsoring Technical Committee/Task Group (TC/TG) at the annual and winter meetings, and be available to answer such questions regarding the research as may arise.

b. Final Report

A written report, design guide, or manual, (collectively, "Final Report"), in a form approved by the Society, shall be prepared by the Institution and submitted to the Society's Manager of Research and Technical Services by the end of the Agreement term, containing complete details of all research carried out under this Agreement. Unless otherwise specified, six copies of the final report shall be furnished for review by the Society's Project Monitoring Subcommittee (PMS).

Following approval by the PMS and the TC/TG, in their sole discretion, final copies of the Final Report will be furnished by the Institution as follows:

- An executive summary in a form suitable for wide distribution to the industry and to the public.
- Two bound copies
- One unbound copy, printed on one side only, suitable for reproduction.
- Two copies on CD-ROM; one in PDF format and one in Microsoft Word.
- c. Science and Technology for the Built Environment or ASHRAE Transactions Technical Papers

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One or more papers shall be submitted first to the ASHRAE Manager of Research and Technical Services (MORTS) and then to the "ASHRAE Manuscript Central" website-based manuscript review system in a form and containing such information as designated by the Society suitable for publication. Papers specified

as deliverables should be submitted as either Research Papers for Science and Technology for the Built Environment or Technical Paper(s) for ASHRAE Transactions. Research papers contain generalized results of long-term archival value, whereas technical papers are appropriate for applied research of shorter-term value, ASHRAE Conference papers are not acceptable as deliverables from ASHRAE research projects. The paper(s) shall conform to the instructions posted in "Manuscript Central" for an ASHRAE Transactions Technical or Science and Technology for the Built Environment papers. The paper title shall contain the research project number (XXXX-RP) at the end of the title in parentheses, e.g., (XXXX-RP).

All papers or articles prepared in connection with an ASHRAE research project, which are being submitted for inclusion in any ASHRAE publication, shall be submitted through the Manager of Research and Technical Services first and not to the publication's editor or Program Committee.

d. Data

Data is defined in General Condition VI, "DATA"

e. Project Synopsis

A written synopsis totaling approximately 100 words in length and written for a broad technical audience, which documents 1. Main findings of research project, 2. Why findings are significant, and 3. How the findings benefit ASHRAE membership and/or society in general shall be submitted to the Manager of Research and Technical Services by the end of the Agreement term for publication in ASHRAE Insights

The Society may request the Institution submit a technical article suitable for publication in the Society's ASHRAE JOURNAL. This is considered a voluntary submission and not a Deliverable. Technical articles shall be prepared using dual units; e.g., rational inch-pound with equivalent SI units shown parenthetically. SI usage shall be in accordance with IEEE/ASTM Standard SI-10.

GENERAL CONDITION V - CHANGES IN THE SCOPE OF SERVICES

The Society or the Institution may, at any time, by written request suggest changes to the scope of Services, including but not limited to (a) revising, adding or deleting from the Services, or (b) revising the period of performance. Such request will be incorporated into this Agreement by mutual consent in writing. If any changes in the Scope of Services result in an increase or decrease in the total cost for the Services, the fixed sum described in ARTICLE II will be adjusted before such change becomes effective.

GENERAL CONDITION VI - DATA

The Institution agrees to maintain true and complete books and records, including but not limited to notebooks, reports, charts, graphs, analyses, computer programs, visual representations etc., (collectively, the "Data"), generated in connection with the Services. Society representatives shall have access to all such Data for examination and review at reasonable times. The Data shall be held in strict confidence by the Institution and shall not be released to third parties without prior authorization from the Society, except as provided by GENERAL CONDITION VII, PUBLICATION. The original Data shall be kept on file by the Institution for a period of two years after receipt of the final payment and upon request the Institution will make a copy available to the Society upon the Society's request.

GENERAL CONDITION VII - PUBLICATION

The intent of the parties is to make the results of the Services available to, and for the benefit of, the public. In view of their financial support of the Services, the Society shall own the exclusive rights to publication of all Data, Research or Technical Papers, Progress, Financial and Final Reports resulting from the project for the shortest of the following periods:

a. Until the Society gives the Institution written permission to publish the results, or

- b. Until the Research or Technical Paper described in GENERAL CONDITION IV, DELIVERABLES, is published, at which time the paper or derivative paper based on data resulting from the Services, may be published by the Institution with acknowledgement to the Society, or
- c. Until the period of one year has passed from the submission of said Research or Technical Paper to the Society at which time the paper or derivative paper based on data resulting from the Services, may be published by the Institution with acknowledgement to the Society,

Prior to publication by either party, the Institution may catalog and place theses or reports of the Services in the Institution's library for research and reference purposes.

The cooperative character of the investigation shall be recognized in each text, on the title page or on the cover of the Final Reports, Research or Technical Papers or other published accounts of the Services by including the following annotation: "Results of Cooperative Research between the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., and [Name of Institution]."

Prior to the Institution's offering for sale or distribution any book, manual, guide, software, or other such product of commercial value created in connection with the Services, the Institution and/or the Principal Investigator shall enter into a royalty or publication agreement with the Society.

The Institution may not use the ASHRAE name or logo in any manner which may imply the Society's endorsement of any publication or software resulting from the Services without prior written permission from the Society.

GENERAL CONDITION VIII - PATENTS

The Institution agrees to promptly disclose any patentable or copyrightable inventions resulting from the Services to the Society and will assist the Society in seeking a patent(s) with respect to such inventions. Alternatively, the Society may permit the Institution to seek a patent provided: (i) the Institution executes all documents necessary to obtain such patent; (ii) the Institution grants to the Society, a worldwide, non-exclusive, irrevocable, sub-licensable, royalty-free license use for any purpose, the patented work; and (iii) the Institution shares its net income from such patent(s) with the Society in the portions 40% to the Society and 60% to the Institution.

GENERAL CONDITION IX - TERMINATION

The Society shall have the right to terminate this Agreement upon 30 days' notice in writing to the Institution for any reason. If the Society exercises this termination right, the Institution agrees to stop all work to the extent specified in the notice and incur no further expenses beyond those authorized in such notice.

Likewise, the Institution shall have the right to terminate this Agreement upon 30 days' notice in writing to the Society for any reason. If the Institution exercises this termination right, the Institution agrees to stop all work immediately upon the date notice is given, except to the extent authorized by the Institution.

In the event of termination by either party, the Society will determine, in consultation with the Institution, the portion of the fixed sum earned to the date of termination. The Institution agrees, upon the Society's request, to complete the portion of the Services initiated prior to the notice of termination The Society will pay the Institution for such Services and any agreed upon expenses up to the fixed sum of the Agreement stated in Article II, "TYPE OF AGREEMENT." Expiration, cancellation or termination of the Agreement under any circumstances will in no way be construed as a restriction, limitation or waiver of either party's rights to pursue any additional remedy (ies) at law or equity.

GENERAL CONDITION X - KEY PERSONNEL

The Institution agrees to assign the persons listed in the proposal to perform the Services for the time period and at the level of activity stated in the proposal. Should, for any reason, one or more of these persons be unavailable to carry out the assignment, the Institution shall, with prior approval of the Society, replace them with a person(s) of equal abilities and qualifications.

GENERAL CONDITION XI - STATUS, ASSIGNMENT

The Institution's status under this Agreement shall be that of an independent contractor and not that of an agent or employee. The Institution shall have no right or power to enter into any contract or commitment on behalf of the Society. The parties acknowledge that the identity and expertise of the Institution were and continue to be material circumstances upon which the Society relied in entering into this Agreement, and therefore this Agreement is not assignable by the Institution without the prior written consent of the Society.

GENERAL CONDITION XII - COPYRIGHT INFRINGEMENT

The Institution represents and warrants to the Society that any and all materials to be prepared under this Agreement for the Society do not and will not infringe upon the copyright, patent, or license or otherwise violate the proprietary rights of any person or entity. The Institution hereby agrees to indemnify and hold the Society harmless from and against all liability, loss, damage or injury and reasonable costs and expenses (including reasonable attorneys' fees and costs of any investigation or suit related thereto, and of any judgment under any such suit satisfying any claim described herein) arising from: (i) any misrepresentation by, or breach of the representations and warranties given by, the Institution herein, or from a breach of any covenant or warranty of the Institution contained in this Agreement, or from any misrepresentation in or omissions from any other instruments, or any breach of any covenant or warranty in any instrument, furnished or to be furnished by the Institution hereunder; or (ii) from any suit, action, proceeding, claim or investigation pending or threatened against or affecting the Institution or the Society which alleges any such infringement.

In the event there is such a claim, the Institution agrees to: (i) procure for the Society the continuing right to use of the material without restriction; (ii) replace the material which is the subject of an infringement claim with material of equal suitability, in the opinion of the Society, for the use to which the infringing material was used; or (iii) modify the material which is the subject of the infringement claim so that it is no longer subject to such a claim.

GENERAL CONDITION XIII - INSURANCE

The Institution hereby represents and warrants to the Society, and agrees hereby to furnish the Society with a certificate proving compliance therewith, that it is presently conducting its business so as to comply in all respects with all applicable statutes, ordinances, rules, regulations and orders of any governmental authority with regard to Workers' Compensation Insurance coverage. Such coverage may take the form of a certificate of workers' compensation or proof of self-insurance.

The Institution covenants and agrees to purchase and maintain, during the term of this Agreement Employer's Liability Insurance ("Insurance") in a minimum amount of One Million Dollars (\$1,000,000) for the injury or death of any one employee. The terms of such Insurance shall provide that the Society receive 30 days' written advance notice prior to the cancellation, termination, alteration or material change of any such Insurance coverage.

The Institution shall, at its own expense, purchase and maintain during the performance of this Agreement, Comprehensive Automobile Liability and Comprehensive General Liability Insurance with coverage and in such minimum amounts as provided below:

- 1. Comprehensive Automobile Liability insurance shall include coverage for owned, hired and non-owned vehicles and shall not be in an amount less than Three Hundred Thousand Dollars (\$300,000) combined single limit for any one occurrence.
- 2. Comprehensive General Liability insurance shall include coverage for personal injury, bodily injury and property damage for Premises-Operations, and Products/Completed Operations Hazard. The amount of such insurance shall not be in an amount less than One Million Dollars (\$1,000,000) combined single limit for any one occurrence.

All insurance policies referred to herein shall include, by endorsement to the policy(ies), the Society as an "additional insured." The Institution shall incur the cost of any and all premiums and endorsements related to all types of insurance described herein.

Evidence of the coverage for each type of insurance described herein shall state that coverage provided is primary and is not excess or contributing with any insurance or self-insurance maintained by the Institution.

The Society shall have the right to inspect or obtain a copy of the original policy(ies) of insurance. The Institution shall, if requested, furnish the required certificates and endorsements to the Society prior to commencing performance of the Services described herein. All insurance certificates, endorsements, cancellations, terminations, alterations and material changes of such insurance shall be issued and submitted to the following:

Manager of Research and Technical Services ASHRAE, Inc. 180 Technology Parkway Peachtree Corners, GA 30092

GENERAL CONDITION XIV - INDEMNIFICATION

In connection with any and all third-party actions, losses, claims, demands and damages arising in connection with the performance of this Agreement.

- A. The Society agrees to indemnify and hold harmless the Institution, from and against any and all losses, claims, demands, and damages that may arise by reason of any acts or omissions on the part of the Society, its agents or employees, in performance of this Agreement, and shall assume full responsibility for the defense thereof, and upon its failure to do so on upon proper notice, the Institution reserves the right to defend such action and to charge all costs to the Society.
- B. The Institution agrees to indemnify and hold harmless the Society, from and against any and all losses, claims, demands, and damages that may arise by reason of acts or omissions on the part of the Institution, its agents, employees, contractors and subcontractors, in performance of this Agreement, and shall assume full responsibility for the defense thereof, and upon its failure to do so on proper notice, the Society reserves the right to defend such action and to charge all costs to the Institution.

GENERAL CONDITION XV - REPRESENTATIONS

<u>Standard of Care</u>. The Institution represents that it is knowledgeable and experienced in research services and possesses the necessary expertise, facilities, and legal right to provide the Services contemplated hereunder. The Institution represents to the Society that the Services shall be performed in a workmanlike manner consistent with the standards of care, diligence, and skill ordinarily exercised by similar professional research institutions.

Laws and Regulations. The Institution represents and certifies that in the performance of the Services it is familiar with, understands and will comply with all applicable statutes, rules, regulations, orders, judgments, directives or other governmental requirements of the United States and of any state or political subdivision or of any foreign nation, jurisdiction, or subdivision where the Services will be conducted, including, without limit, licensing and certification requirements, laws and regulations designed to protect human and animal test subjects, environmental laws, health and safety laws, worker health and safety laws pertaining to labor wages, hours and other conditions of employment. The Institution shall obtain and/or will obtain all permits, licenses, or other forms of documentation required to provide the Services for the Society in compliance with said laws. The Institution shall furnish the Society with certification of compliance with applicable permits and licenses prior to performing the Services. Where appropriate, the Institute shall certify that it complies with all the Department of Health and Human Services (National Institute of Health [NIH]) guidelines regarding use of human and animal subjects in research and that an approved animal or human subjects Board has assured compliance for the Services.

GENERAL CONDITION XVI - WARRANTY

The Institution warrants that all Services performed under this Agreement shall conform to the specifications described in the proposal referenced in Article I, Statement of Work, and the Society shall provide the Institution notice of any non-conformance as soon as practicable after discovery of such non-conformance. Institution shall promptly correct, at no additional charge to Society, any such non-conformance caused in material part by the Institution's acts or omissions.

GENERAL CONDITION XVII - MISCELLANEOUS

a. Notices. All notices or other communications required to be given hereunder must be in writing and delivered either personally, by facsimile with electronic confirmation, by overnight courier or by U.S. mail, certified, return receipt requested, postage prepaid, and addressed as provided in this Agreement or as otherwise requested in writing by the receiving party. Notices delivered personally will be effective upon delivery and notices delivered by facsimile, overnight courier or U.S. mail will be effective upon their receipt by the party to whom they are addressed.

If to Society:

ASHRAE, Inc. 180 Technology Parkway, Peachtree Corners, GA 30092 Attn: Michael Vaughn

If to Institution:

XXXXX XXXXX XXXXX

- b. Governing Law. This Agreement will be governed by and construed and enforced in accordance with the laws of the State of Georgia, without regard to any conflicts of laws principles applied in that state.
- c. Severability. In the event any provision of this Agreement or any part thereof is declared invalid or unenforceable by a final judgment or decree of a court of competent jurisdiction from whose decision no appeal is taken, or a decree of a competent governmental agency, all other sections, provisions and parts of this Agreement, and the application of such provision in any other circumstances, shall remain in full force and effect.

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

Name:

Jeff H. Littleton

Date:

Title: Executive Vice President

INSTITUTION

Name:

Date:

Title:

9. PROJECT MONITORING

Monitoring and technical evaluation of the work being accomplished is the responsibility of the TC (or TG, MTG w/research authority, SSPC or another authorized committee) sponsoring the project. This is assigned to the Project Monitoring Subcommittee (PMS) named by the TC and approved by the Research Liaison.

The PMS is guided in their efforts by the "Instructions for Project Monitoring Subcommittee" (see copy following).

Minutes should be taken at all PMS meetings and copies distributed to the members, the TC Chair, the Research Liaison and the Manager of Research and Technical Services (MORTS). These individuals should also receive copies of any PMS correspondence in their capacity as ex-officio members of the PMS.

If in the opinion of the PMS, the principal investigator for the project is not performing as expected (e.g., missed <u>Critical Project Milestone specified for project</u>, or unresponsive to PMS, etc.) the RP Alert form should be used to notify the MORTS as soon as possible (see copy attached).

At the conclusion of the project, the PMS shall prepare and submit a "Disposition of ASHRAE Sponsored Research Results" form to the MORTS (See Section 10).

9.1 Instructions for Project Monitoring Subcommittee

Purpose:

The purpose of the Project Monitoring Subcommittee (PMS) is to provide direction to the contractors, and provide recommendations and guidance to the TC (or TG, MTG w/research authority, SSPC or other committees authorized to sponsor a research project) members relative to their decisions, and actions in carrying out a research project.

Scope:

Inclusions - The scope of these instructions applies to ASHRAE Research and Technical Projects.

Exclusions - The scope of these instructions does not include provisions for ASHRAE Special Projects as covered in either the Policy or Procedures for ASHRAE Special Projects or Manual of Procedures for Technology Council Special Projects Committee.

Members:

Typically, at least three (3) members, but not more than five (5) including a PMS Chair, shall be nominated by the Chair of the sponsoring TC to form the PMS. The procedure for nominating and approving PMS members is the same as that for the members of Proposal Evaluation Subcommittee (PES), including provisions for nominating members of the PMS when the TC Chair is a possible bidder (see Section 6.2). No individual who bid on a project, or who is a member of an organization that bid on a project (whether successfully or unsuccessfully), may serve on the PMS of that project. It is desirable, but not required, that PMS members should be members of the PES. Appointments to the PMS are subject to the approval of the Research Liaison.

If a project has co-funding from non-ASHRAE organization (such as AHRTI, CIBSE, USGBC, etc.) then the Manager of Research and Technical Services (MORTS) will appoint a representative from that organization to also be a member of the PES and PMS.

The PMS shall be tentatively appointed prior to initial submittal of proposed Work Statements to the Manager of Research and Technical Services (MORTS) and finalized prior to initiation of the project contract.

The MORTS and the Research Liaison shall be *ex officio*, non-voting members of the PMS and shall receive copies of all PMS correspondence.

Monitoring:

The PMS is responsible for maintaining close contact with the contractor and providing necessary direction to accomplish the stated objective(s) of the project, within the limitations of the budget and the Work Statement. This includes the technical editing of any resultant Special Publications, assisting with review and editing of Research or Technical Papers and recommending acceptance of the product of the project.

The PMS shall report to the TC as required to conform to the purpose of this subcommittee.

The ASHRAE staff is the primary coordinator and financial manager of the project, including:

- Receiving invoices from the contractor and arranging timely payments.
- Preparing records on the technical progress of the project and relaying technical reports to the appropriate chair of committee.
- Undertaking detailed editing of publications and arranging for publication.
- Securing approvals as required.
- Providing periodic financial data in appropriate financial reports.
- Negotiating the contract and any potential modifications to it with contractor

Deliverables:

The deliverables will be clearly identified in the Work Statement accompanying the RFP and in the contract.

Quarterly Technical Progress Reports, which is one category of deliverable, are required every 3 months. PMS Chair needs to submit a summary of the technical progress report

Financial and management reports are required and are submitted with the Technical Progress Report.

The PMS must review these periodic reports. If the PMS does not agree with the progress, as reported by the Contractor, or if the PMS feels that there are some technical or project management issues that might affect the timely and successful completion of the project, <u>such as a missed Critical Project Milestone</u>, then it must notify the MORTS and Research Liaison of this, as soon as possible, providing descriptions of the causes for concerns and recommendations of specific actions the MORTS should take. The alert form shown below is recommended to be used for this purpose.

Missed Critical Project Milestone:

One or more Critical Project Milestones were identified in the project work statement by the sponsoring TC prior to being released for bid and the contractor was allowed to adjust the project month in which that milestone(s) would be reached in their proposal to ASHRAE.

If a Critical Project Milestone is missed by the contractor, the following steps will be taken:

- 1. PMS Chair will notify MORTS about the missed Critical Project Milestone as soon as possible.
- 2. MORTS will immediately notify RAC Research Liaison (RL) responsible to this project and flag project for close monitoring by RAC.
- 3. RL will meet with P.I. and PMS via web meeting, as soon as possible, in order to develop a corrective plan. MORTS in parallel will initiate a 3-month No-Cost-Extension (NCE) contract change order for the project with the contractor in order to allow for additional time to complete the Critical Project Milestone to the satisfaction of the PMS.
- 4. If after the three month contract extension the Critical Project Milestone is still not completed to the satisfaction of the PMS, a web meeting will be convened so that the P.I. & PMS can brief the full RAC or a subset of RAC on the project, the corrective plan, and progress to date. Based upon this meeting, RAC will decide if another NCE is needed or if the project should be terminated early and rebid.

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9.2 Optional Project Performance Alert Form

Project Information						
Project Number:	- RP				Date: Sponsoring	
Title:					TC/TG:	
Contractor: PMS Membership:						
Contract Period:	to					
Ratings						
		(5) = Poor	(4) = Fair	(3) = Satisfactory	(2) = Good	(1) = Excellent
Contract Statement of Compliance	of Work					
Comments:						
Work Quality						
Comments: Schedule Complianc (Missed CRP?)	e					
Comments:		_	_	_	_	_
Rate of Expenditures	5					
Comments:						
Communication/Rep	orting					
Responsiveness to F Concerns	PMS					
Comments:						

Overall Rating (average the rating numbers above): **CRP** – Critical Project Milestone Missed:

Concerns of PMS

Additional Comments:

Suggested Corrective Actions (please indicate if progress payments should be temporarily interrupted):

Verification of Alert

By signing this form, you confirm that you have discussed this review in detail with the other members of the PMS.

PMS Chair Signature

Date

9.3 PMS Procedures, Responsibilities & Reporting Forms

The final deliverable is a Final Report or a Manual, a Research or Technical Paper, a Special Publication, a journal article, or a combination of these. The final report must be approved by the PMS and by a vote of the sponsoring TC before the project is complete. Publication of any material prior to approval by the PMS and sponsoring TC is not allowed.

Procedures:

The PMS shall follow all procedures as outlined herein (Section 9 of the Research Manual). The PMS shall coordinate all procedures with the MORTS and Research Liaison.

All instructions and comments to the contractor should be made only by the PMS Chair, who speaks for the subcommittee.

The PMS is responsible for assuring the two-way flow of information so that the TC can make informed decisions relative to PMS recommendations.

In the event of dissatisfaction with contractor's performance, the PMS shall advise the MORTS and provide all supporting material and recommended action. In determining the recommended action to the MORTS, the PMS shall present their concerns and supporting materials to the sponsoring TC for consideration and input.

Research results contained in quarterly progress reports or delivered by the contractor in semi-annual presentation to the TC should be considered interim and tentative and should be kept confidential. Results should not be released or discussed outside of the TC until the final report is delivered and approved.

Meeting Requirements:

Project Monitoring Subcommittees shall meet at least twice annually, normally at Society meetings. More meetings may be scheduled as prudent project management may indicate.

Written Progress Reports:

Verbal reports to the TC are usually required at each winter and Annual Meeting by the PMS and/or the contractor. A written summary of this report shall be included in the TC minutes.

The PMS, at the completion of the project, shall review and, if necessary, edit the Contractor's approximately 800word Executive Summary from the final report. The final Summary should be suitable for publication in the *ASHRAE Journal* and *Insights*, describing the results of the project, its purpose and its application in simple to understand layman's language. The PMS, in cooperation with the sponsoring and co-sponsoring TC(s), shall prepare a Disposition of ASHRAE Sponsored Research Results Form, as described in Section

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Quick Summary of PMS Chair Responsibilities

Make sure your PMS membership and contact information match the paperwork provided by ASHRAE staff and MORTS. If the project has co-funding from an outside organization, make sure their representative is invited to all PMS meetings. Include your Research Liaison (RL) in all correspondence with the PMS, contractor, or MORTS.

Before each meeting make sure you have requested a room and a meeting time from ASHRAE Meetings staff so that your meeting is printed in the official schedule.

Review the Technical Progress Reports and Financial/Management Reports provided to you by ASHRAE staff. Use Optional Project Performance Alert Form to report any concerns or problems to MORTS.

If a Critical Project Milestone is missed by the contractor, notify MORTS about the missed Milestone as soon as possible.

Keep your TC informed about the project progress. The minutes of your PMS meeting should include a summary of your report to the TC.

When the project is complete make sure all deliverables are completed by the contractor. Make sure that the TC and contractor incorporates findings into the Handbook as defined in the original Work Statement. The PMS chair should work with the contractor to complete the Disposition of ASHRAE Research Form and send it to MORTS.

RESEARCH PROGRESS REPORT

1. Project Number and Title:

2. (a)*Contractual Completion Date:

(b)*Estimated Date of Final Report:

(Date)

(Date)

3. Sponsoring ASHRAE Technical Committee or Task Group

4. Research Institution:

5. Objective of Research:

6. Period of Report:

7. Summary of Activity including specific accomplishments, trends or conclusions (use additional sheets if needed)

8. Any condition(s) which affect the scheduled completion or cost of the project or which suggests a modification to the scope is reported on a separate sheet.

Such a sheet is _____ is not _____ attached.

(Signature of Principal Investigator)

(Typed Name and phone number of Principal Investigator)

Submit Copies of this Report to:

Manager of Research & Technical Services ASHRAE 180 Technology Parkway Peachtree Corners, GA 30092

E-mail: MORTS@ashrae.net

*If the date in (b) of #2 is <u>later</u> than that in (a), a no-cost extension request must be made to ASHRAE headquarters. *Noting a late completion date on this form does not automatically provide such an extension!*

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RESEARCH FINANCIAL REPORT

- A. Project Number and Title:
- B. Research Institution:
- C. Period Covered by Report:
 - 1.0 Total ASHRAE Funds Appropriated: \$_____
 - 2.0 Expenditures prior to period reported: \$_____
 - 3.0 Expenditures during period reported:
 - a) Professional Salaries: \$_____
 - b) Research Assistants: \$_____
 - c) Fringe Benefits: \$_____
 - d) Equipment: \$_____
 - e) Supplies & Materials: \$_____
 - f) Computer Costs: \$_____
 - g) Travel & Communications: \$_____
 - h) Special Expenses (explain below): \$_____
 - j) Indirect Costs: \$_____
 - k) TOTAL: \$_____
 - 4.0 Total expenditures to date: \$_____
 - 5.0 Balance of appropriated funds: \$_____
 - 6.0 Explanation of any Special Expenses:
 - 7.0 Statement of anticipated deviation from estimated fund requirements:
 - 8.0 Signature of Project Director:

Title: _____

Date: _____

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Submit _____ copies to: Manager of Research & Technical Services ASHRAE 180 Technology Parkway, Peachtree Corners, Georgia 30092 E-mail: <u>MORTS@ASHRAE.net</u>

10. PROJECT COMPLETION

The completion phase of a project is usually initiated by the submission of the draft of the final report (in some cases this may be a technical manual). The draft of the final report/manual (6 copies and electronic format) is sent to the Manager of Research and Technical Services (MORTS) who distributes copies to the PMS. The PMS reviews and evaluates the report and makes suggestions for corrections and revisions to the Principal Investigator. The PMS shall ensure that an Executive Summary of about 800 words that can be easily understood by a layperson is included in the Final Report. It should include information on project scope, results, and how this project has benefited ASHRAE, the industry and/or the general public.

The PMS comments on the draft final report are considered and incorporated into a final draft. The final draft is reviewed by the PMS and forwarded with a recommendation to the TC (or TG, MTG w/research authority, SSPC, or other authorized committee sponsoring the project) for a vote of approval. When the Principal Investigator feels that he/she has understood the sense of the PMS, he/she will prepare the Research or Technical Paper(s) required by the research agreement.

The paper is submitted first to the MORTS and then to the "ASHRAE Manuscript Central" website-based manuscript review system in a form and containing such information as designated by the Society suitable for publication. The paper should be submitted as either a Research Paper for Science and Technology for the Built Environment or Technical Paper for ASHRAE Transactions. Research papers contain generalized results of long-term archival value, whereas technical papers are appropriate for applied research of shorter-term value, ASHRAE Conference papers are not acceptable as deliverables from ASHRAE research projects. The paper(s) shall conform to the instructions posted in "Manuscript Central" for an *ASHRAE Transactions* or *Science and Technology for the Built Environment* paper. The paper title shall contain the research project number at the end of the title in parentheses, e.g., (99-9999-RP).

The final approved manuscript of the Final Report is furnished to the MORTS as follows:

- An executive summary in a form suitable for wide distribution to the industry and to the public.
- Two bound copies.
- One unbound copy, printed on one side only, suitable for reproduction.
- Two copies on disks; one in PDF format and one in Microsoft Word.

For those projects which the RAC feels have appeal to a wide audience, the RAC will recommend to the Editor of the ASHRAE Journal that a journal article be solicited describing the project and the results.

Following completion of all phases of the project, the Chair of the Project Monitoring Subcommittee will work together with the RAC Research Liaison to complete a form entitled "Disposition of ASHRAE Sponsored Research Results". The completed form together with the Executive Summary from the original approved Final Report will be submitted to the MORTS. This summary will be written so as to be easily understood by a layperson and shall include purpose of the project, its results and how the results may be applied for benefit to ASHRAE, the industry and the public. The TC may, if it desires, edit or modify the Contractor's Summary, with approval from the Contractor, as provided in the final report to make it more suitable for wide dissemination.

The TC shall also indicate on the form anticipated ASHRAE publications where the research results will be applied, including Handbook (specific chapters and table), standards, and special publications. It is suggested that the TC also reviews the RTAR and WS for the research, to see where application of the results was originally anticipated. The TC shall report to RAC and MORTS when the project's results are actually incorporated into these ASHRAE publications.

To assist the MORTS in disseminating the results of ASHRAE's research, the TC, PMS and Principal Investigator will list on the Disposition of ASHRAE Sponsored Research Results Form specific organizations, companies, associations, standards bodies, government agencies (local, state, federal, or foreign), universities, or individuals who should be notified directly of the completion of the research and receive the project Summary.

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DISPOSITION OF ASHRAE SPONSORED RESEARCH RESULTS

Sponsoring TC/TG/MTG/SSPC:		
Project Principal Investigator and Affiliation:		
Date Research Completed:		
Will research be reported in special publication:	Yes;	No.
If so, has Special Publications been contacted?	Yes;	No.
Should research results be included in ASHRAE Handbooks?	Yes;	No.
If so, what chapter(s) in what volume(s)?		
Should research results be included in an ASHRAE Standard?	Yes;	No.
If so, which Standard(s)?		
Will other industry affiliates use this research (ARI, USGBC, EPA, I	ESNA, etc.)? Yes	s; No. If so, which
Standards, guides or publications?		
To assist MORTS in disseminating the results of ASHRAE's rest associations, standards bodies, government agencies (local, state, who should be notified directly of the completion of the research a results. (Use additional sheet if necessary).	earch, list specific orga federal, or foreign), uni and receive a Summary	anizations, companies versities, or individuals / of the project and its
Please indicate if and how your responses above contrast to the original Wo	ginal plans to dissemina	te the research results e WS is available from

Please attach the Executive Summary of this project from the approved Final Report for this project (approximately 800 words). The Summary should include the need that, initiated the project, the scope the results and how the results will benefit the industry and/or the public. (NOTE: The TC/TG/MTG/SSPC may submit a Summary that is edited from the Summary in the Final Report if it so desires.)

Please complete form and send to:	Manager of Research and Technical Services ASHRAE 180 Technology Parkway Peachtree Corners, GA 30092 <u>MORTS@ashrae.net</u>	
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Manager of Research and Technical Services will send to Special Publications, Handbook and relevant TC's, TG's, MTGs and SSPCs for action.

11. DISSEMINATION OF RESULTS

The dissemination of results of a project and their wide acceptance and use is the ultimate goal of ASHRAE research. The actions in Section 10 on project completion describe how some of the dissemination is started. Those actions will result in one or more papers being published in Science and Technology for the Built Environment or *ASHRAE TRANSACTIONS*. Reprints of the paper will also be available to the public at an ASHRAE meeting at a nominal charge. The possibility also exists for a Research or Technical Paper to be made part of a TECHNICAL DATA BULLETIN. For those projects for which an *ASHRAE Journal* article is written the research results become available to all ASHRAE members.

A release to the trade press will be made following the completion of research projects. The release will include a short description of the project, the results and conclusions reached and information on how more detailed information can be obtained.

The sponsoring TC (or TG, MTGs w/research authority, SSPC or other committee authorized to sponsor a research project) should utilize the information generated in updating the HANDBOOK chapters for which they are responsible, and Standards Project Committees should use it in writing and revising their standards.

Some projects are designed specifically to result in the printing and distribution of a Special Publication in order to fill a void in the available literature. These projects are usually designated technical projects rather than research projects since they collect and organize information rather than generate new information.

The TC indicates on the Disposition of ASHRAE Sponsored Research Results Form the anticipated ASHRAE publications where the research results will be applied. The TC shall report to RAC and MORTS when the project's results are actually incorporated into these ASHRAE publications, and this shall be part of the RAC Research Report to the Society. RAC and MORTS shall monitor the TC's progress in incorporating the results into ASHRAE publications.

The Disposition of ASHRAE Sponsored Research Results Form also indicates entities that should be notified of the completion of the research project. The MORTS shall forward to all of these the Executive Summary from the Final Report.

The MORTS maintains a master copy of all Final Reports. Copies of the full report or portions of the report may be obtained from the MORTS at a nominal charge to cover the costs for reproduction and mailing.

Projects completed in the more recent past required the Final Report also be submitted in an electronic format. The Final Reports of these later projects are therefore also available for downloading in a PDF format.

The MORTS will forward to the Resource Promotion Committee, Chapter Technology Transfer Committee, and Technology Council the Executive Summary as well as an accounting of where the research information will be used to benefit the members (Handbook volumes and chapters, standards, or publications, with approximate dates). This will be used to assist in raising research promotion funds at the chapter level and monitoring the effectiveness of use of ASHRAE's research funds.

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APPENDIX 1: RESEARCH RELATED TO TECHNOLOGY TRANSFER

Research related to technology transfer projects takes one of three forms:

- 1. Applied technology development projects that are intended to come up with new or enhanced techniques for dissemination of research results, Handbook materials, standards, guidelines etc.
- 2. Tool-kit projects, which involve development and careful validation of libraries of algorithms and computer code for systems design and/or evaluation.
- 3. Preparation of Research Bulletins for:
 - A. Collection or collation of technical information on a subject (from the Handbook, research project reports, and other relevant sources) and synthesizing the source material into a single, relatively comprehensive resource book for use by design professionals, educators, etc., or
 - B. Preparation of User Manuals for ASHRAE Standards and Guidelines.

Documents of the type 3A should be designated as Research Bulletins while type 3B documents could be designated as Research Bulletins or User Manuals, as appropriate.

The Research Administration Committee (RAC) processes projects submitted by TC (or TG, MTGs w/research authority, SSPC and other committees authorized to sponsor research) for categories 1, 2, and 3A where no co-funding appears likely. Projects in category 3A where co-funding is available could be handled by a Special Projects Committee. 3A projects are submitted by a sponsoring TC or by other legitimate ASHRAE groups (standing committees, chapter groups, etc.) to the Manager of Research and Technical Services and RAC research liaison. Projects for User Manuals (3B) are originated by the subject SSPC or SPC (or the cognizant TC/TG/MTG) and forwarded to the Standards Committee (StdC) for handling through Special Projects or StdC as appropriate. All category 3 projects are carefully reviewed at the Work Statement stage to assure RAC or StdC, Technology Council and the Board of Directors (BOD) that:

- a) The work is too extensive for a volunteer effort; and
- b) A well-prepared outline exists, and a well-balanced committee will review proposals and monitor the work to assure that a useful document result.

If category 3B projects represent a considerable drain on the Research Fund, additional resources should be sought through one of the following means:

- 1) That the Director of Technology (DOT) solicit outside funding;
- That Publishing Council be asked to provide funds to assist in preparation and printing of User Manuals, with the balance of ASHRAE funds to come from additional Exposition Income (see #3 just below) or from the Research Fund; or
- 3) That Technology Council petitions the BOD for additional Exposition income.

APPENDIX 2: RECOMMENDED METHODOLOGY FOR PROJECTS WITH FIELD MONITORING

Prepared by: Technical Committee 7.6, System Energy Utilization

Introduction

Many of ASHRAE's sponsored research projects involve the field monitoring of building energy systems. The data collected through these projects are very important and are often used to support ASHRAE Handbook chapters prepared by the Technical Committees. The TC 7.6 Subcommittee on Building Monitoring has sponsored several Forums on the topic of methodology for field monitoring projects. A recurring suggestion by participants has been to disseminate information within ASHRAE on procedures for the effective design of field monitoring projects. This Appendix offers recommendations to Technical Committees interested in commissioning sponsored research projects involving building field monitoring.

How to Use the Recommendations

Field monitoring projects can be problematic and troublesome. At the first National Workshop on Field Data Acquisition for Building and Equipment Energy Use Monitoring, (Dallas, TX, October 1985), both practitioners and data users identified the major cause of these problems as the lack of procedures for monitoring project planning and execution.

To remedy this problem, a sequence of planning activities that is applicable to nearly all projects of this type has been developed, as well as ASHRAE Guideline 14-2002, *For Measurement of Energy and Demand Savings*. Since each research project is different in terms of goals, objectives and data product requirements, the details of implementing this procedure will vary by project. However, use of this recommended methodology and Guideline 14 should ensure that all project design parameters are considered.

These recommendations can be used by ASHRAE Technical Committees in two ways. First, TCs and/or their research subcommittees can use this Appendix as a guide for preparing RFPs for sponsored research. The protocol will aid in specifying the requirements for the field monitoring portions of the project. Second, this Appendix can be used as an evaluation checklist when reviewing the proposals from prospective contractors.

The following sequence of planning activities is recommended for the design of building field monitoring projects. The intent of using this approach to structure a Work Statement is to minimize the possibilities for major oversights in the design and execution of projects of this type.

1. Identification of project goals, objectives and research questions to be addressed.

The first priority should be to clearly state the purpose and expected outcome of the monitoring project, and to unambiguously state the research questions to be answered by the monitored data. This is the first step to ensuring that all crucial data items are identified, and that unnecessary data items are eliminated.

2. Specification of results which meet objectives

This activity identifies the specific results that are necessary to answer the research questions of interest. This can be done through mock-ups of data tables, charts, graphs, etc. Data results should also be prioritized to accommodate possible cost trade-offs later. The results of this activity should provide a clear specification of the data to be delivered on the project.

3. Specification of experimental design approach

Monitoring projects often collect data, which are used to compare the performance of different equipment or systems (e.g., central vs. unitary systems), or to identify the effect of changes to building systems (e.g., retrofits). Various "passive" experimental design approaches are available to do this, including test reference design; before/after design; and flip/flop (or on/off) design. An "active" design would be to stress test a building system over a range of

experimental conditions. The experimental design approach must be evaluated for its ability to yield enough comparative data. The length of monitoring or conditions under which the building is monitored must be considered. For some objectives, it is important to monitor performance under extreme or design conditions; this is where "stress tests" may be considered. For some objectives, the differences in seasonal or annual energy use are important, and year-long or season-long monitoring periods are called for. In this case, there is always the risk that the weather conditions during the monitored period are not typical, and to guard against this one may combine passive monitoring periods that can be adjusted to typical meteorological conditions and active experiment design to capture performance under extreme or design temperatures. Therefore, it is essential to record adequate data on ambient conditions to be able to estimate "annual" and "design condition" performance. This must be considered in the measurement plan, Section 5 below.

4. Specification of data analysis procedures and algorithms

This activity details how the monitored data will be processed to produce the data results previously specified. These procedures may involve the use of engineering calculations, models, statistical methods, etc. The analysis procedures may also involve the use of engineering constants, or one-time field measurements in addition to time-series monitored data. This activity will identify all variables required for data analysis, and their specific use and priority. The entire set of variables required to produce the required data results will include a sub-set of data items to be monitored in the field. This activity identifies them as well. Data analysis procedures and algorithms should also take into account established test and rating standards and methods for building system components and equipment listed in the Codes and Standards chapter of the HVAC Systems and Applications volume.

5. Specification of field monitoring data points – measurement plan

This activity treats the sub-set of variables to be monitored or measured in the field. The output of this task is often referred to as a measurement plan, which details the location of specific data points within the building system. The measurement plan is also the working document for installers of field equipment and sensors. The measurement plan should also include details for the types of sensors required, and procedures for taking any one-time measurements.

6. Specification of building characteristics data

This activity develops the data framework that will be used to describe the building or buildings being monitored. It is usually not possible to understand the relevance of monitored data without a reference framework that describes the building being monitored and the types of activities conducted in the building. The building information collected depends on the systems of interest for the project. However, general building information could include: the type of zone, building or complex being monitored; the types of activities in the facility(s); the age, number of floors and conditioned area; building schedules for occupancy and temperature; a description of the building envelope including items such as walls, glazing, roof, shading and large doors; descriptions of the HVAC and control systems, and their maintenance; descriptions of lighting systems; descriptions of other important energy systems such as large computer or food service operations; the types of fuels or utilities supplied to the building; a history of utility and fuel purchase statements; and any special aspects of all the above that impact the interpretation of the monitored data results. In addition, if energy improvements are made during the course of the project, a description of the improvements should be documented.

7. Specification of verification and quality control procedures

A common field-monitoring problem is measurement failure, which is often due to failed sensors that go undetected for long periods of time. Verification and quality control procedures can minimize this problem by: specifying frequent data retrieval and error checking; pre-specification of acceptable ranges of sensor performance; secondary range check calculations using monitored data; and use of back-up sensors for critical measurements or inaccessible locations. Quality control procedures may also reference existing standards for certain measurements such as temperatures and flow rates. Sensor accuracy and total data acquisition system accuracy should also be specified here.

8. Specification of data collection hardware

One of the final steps is to select the sensing and data logging hardware required to collect the specified data, taking the verification and quality control procedures into account. Some guidance on hardware selection is available from the Measurement and Instruments chapter of the ASHRAE Handbook, Fundamentals Volume. Other guidance is available from published measurement standards.

9. Specification of recording and data exchange formats

This activity specifies the formats in which the data will be supplied to the end-user or other data analysts. It is always important to specify both raw and processed data as deliverable items for research projects. Project sponsors often wish to conduct supplemental analyses of the data and should specify the media and format they require (e.g., database, spreadsheet, ASCII, etc.). Documentation of data file format should be required.

Frequently the goal of a monitoring project is to determine the impact or savings associated with a change or improvement in a building (i.e., the before and after experimental design) This special case commonly occurs when energy service companies (ESCOs) make an improvement and are compensated based on measured "savings". Two standardized methods have been developed to determine savings in these situations:

- 1) ASHRAE Guideline 14-2002 *Measurement of Energy and Demand Savings*
- 2) International Performance Measurement and Verification Protocol

The two references above should be consulted when the goal of the research project is to collect monitored data to discern the impact of a change.

ASHRAE Guideline 14 recommends many of the industry consensus and standard methods to measure and verify energy savings resulting from the implementation of energy-conservation measures developed by the U.S. Department of Energy. The second reference, International Performance Measurement & Verification Protocol (IPMVP), provides standard measurement & verification (M&V) terminology and defines four M&V options to quantify energy and water savings. More information can be found at http://www.ipmvp.org. or at http://www.evo-world.org

Checklist of Contractor Evaluation Criteria for ASHRAE-Sponsored Field Monitoring Research Projects

- 1. Experimental Design Evaluation Criteria
 - A. Understanding of project goals, objectives and research questions to be addressed.
 - B. Responsiveness and completeness of proposed research results to meet project objectives as specified by the TC.
 - C. Appropriateness and practicality of experimental design approach.
 - D. Completeness of data analysis procedures and algorithms including specification of algorithms, analytical tools and models, and analysis variables.
- 2. Data Collection Evaluation Criteria
 - A. Completeness of specification for field measurement plan.
 - B. Completeness of specification for building characteristics data.
 - C. Completeness of specification for data verification and quality control procedures.
 - D. Appropriateness of proposed data collection hardware to meet project objectives.
- 3. Product Delivery Evaluation Criteria
 - A. Completeness of specification for data recording and data exchange formats.

APPENDIX 3 GUIDELINES FOR THE USE OF COMPUTATIONAL FLUID DYNAMICS (CFD)

Scope

Many TC and Research Chairs are considering and specifying the use of Computational Fluid Dynamics (CFD) for their Research Projects. CFD is computationally difficult and is not well understood by the average technically trained engineer. These guidelines are intended to help increase the understanding of CFD and its strengths and its disadvantages. These notes should also help the writing of a better work statement and the evaluation of the bids.

Definition

CFD is based on several engineering principles including conservation of mass, and energy and sometimes linear momentum. Quite often the basic Navier Stokes (NS) equations are used. Unfortunately, the NS equations are not easily solved and require quite a bit of judgment and several assumptions to reach a solution. Basically, each application includes constructing the flow field control volume, developing the computational mesh (or grid), which defines the surface of the flow field, applying boundary conditions, solving for field variables and evaluating the results.

Potential Strengths

There are several advantages to using CFD techniques. These include not only the ability to visualize the flow (velocities, temperatures etc.) profiles but also the possibility of modeling several variations of specific situations without the time and cost of building individual test rigs. Complex flows often can be analyzed only by CFD modeling because of experimental difficulties. Accuracy can be comparable to other test methods.

Potential Disadvantages

CFD requires a highly trained investigator with very good judgmental and mathematical skills. Accuracy is entirely dependent on the talents of the principal CFD investigator and the CFD package. Computer runs can be very long (up to a week or more) and require high-speed large memory computers. It is possible for two equally talented investigators to produce very different results for the same problem while using the same CFD package. The proposed investigator should have a very good practical as well as theoretical background in the specific areas of interest

ASHRAE Applications

Our Society continues to see several projects which should use CFD methods, including velocity, pressure and temperature predictions for rooms, duct systems, total buildings, airplanes, tunnels and additionally smoke plume determinations and laboratory hood velocity contours.

Structuring the Work Statement

A TC can write clearer work statements if they take advantage of certain fundamentals.

A literature search among past ASHRAE projects using CFD will share questions raised by bidders, responses by the Project Monitoring Sub-committee (PMS) and the final results of the project.

An understanding of the commonly used words as well as strategies used by CFD investigators will help to clarify the work statement. A typical outline follows and applies to the three major portions of the package; the preprocessor (input), the problem solver, and the post-processor portions.

1. Constructing the flow field control volume

A flow field is normally an internal flow within solid walls or an external flow around an immersed body. Careful selection of a flow field control volume will permit efficient construction of the continuity, energy and momentum equations and also help to simplify later assumptions.

2. Constructing the flow field mesh or grid

This activity defines the flow field by means of a series of shapes (surfaces [2D] use triangles or quadrilaterals, solid models [3D] use bricks, wedges or tetrahedrons) connected to each other at points called nodes. Forces, temperatures and other properties are transferred to adjacent shapes through nodes. The more nodes the more accurate the transfer of these properties but the more computation time is required. The intensity of the mesh (or grid) can be increased or decreased throughout the surface depending on the activity at certain points or the accuracy desired.

This work is performed in the pre-processor portion of the package.

3. Applying boundary conditions

The boundary conditions which describe the flow field profile between the "walls and boundary" and the average fluid velocity as well as project specific data are entered here. Boundary conditions can also include pressure, temperature, turbulence level, heat flux and contamination and levels. The wall roughness should be mentioned if a good correlation with experimental results is desired.

Modeling the turbulence intensity is very difficult but must be done well for accurate estimates of pressure and friction losses, drag, mixing of temperature and other profiles. Turbulence is described as consisting of vortices (eddies or swirl) which are always changing size, position and energy. A popular turbulence model is the k- ϵ model used primarily for fully developed turbulent flow. Unfortunately, the flow fields will contain either turbulent, transitional or laminar flow. Near the "walls" turbulence intensity is much lower, shear forces predominate, and the original k- ϵ formula does not apply. The k- ϵ formula estimates the overall kinetic intensity (k) and its dissipation rate (ϵ). For estimating partially turbulent flow the k- ϵ formula can be modified or another method of analysis is selected. Other models include: 1) Using 3D time-based NS equations to directly numerically simulate (DNS) only the most important scales of turbulence and 2) Simulating the energy of only the larger eddies (LES) and averaging the effect of the small eddies on the large ones. These last two options require a lot of calculation capacity (and time) which reduces their popularity. Possibly at some time a direct numerical profile of all turbulence energy levels will be developed but for now various approximations must be used.

This work is performed in the pre-processor portion of the package.

4. Solving for the field variables

A series of partial differential equations (based on conservation of mass, momentum and energy) are written describing the fluid flow within the control volume. A special form of these equations is called Navier- Stokes equations which deal well with viscous flows - flows of interest to ASHRAE. Then Finite Element Analysis or Finite Difference Analysis or Finite Volume Analysis are used to reduce these complex differential equations (this is often described as discretizing the primary equations) to algebraic equations describing the elements of the grid or mesh. The turbulence calculations are performed here.

Unfortunately, these equations are complex (non-linear, second order, partial differential equations) and require certain simplifying assumptions as well as a computer-based equation solver to resolve. One common strategy begins with an initial approximation of the result and tries in successive calculations to reduce this approximation to a very small value. Often the initial approximations are not accurate, and this inaccuracy contributes to long computer runs to achieve the desired results.

This work is performed in the solver portion of the package.

5. Selection and presentation of the results

This includes the plotting of various streamlines including velocities, pressure contours, isotherms etc. The selection of a post-processor with good 3D graphics will help communicate the results of the project. While pressure profiles are normally not presented, they can be a useful check on the primary results.

This work is performed in the post-processor portion of the package.

6. Evaluating the results

The theoretical CFD results should be compared to work based on other techniques to validate the assumptions required for CFD calculations. The researcher can also verify his / her work by changing the grid size and comparing results. The different results should relate to each other. However, there are normally errors of some size in both sets of data, so a discussion of errors is warranted.

Preparation of the Work Statement

The TC should specify whether CFD or other analytical methods are preferred. CFD can often output data in a visual format that facilitates rapid understanding of otherwise complex results. The selection of an analytical method (CFD or other) is often based on the type of project, ease (or lack thereof) of analysis, accuracy desired and final use of the data by others. Sometimes a supplementary note giving the contractor a choice of technologies can be useful if the results will be comparable.

When considering CFD the TC has available several sources for guidance. These sources include data from previous contracts, past members of other PMS and possibly current ASHRAE members who have been prior CFD contractors and for some reason will not bid on the current project.

The TC should discuss the type of flow field; either steady or non-steady state. If non-steady state, the minimum and maximum conditions should be reviewed in detail. If the flow has a predictable time period from minimum to maximum and then to minimum value this should also be reviewed.

The level of required accuracy should be discussed in depth and a clear standard be set. An often-asked question is "What is the level of accuracy needed to make this project useful and how much will this accuracy cost?" There is no easy answer here, but the PMS should develop this guideline. The bidder's perception of the goals of the contract will influence the estimated time input and the ultimate cost. Ambiguity should be avoided as much as possible. Increased accuracy will require significantly more computational time and possibly a commitment of high capacity hardware. However, it is likely that the final work may not be useable by the average consultant if the computational time is too large or special computers are required.

The contractor should discuss a proposed validation method for the specific research project. This validation can include a comparison with actual test data, by changing the mesh sizes or by deleting a major component and observing a predicable result.

Many TC members believe that one can circumvent the technical details mentioned above by writing a performance specification. Unfortunately, a good performance specification for CFD should discuss the assumptions available to the contractors so the offers are somewhat comparable. Therefore, the preparation of a through performance specification can require as much effort as a normal "task based" specification would require.

The contractors should be advised in the work statement that a standard format for the final report should be followed including at least the following; a table of contents, an abstract, presentation of the research procedures and results, an error (sensitivity) discussion, conclusions and recommendations and, finally, references.

Preparation of the Proposal by the Contractor

Many contractors have resources available from past contracts, which can reduce the time input as well as hardware (and software) purchases. If the goals of the project are met, the contractor should be encouraged to use all resources as efficiently as possible as long as the use of these special resources is communicated to the Society.

The contractors should be asked to specify the type of hardware to be used and the approximate amount of computational time required.

Also, the contractor should be asked to explain whether the data could be extrapolated to physically larger (or smaller) models or to other changes in the research parameters such as temperatures, pressures, viscosities etc.

The potential contracgtor should discuss the following in his application:

- 1. The reasons for selecting the general purpose CFD package.
- 2. The ability of the code to meet the computational and modeling needs of the project as well as indicating the strengths of the proposed pre- and post-processors. As an example, not all CFD packages are equal in the modeling of radiation, transitional flows and flows where gravitational and buoyant forces are similar. ASHRAE has no preferred program. The contractor should select the program with which he/she wants to work. The contractor should discuss the validation of the particular package and list the benchmark" problems used by the software designer to validate the program.
- 3. A detailed discussion of the contractor's computational approach should be included. At least the following areas should be reviewed: the assumptions, the proposed basic equations, element selection (type and resolution), choice of a turbulence problem solver (the k-ε model is often used), boundary layer definition and a method of calculating the loss coefficients. The TC may want to define the boundary layer profiles if it is aware of special conditions.
- 4. The form in which archival results will be provided should be specified. ASCII form is preferable for future readability, but binary formats may be acceptable if the format is clearly documented. The media format that will be used to deliver the results should also be specified.

APPENDIX 4: SAMPLE WORK STATEMENT AND COVER SHEET

WORK STATEMENT COVER SHEET	Date: December 15, 2006
(Please Check to Insure the Following Information is in the Work Statement) A. Title B. Executive Summary C. Applicability to ASHRAE Research Strategic Plan D. Application of Results E. State-of-the-Art (background)	Title: Derating recommendations based on field testing and analysis of high-altitude installation of gas-fired boilers and water heaters
F. Advancement to State-of-the-Art G. Justification and Value to ASHRAE H. Objectives I. Scope/Technical Approach J. Deliverables/Where Results will be Published K. Level of Effort∟□ Project Duration in Months Professional-Months: Principal Investigator Professional-Months: Total Estimated \$ Value L. Other Information to Bidders (optional) M. Proposal Evaluation Criteria & Weighting Factors N. References	WS # 1388 (To be assigned by MORTS - Same as RTAR #) Results of this Project will affect the following Handbook Chapters, Special Publications, etc.: HVAC Systems and Equipment, Chapter on Automatic Fuel Burning Equipment
Sponsoring TC/TG/SSPC: 6.10 Fuels and Combustion	Date of Vote: 12/9/06
For 12 Against * Abstaining * Absent or not returning Ballot * Total Voting Members 18	This WS has been coordinated with TC/TG/SSPC (give vote and date): TC6.1 vote 13-0-0-3 on 6.27.06 TC6.6 vote 10-0-4-1 on 6.27.06 Has RTAR been submitted ? Strategic Plan Theme/Goals:
Proposal Evaluation Subcommittee: Chair: Thomas Butcher Members: David Bixby, GAMA	Project Monitoring Subcommittee: (If different from Proposal Evaluation Subcommittee) same as PES
Hall Virgil Ray Albrecht Bill Roy	
Recommended Bidders (name, address, e-mail, tel. number): ** Battelle, Columbus, OH (Dr. Darrell Paul) Gas Consultants Inc., Waltion Hills, OH (Carl Suchovsky) Gas Technology Canada, Ontario, Canada (Don Mills) Gas Technology Institue, Des Planes, IL (Neil Leslie) Intertek Testing Services NA, Inc. Cortland, NY (Jackie Wilchek) Canadian Standards Association, Tornonto, Ontario (John Gorman, Cleveland, OH)	Potential Co-funders (organization, contact person information): Gas Appliance Manufactures Association - cooridinated donation of appliances for testing
Is an extended bidding period needed? Has an electronic copy been furnished to the MORTS? Will this project result in a special publication? Has the Research Liaison reviewed work statement?	Yes No How Long (Weeks)
* Reasons for negative vote(s) and abstentions One voter who abstained simply did not feel familiar enough with the One voter who abstained may bid on the project. Negative voter felt project budget should be larger.	e topic and issues.

** Denotes WS author is affiliated with this recommended bidder Use additional sheet if needed

WORK STATEMENT# 1388 (Same as RTAR) SPONSORING TC/TG/MTG/SSPC: # 6.10 – Fuels and Combustion

CO-SPONSORING TC/TGs TC 6.1 and TC 6.6

A. TITLE

Derating Recommendations Based on Field Testing and Analysis of High-Altitude Installations of Gas-Fired Boilers and Water Heaters

B. EXECUTIVE SUMMARY

Current practice for derating gas-fired heating appliances with altitude is based on outdated data not relevant to modern, high-efficiency burner technology. This project includes an experimental effort to determine derating requirements of boilers and water heaters. An earlier ASHRAE research project addressed furnaces and found that lower derating could be accepted with modern equipment. This project will provide the needed basis upon which to change this practice for boilers and water heaters. Estimated budget: \$150,000.

C. APPLICABILITY TO THE ASHRAE RESEARCH STRATEGIC PLAN

By recognizing the higher efficiency at altitude of modern combustion systems, this project will contribute to Goal 9 (Improved HVAC&R Components) by improving the rightsizing, and therefore cost-effectiveness, of more efficient combustion control systems.

D. APPLICATION OF THE RESULTS

The results of this work will be to provide guidance to manufacturers, design engineers, code committees, and installers on best practices for derating.

E. STATE-OF-THE-ART (BACKGROUND)

Installation codes such as the ANSI Z223.1/NFPA 54 National Fuel Gas Code and CSA B149.1 National Standard of Canada Natural Gas and Propane Installation Code specify that gas-fired furnaces, boilers and water heaters be derated during operation at altitudes of more than 2000 ft above sea level. These appliances are to be adjusted for the lower amount of available oxygen per cubic foot of air. The prescribed method of the fuel gas reduction is to reduce gas input rate by 4% per 1000 feet above sea level. This reduction must be considered before selecting appropriately sized appliances. The usual method to reduce the input rate is to use smaller gas orifices or to reduce the gas orifice manifold pressure. Recent demographic trends have resulted in greater numbers of these appliances being operated at altitudes high enough to require large derating factors. Recent appliance innovations cause many engineers in the industry to question the appropriateness of this simple rule.

F. ADVANCEMENT TO THE STATE-OF-THE-ART

The original 4% derate per 1000 feet above sea level method was developed for Bunsen-burner type appliances. The recent development of state-of-the-art combustion systems and appliances (e.g. fan-assisted combustion, direct venting, condensing heat exchangers, inshot and pre-mix burners, sidewall venting) may permit some appliances to operate acceptably with less or no derating for altitude. This research will update the altitude derating methods, so they apply to modern appliances.

G. JUSTIFICATION OF NEED AND VALUE TO ASHRAE

Some manufacturers' listed appliance instructions already specify less derating than 4% per 1000 feet above sea level. These inconsistencies cause confusion among installers, leading to misapplications similar to the vent misapplications that were common before 1991 and 1992, when the GAMA and ANSI Z223.1/NFPA 54-1992 National Fuel Gas Code (NFGC) venting guidelines were issued for venting mid-efficiency fan-assisted combustion furnaces. The NFGC and other codes need new high-altitude guidelines that are consistent for each current appliance type.

From the consumer's perspective, less derating would mean less need to increase furnace, boiler, or water heater size at high altitudes, with consequent installed-cost savings.

The experience of knowledgeable gas-fired combustion appliance engineers is that different appliance types (i.e., water heaters versus furnaces versus boilers, natural-draft versus fan-assisted combustion, direct-vent versus nondirect-vent, etc.) react differently to the effects of high altitude. Therefore, multiple appliance types are required to be tested and analyzed. Furnaces were previously tested on ASHRAE Research Project RP1182 because they are the highest sales volume gas appliances with the largest gas inputs and because they include a variety of the needed combustion system types. The results of that work were strongly indicative that a much lower derate factor is appropriate for furnaces and that a follow-on project be initiated to analyze two other appliance types, boilers and water heaters.

H. OBJECTIVES

Based on first-principle work and recommendations reported in the Gas Research Institute topical report High Altitude Installation of Natural Gas-Fired Appliances with Fan-Assisted Combustion Systems GRI-95/0014, determine whether less derating than is currently prescribed can be safely permitted for operating natural gas-fired and propane gas-fired boilers and water heaters at high-altitude.

Determine the applicability and validity of National Standard of Canada CAN/CGA-2.17-M91, Gas-Fired Appliances for Use at High Altitudes, section 2.2 for use in testing appliances at near sea level (0 to 2,000 feet altitude) to demonstrate robustness at high altitude (2,000 to 10,000 feet altitude).

Investigate alternate testing and prediction methods, which may be used to provide equivalent high-altitude performance and validation.

Work with the Project Monitoring Subcommittee (PMS) to provide industry acceptable data and tools for better understanding of high-altitude applications and acceptable high-altitude appliance heating capacities.

I. SCOPE/TECHNICAL APPROACH

The proposed research will perform the tasks described in below.

- 1. Identify three geographical locations for field testing. One location for benchmarking shall be as close to sea level as possible, but no higher than 1000 feet. The other two locations shall be in the 4,000 foot and 10,000-foot range, with at least 4,000 feet difference in altitude between any two locations (use population centers as guides).
- 2. Develop a detailed test plan to include details of test instrument calibration, method of test, test parameters, test data forms, test acceptance criteria, schedule, and locations with altitudes. This test plan shall be submitted to the PMS for review and approval prior to the start of testing.
- 3. Select and obtain suitable boiler and water heater models for test. The Gas Appliance Manufacturers Association directory of ratings can be used to assist in the selection of appliances. The following boiler and water heater types shall be included:
 - One Category I draft hood equipped, standing pilot, water boiler with a rated sea-level input in the range of 50,000 Btu/hr to 150,000 Btu/hr,
 - One Category III (induced draft) water boiler with a rated sea-level input in the range of 50,000 Btu/hr to 150,000 Btu/hr,
 - One Category III or IV direct vent water boiler with a rated sea-level input in the range of 50,000 Btu/hr to 150,000 Btu/hr,
 - One 40 gal., 40,000 Btu/hr residential flammable vapor ignition resistant (FVIR) model,
 - One Category III or IV 40 gal., 40,000 Btu/hr residential FVIR model
 - One condensing 40 gal., 40,000 Btu/hr commercial FVIR model

Additional qualifications:

- Each of the boiler and water heater models shall be manufactured by a different manufacturer.
- Each of the boiler and water heater models shall be listed for use with natural gas and propane.
- Direct vent appliances shall be installed and tested with maximum listed vent and inlet piping lengths.
- Category III and IV appliances shall be installed and tested with maximum listed vent length.
- The following burner types shall be included in the appliance selections: lanced port tubular, punched port tubular, in-shot, and pre-mix.

Prior to procurement of specific appliances, a proposed list shall be submitted to the PMS for approval.

- 4. Perform the tests listed below on the boilers and water heaters, in accord with the referenced sections of the ANSI Z21.13-2004•CSA-4.9-2004 (Gas-Fired Low Pressure Steam and Hot Water Boilers Standard), ANSI Z21.10.1-2004--CSA 4.3-2004 Vol 1, ANSI Z21.10.3-2004--CSA 4.3-2004 Vol 3 and CAN/CGA-2.17-M91 (Gas-Fired Appliances for Use at High Altitudes). The focus of the testing shall be to determine the effects of altitude on combustion, CO (air-free) and CO2 levels, burner and pilot or igniter operating characteristics, heat exchanger operating temperatures, and blocked-vent shutoff combustion performance. Each furnace model shall be tested at the conditions specified in OTHER INFORMATION FOR BIDDERS. (Section numbers refer to the boiler and water heater standards, respectively.)
 - a) Category Determination (section 2. 4)
 - b) Combustion (section 2.5)

Note: Contractor shall insure that 6-1/4% overfire combustion margin is evaluated at all three altitudes, i.e., how much margin exists at these altitudes before combustion exceeds 400 ppm CO (air-free). If clean combustion cannot be achieved within the requirements of section 2.5, gas input and/or combustion air adjustments shall be made and reported to achieve clean combustion.

- c) Burner Operating Characteristics (section 2.6)
- d) Piloted Ignition Systems (section 2.7); Direct Ignition Systems (section 2.8) and Proved Ignition Systems (section 2.9) as applicable.

For all tests listed above, the actual barometric pressure, relative humidity, gas inlet test pressure and temperature, gas orifice manifold pressure, inlet and outlet water temperatures, flue gas temperature, CO and CO2 concentrations, and the pressure(s) sensed by the pressure switch shall be recorded.

Pressure-switch pressure data shall be frequently obtained from ambient startup through steady-state operation and throughout a transient test-to-shutoff blockage. All identifying model numbers, dates, and settings marked on pressure switches shall be recorded. Pressure switches shall be carefully removed and preserved for examination and analysis by the PMS after testing is complete. Fuel gas constituents and concentrations shall be certified by the supplier or other qualified agency at each test location within +/-1% accuracy to for higher heating value, specific gravity and Wobbe number determination, all at standard conditions of 30.00 in. Hg and 60°F.

- 5. Analyze the data on each appliance at the three altitudes tested in such a manner as will facilitate recommendations on reducing the amount of gas input derating needed for safe and reliable high-altitude operation.
- 6. Make specific recommendations concerning improved appliance safety standards and installation code requirements for high-altitude operation of gas-fired boilers and water heaters, and for low altitude test methods to evaluate high altitude performance. These may include, but are not limited to, gas input rate adjustments, air flow adjustments, temperature adjustments and other reasonable modifications or tools to be used for sea level operation. These recommendations shall be arrived at through an iterative process of discussion with the Project Monitoring Subcommittee.

J. DELIVERABLES

a) Progress and Financial Reports to the PMS must be made at quarterly intervals. All available data must be available at or before the scheduled report time. Data and/or reporting information may be transmitted electronically or on ASHRAE approved digital media.

- b) The Principal Investigator shall report in person to the TC at the annual and winter meetings and answer such questions regarding the research as may arise.
- c) Test plan for review and approval by the PMS as per the description of Task 2 in the Scope section above.
- d) List of specific appliances to be tested for review and approval by the PMS as per the description of Task 3 in the Scope section above.
- e) Memorandum proposing suggested changes to standards, code requirements, and test procedures, as described in Task 6 of the Scope section. Contractor will present this material and discuss it with the PMS.
- f) A Final Report shall be prepared and submitted to the Society by the end of the contract period covering complete details of all research carried out on the project. The final report shall include, as a minimum, the following:
- 1. An Executive Summary suitable for wide distribution to the industry and to the public.
- 2. Description of test procedure, locations, and appliances
- 3. Data collected, per Task 4 in the Scope section.
- 4. Results should be presented in a format that will facilitate direct comparison of the results for the different barometrically determined altitudes and their use in recommending the amount of gas-input derate for the appliance classes for high- altitude operation.
- 5. Specific recommendations for changes to standards and test methods as described in Task 6
- Unless otherwise specified, the final report shall be furnished in the following manner:
 - Six bound copies
 - One unbound copy, printed on one side only, suitable for reproduction.
 - Two copies on ASHRAE approved digital media; one in ASCII format and one in the latest versions of ----Microsoft Word format for the report and in Microsoft Excel format for data and approved by the PMS.
- g) One or more papers based on the final results of the project shall be submitted first to the ASHRAE Manager of Research and Technical Services (MORTS) and then to the "ASHRAE

Manuscript Central" website-based manuscript review system in a form and containing such information as designated by the Society suitable for publication. The papers should be submitted as either Research Papers for Science and Technology for the Built Environment or Technical Paper(s) for ASHRAE Transactions. Research papers contain generalized results of long-term archival value, whereas technical papers are appropriate for applied research of shorter-term value, ASHRAE Conference papers are not acceptable as deliverables from ASHRAE research projects. The papers shall conform to the instructions posted in "Manuscript Central" for a technical ASHRAE Transactions Technical or Science and Technology for the Built Environment paper. The technical paper title shall contain the research project number (xxxx-RP) at the end of the title in parentheses, e.g., (9999-RP).

h) A Technical Article suitable for publication in the ASHRAE Journal, if requested by the Society.

K. LEVEL OF EFFORT

The level of effort is estimated to be approximately 900 hours of a professional person over 12 months. A total cost of \$150,000 is estimated. The accepted bidder will be responsible for obtaining the test boilers and water heaters, test equipment and testing facilities. Boiler and water heater manufacturers have shown interest in donating appliances. Appliance requests and donations shall be coordinated through the Gas Appliance Manufacturers Association, Arlington, VA.

L. PROPOSAL EVALUATION CRITERIA AND WEIGHTING FACTORS

1. Qualifications and relevant experience	30%
2. Facilities	30%
3. Work Plan	20%
4. Overall relevance to the project objectives	20%

M. CRITICAL PROJECT MILESTONES

	Project Month
1. Identify three geographical locations for field testing	Month 3
2. Develop a detailed test plan	Month 3

3. Perform the tests	Month 9
4. Analyze test results, draft final report, make recommendations	Month 12

N. WORK STATEMENT AUTHORS

1. Jane Doe, Lead author

- 2. John Q. Public
- 3. Will Smith

O. REFERENCES

High Altitude Installation of Natural Gas-Fired Appliances with Fan-Assisted Combustion, topical report GRI-95/0014 prepared by the American Gas Association Laboratories, Cleveland, Ohio for the Gas Research Institute (now the Gas Institute of Technology), 8600 Bryn Mawr Avenue, Chicago, Illinois 60631 (now 1700 South Mount Prospect Road, Des Plaines, IL 60018), January 1995.

ANSI Z21.13-2004•CSA-4.9-2004 American National Standard/CSA Standard for Gas-Fired Low-Pressure Steam and Hot Water Boilers (or latest revision), CSA America, Inc., 8501 East Pleasant Valley Road, Cleveland, OH 44131-5575.

ANSI Z21.10.3-2004--CSA 4.3-2004 American National Standard/CSA Standard for Gas Water Heaters Volume III, Storage Water Heaters with Input Ratings Above 75,000 Btu/h, Circulating and Instantaneous (or latest revision), CSA America, Inc., 8501 East Pleasant Valley Road, Cleveland, OH 44131-5575

CAN/CGA-2.17-M91 National Standard of Canada for Gas-Fired Appliances for Use at High Altitudes (or latest revision), Canadian Gas Association (Canadian Standards Association), 55 Scarsdale Road, Don Mills, Ontario M3B 2R3 (now 178 Rexdale Boulevard, Toronto, Ontario M8W 1R3) Canada.

ANSI Z223.1/NFPA 54-2006 (or latest revision) National Fuel Gas Code, AGA 400 N. Capital St., NW, Washington D.C. 20001 and National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

CAN/CSA-B149.1 National Standard of Canada Natural Gas and Propane Installation Code (latest revision), CSA International, 178 Rexdale Boulevard, Etobicoke (Toronto), Ontario M9W 1R3 Canada.

Variability of Natural Gas Composition in Select Major Metropolitan Areas of the United States, report GRI-92/0123 [Wobbe numbers], Gas Research Institute (now the Gas Institute of Technology), 8600 Bryn Mawr Avenue, Chicago, Illinois 60631 (now 1700 South Mount Prospect Road, Des Plaines, IL 60018), March 1992.

Standard Atmospheric Data for Altitudes to 60,000 Feet, Table 1, Chapter 6, 2001 or 2005 Fundamentals Handbook, American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., 1791 Tullie Circle, N.E., Atlanta, GA 30329

P. OTHER INFORMATION FOR BIDDERS

Bidders shall have experience in testing these gas appliances in accordance with the standards specified in Task 4.

Frequent meetings, in person or by conference call with the PMS are deemed essential to the success of the project. As described in the Scope section above, submissions to the PMS for review and approval are requested at several points during the project. It is expected that the PMS will discuss these submissions with the contractor, and this will be done either via meetings at the ASHRAE Winter or Annual meetings or conference call, as appropriate. Additional meetings may be held at the contractor's test sites at the discretion of the PMS Chairman. The contractor shall provide to the PMS at these meetings a detailed report of work accomplished and work yet to be done. The PMS shall give the contractor following these meetings a written report of the PMS's assessment of the contractor's progress and any requests for project changes deemed necessary to maintain the objectives and schedule of the project.

This section specifies the test conditions to be used in the tests set forth in item 4. Since barometric pressure can vary over time, the actual barometric pressure shall be recorded for all tests listed above. This is to provide the corresponding test altitude, if found to be different from the designated test location altitude for purposes of setting rate (or derate) and analyzing results. The composition of the inlet air supply (i.e., % oxygen and water in the air by weight) shall be measured during each test. Each boiler and water heater model shall be tested at the following conditions:

- a) at sea level with factory-installed orifice(s) and factory-set manifold pressure.
- b) at sea level with factory-installed orifice(s) and manifold pressure adjusted to achieve nameplate input.
- c) at natural derate with no change in gas orifice size or manifold pressure setting from b).
- d) at natural derate with no change in gas orifice size or manifold pressure setting from b), except for the following:
 - If any change to orifice size or manifold pressure is required to satisfy CAN/CGA-2.17 or ANSI Z21.13-2004•CSA-4.9-2004, ANSI Z21.10.1-2004--CSA 4.3-2004 Vol 1, ANSI Z21.10.3-2004—CSA 4.3-2004 Vol 3, they must be recorded. If the manufacturer(s) of the tested appliance(s) recommend different derating method(s), then that method(s) shall also be tested.
 - 2. If there was a difference in Wobbe number between sea level gas and the gas used at altitude that would affect the amount of derate observed, it must be recorded.
- e) at 4% per 1000 ft above sea level derate when installed above 2000 ft. (These tests shall be conducted:
 i) by changing orifice sizes with constant manifold pressure and ii) by adjusting manifold pressure with constant orifice size.)
- f) depending on the test results for conditions 0, , 0and 0, at the derate necessary to produce the same CO₂ percent at altitude as was obtained at sea level.
- g) repeat 0 to produce clean combustion per ANSI Z21.13-2004•CSA-4.9-2004, section 2. 5. , ANSI Z21.10.1-2004--CSA 4.3-2004 Vol 1, section 2.4 or ANSI Z21.10.3-2004--CSA 4.3-2004 Vol 3, section 2.4 .

In order to obtain data that is unaffected by differing natural and propane gas mixtures, a subset of test data shall be obtained with a reference fuel gas source, such as a single bottled natural gas supply trucked to each test location. In the interest of minimizing the amount of bottled gas required, the appliances can be operated on local gas until data is to be taken. Then the bottled gas can be swapped on-the-run (without interruption of appliance operation) with the local gas for only as long as required to establish a new equilibrium at the specified conditions and take data. Data should also be taken with the local source gas for comparative analysis. For each appliance, at each altitude, the data subset with the reference gas shall include unmodified combustion performance (CO, excess air, flue temperature, and margin as discussed in Task 4, above). Wobbe index and fuel gas composition shall be the primary parameters used to evaluate impacts of different local gas compositions.

The contractor shall provide to the PMS:

- 1. Results of benchmark, sea-level tests prior to on-location tests at higher altitudes.
- 2. Results of on-location tests after tests are complete at each site and before dismantling test capability at each site such that corrective tests could be performed before leaving each site, if needed by the PMS.
- 3. All raw data: acceptable and unacceptable results are to be identified as such.
- 4. Analysis of all test results. Detailed methods of analysis shall be provided.
- 5. Recommendations on how to fulfill the project Objectives.

Beyond the guidance provided in the Scope section above, the PMS is very interested in the specific appliances selected for testing and expects to actively support the contractor in this selection. As discussed in the Scope section, above, the PMS will review and approve the final list of specific appliances.

If bidders feel that additional work is needed to fulfill project Objectives, additional work shall be specified, recommended, and quoted separately with their base bids.

APPENDIX 5: PTAR & WSP EXAMPLE FORMS

Publication Topic A (Please Check to Ensure th A. Title B Summary C. Background D. Publication Need E. Target Audience F. Rationale for PTAR G. Level of Effort H. References	cceptance Request Cover Sheet e Following Information is in the PTAR)	Date: T	Title: TAR # (To be assigned by MORTS) esults of this Project will affect the following Handbook Chapters, becial Publications, etc.:
Responsible Committee:		 Date of	
PTAR Authors	For Against * Abstaining * Absent or not returning Ballot * Total Voting Members	Cospor	nsoring TC/TG/MTG/SSPCs (give vote and date)
Lead: Others:			
Expected Work Statement A Lead: Others:	uthors	Potentia	al Co-funders (organization, contact person information):
Has an electronic copy been Has the Research Liaison re * Reasons for negative vote	fumished to the MORTS? viewed the PTAR? e(s) and abstentions		Yes No

PTAR # _____

Title:

Insert proposed project title

Summary

Background

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

Publication Need

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

- Does this guide summarize, combine, or integrate research from new ASHRAE research projects or other sources?
- Is there a clear need to present this in a more understandable form for engineers and practitioners to use this information?
- Is there an urgent need with respect to the ASHRAE strategic plan to publish this guide?
- For guideline revisions, is there a substantial lack of new research, information, technology, products, or approaches in the existing guide? How old is the latest revision?
- If this information is covered (wholly or partially) by another ASHRAE publication, why should there be an additional publication on this topic? Are there resources on this topic available from other organizations, and if so, how would this be different?

Target Audience

Requires support from ASHRAE publications committee

Statement of why this needs to be a paid project instead of a volunteer effort

What prior or ongoing ASHRAE Research will be disseminated through development of this Publication? (Where possible, list specific ASHRAE Research project by number (RP-XXXX) and Title.
Anticipated Funding Level and Duration

Funding Amount Range: \$_____

Duration in Months:

References

List the key references cited in this PTAR

Feedback to RAC and Suggested Improvements to PTAR Procedures

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

PTAR EVALUATION FORM

PTAR EVALUATION FORM			
Project ID	XXXX		
Project Title			
Sponsoring TC			
Cost / Duration			
Submission History			
RAC 20XX Meeting Review			
Essential Criteria	Satisfied?	Comments & Suggestions	
Background: The PTAR 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.			
Publication Need: Based on the background provided is the need for and the value of the publication clearly identified? Have one or more of the publications need criteria been adequately conveyed? Has the Publications Committee confirmed that they support this product? If not, then the PTAR should be rejected.			
Appropriate as a Research Project: Will this publication disseminate past or ongoing research and/or is additional research required to develop the publication.			
Statement of why this should be a paid project: Has the PTAR adequately made the case that performing this work is not an appropriate task for a volunteer effort? If not, Reject.			
Decision Options	Decision?	Suggested Approval Conditions	
ACCEPT			
REJECT			
ACCEPT Vote - Topic is ready for development into a work statement (WS). REJECT Vote - Topic is not acceptable for the ASHRAE Research Program			

WORK STATEMENT FOR PUBLICATION FORM

WORK STATEMENT COVER SHEET

WORK STATEMENT COVER SHEET	Date:
(Please Check to Insure the Following Information is in the Work Statemed A. Title B. Executive Summary C. Applicability to ASHRAE Research Strategic Plan D. Application of Results E. State-of-the-Art (background) F. Advancement to State-of-the-Art G. Justification and Value to ASHRAE H. Objectives J. Deliverables/Where Results will be Published K. Level of Effort□□ Project Duration in Months Professional-Months: Tincipal Investigator Professional-Months: Total Estimated \$ Value L. Other Information to Bidders (optional) M. Proposal Evaluation Criteria & Weighting Factors N. References	Title: WS # (To be assigned by MORTS - Same as RTAR #) Results of this Project will affect the following Handbook Chapters, Special Publications, etc.:
Sponsoring TC/TG/SSPC:	Date of Vote: This WS has been coordinated with TC/TG/SSPC (give vote and date): Has RTAR been submitted ? Strategic Plan Theme/Goals:
Proposal Evaluation Subcommittee: Chair: Members:	Project Monitoring Subcommittee: (If different from Proposal Evaluation Subcommittee)
Recommended Bidders (name, address, e-mail, tel. number): ** Recommended Bidders (name, address, e-mail, tel. number): ** (Three qualified bidders must be recommended, not including WS author Is an extended bidding period needed? Has an electronic copy been furnished to the MORTS? Will this project result in a special publication? Has the Research Liaison reviewed work statement? * Reasons for negative vote(s) and abstentions	s.) Yes No How Long (Weeks)
newsons on negative vote/sy dru dostenuons	

** Denotes WS author is affiliated with this recommended bidder Use additional sheet if needed

WORK STATEMENT#	
<u>Title:</u>	

Sponsoring TC/TG/MTG/SSPC:

<u>Co-Sponsoring TC/TG/MTG/SSPCs (List only TC/TG/MTG/SSPCs that have voted formal support)</u>

Executive Summary:

Background:

Less than 500 words

Objectives:

Brief description of the work product and how it will reach its intended audience

Audience/Publication Need:

Requires support from ASHRAE publisher or other agency that will publish the work product in some form(s).

Proposed Table of Contents:

Should be at least at chapter level, generally with 8 - 15 substantive elements.

Level of Effort:

Estimate the cost and amount of time to successfully complete the project

ASHRAE RESEARCH MANUAL

SY 20-21 EDITION

<u>Proposal Evaluation Criteria</u>:

No.	Proposal Review Criterion	Weighting Factor

Project Milestones:

No.	Major Project Completion Milestone	Deadline Month

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Authors:

<u>References</u>:

Other Information for Bidders (Optional):

Feedback to RAC and Suggested Improvements to Work Statement Process

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

WSP REVIEW FORM

WSP EVALUATION FORM		
Project ID	XXXX	
Project Title		
Sponsoring TC		
Cost / Duration		
Submission History		
RAC 20XX Meeting Review		PTAR STAGE FOLLOWED
Essential Criteria	Satisfied?	Comments & Suggestions
State-of-the-Art: The WS should include some level of literature		
review that documents the importance/magnitude of a problem and the		
need for this publication. If not, then it should be returned for revision.		
Audience/Publication Need: Is there a plan for this work product to		
reach the intended audience? Does this WS include information that		
documents support from ASHRAE Publications Committee or other		
agency that will publish the work product? If not, reject.		
Detailed Bidders List Provided? The contact information in the		
bidder list should be complete so that each potential bidder can be		
contacted without difficulty.		
Does the proposed table of contents adequately cover the topic?		
The table included in the WS should be broken down at least at the		
chapter level and include 8-15 substantive elements		
Evaluation Criteria and Milestones. Are the metrics listed in the		
evaluation criteria appropriate and adequate for the PES to evaluate		
the likelihood of success? Are the milestones appropriate to evaluate		
the progress of the work?		
Time and Cost Estimate Reasonable? The time duration and total		
cost of the project should be reasonable so that the project can be as it		
Is described in the WS.		
Proposed Project Biddable? Examining the WS as a whole, is the		
project described in the WS of sufficient clarity and detail such a		
potential bloder call actually understand and develop a proposal for the		
revisions are in order or the WS should be rejected		
Decision Ontions	Decision2	Suggested Approval Conditions
	Decision	
ACCEPT Vote Work statement/WS) ready to bid as is		
ACCEPT VOICE - WORK Statement (WS) ready to blu as-is		

CONDITIONAL ACCEPT Vote - Minor Revision Required - RL can approve WS for bid without going back to RAC once TC satisfies RAC's approval condition(s) to his/her satisfaction RETURN Vote - WS requires major revision before it can bid REJECT Vote - Topic is no longer considered acceptable for the ASHRAE Research Program due to duplication of work by another project