TC/TG/MTG/TRG MINUTES COVER SHEET

(Minutes of all Meetings are to be distributed to all persons listed below within 60 days following the meeting.)

TC/TG/MTG/TRG No. 5.1 Date 7/01/2019

TC/TG/MTG/TRG TITLE Fans

DATE OF MEETING 6/24/2019 LOCATION Kansas City, MO

<table>
<thead>
<tr>
<th>MEMBERS PRESENT</th>
<th>YEAR APPTD</th>
<th>MEMBERS ABSENT</th>
<th>YEAR APPTD</th>
<th>EX-OFFICIO MEMBERS AND ADDITIONAL ATTENDANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Armin Hauer</td>
<td>2018</td>
<td>Walter Mecozzi</td>
<td>2016</td>
<td>John Bade</td>
</tr>
<tr>
<td>Zhiping Wang</td>
<td>2018</td>
<td>Michael Feuser</td>
<td>2016</td>
<td>Paul Bauch</td>
</tr>
<tr>
<td>Joseph Brooks</td>
<td>2016</td>
<td></td>
<td></td>
<td>Akshay Bhargava</td>
</tr>
<tr>
<td>Brian Reynolds</td>
<td>2016</td>
<td></td>
<td></td>
<td>Mike Brychta</td>
</tr>
<tr>
<td>Z. Patrick Chinoda</td>
<td>2018</td>
<td></td>
<td></td>
<td>Lee Buddrus</td>
</tr>
<tr>
<td>Jay Eldridge</td>
<td>2016</td>
<td></td>
<td></td>
<td>David Carroll</td>
</tr>
<tr>
<td>Jay Fizer</td>
<td>2016</td>
<td></td>
<td></td>
<td>Thomas Cowen</td>
</tr>
<tr>
<td>Brent Fullerton</td>
<td>2018</td>
<td></td>
<td></td>
<td>Nathan Fetting</td>
</tr>
<tr>
<td>Tim Mathson</td>
<td>2018</td>
<td></td>
<td></td>
<td>Mark Fly</td>
</tr>
<tr>
<td>Adam Sterne</td>
<td>2018</td>
<td></td>
<td></td>
<td>Kevin Gildea</td>
</tr>
</tbody>
</table>

Additional Attendance (next page)

DISTRIBUTION: All Members of TC/TG/MTG/TRG plus the following:

TAC Section Head: SH5@ashrae.net

All Committee Liaisons As Shown On TC/TG/MTG/TRG Rosters (Research, Standards, ALI, etc.) See ASHRAE email alias list for needed addresses.

Mike Vaughn, Manager Of Research & Technical Services MORTS@ashrae.net
Note: These draft minutes have not been approved and not the official, approved record until approved by the TC.

Additional Attendance (continued):

Stephen Idem
Sanaee Iyama
Kenneth Kuntz
Paul Lin
Dennis Loveday
Luke Fresconi
Tim Mathson
Jim Meats
Greg Meeuwsen
Jane Miller
Kim Osborn
Asesh Raychaudhuri
Brian Reynolds
Doug Ross
Kezhen Shen
Larry Smith
James Sweeney
Robert Taylor
Greg Wagner
Jamie Yeh
1. **Call to Order**

   The meeting was called to order by the chair at 4:40 pm

2. **Roll Call**

   The following voting members were present:

   Armin Hauer – Chair  
   Zhiping Wang – Vice Chair & Handbook S/C Chair  
   Joseph Brooks - Secretary  
   Brian Reynolds – Research S/C Chair  
   Z. Patrick Chinoda  
   Jay Eldridge  
   Jay Fizer  
   Brent Fullerton  
   Tim Mathson  
   Adam Stern

   The following voting members were not present:

   Michael Feuser  
   Walter Mecozzi

   A quorum was present. The following non-voting subcommittee chairs were present:

   Akshay Bhargava – Standards S/C chair  
   Jaime Yeh – Program S/C Chair

   The TC 5.1 webmaster, Harold Dubensky, was not present. Other non-voting members and guests are listed in the cover letter.

   It was noted that Walter Mecozzi’s term as a voting member ends on June 30 and that Asesh Raychaudhuri, Jaime Yeh and Akshay Bhargava will become voting members on July 1.

3. **Adoption of Agenda**

   The agenda was approved by consensus with the addition of a ‘basecamp’ demonstration as part of new business.

4. **Approval of the Minutes**

   The last meeting of this committee was held on 14 January 2019 in Atlanta.

   Motion ASHRAE TC 5.1 -06-2019  
   Moved by: Brent Fullerton  
   Seconded: Patrick Chinoda

   To approve the minutes of the previous meeting held on January 14, 2019.

   Passed unanimously (9-0-0 CNV)

5. **Items of business**
5.1 ASHRAE Code of Ethics
Chair reminded the TC of the ASHRAE Code of Ethics that requires us to act with honesty, fairness, courtesy, competence, integrity and respect for others, and that we avoid all real or perceived conflicts of interests. (See full Code of Ethics: https://www.ashrae.org/about-ashrae/ashrae-code-of-ethics.)

5.2 TC 5.0 Section Head/Liaison Reports
The chair reported that ASHRAE is holding off on re-organization. Larry Smith provided a report when he arrived. He discussed the 2020 program and that TAC wanted to reiterate that the Code of Ethics should be on the agenda, and reminded the attendees that appearance of unethical practices is just as bad as the unethical practice.

Dennis Loveday (TC 5.1 Research Liaison to RAC) introduced himself and offered to answer any questions.

5.3 Chairman's report
Relevant announcements, reminders, and slides were posted on basecamp (by the chair) on the previous day. Highlights from his report were:

- It was reported that restructuring the TC system is on hold,
- Shared meetings of all program subcommittee chairs and all research subcommittee chairs across the section was thought to be a good experience,
- Prioritized program proposals for Orlando 2020 winter conference.
- Explained RPM (Remote Participation Meetings): RPMs maybe be conducted with personal hard- and software and it was not necessary to use ASHRAE’s. It was also noted that ASHRAE supports RPM only for conference meetings that otherwise do not meet quorum.
- ASHRAE encourages meetings where everyone takes part through Internet before/after physical conferences.
- TAC supports installation of TC membership chair; with the idea to develop membership, liaison with YEA, welcome new members via email, greet at face-to-face meetings, and explain website and basecamp.

5.4 Old business
Scope: TC 5.1 is concerned with the selection, application and testing-for-rating of fans, including recommended installation practices and field test procedures.
TC scopes are always open for revision – Suggestions were solicited.
- It was suggested that maintenance, commissioning and recommissioning should be added to the scope.

Reviewed TC definition in TC MOP dated February 2019:
“A TC is a standing committee with a defined scope of activity which is constituted to provide the Society with technical expertise on subjects within that scope of activity. TC functions may include:
  a) Handbook Content Development
  b) Program Development
  c) Development of Publications
  d) Research
  e) Standards Development”
Discussed the option to establish a Publication or Education subcommittee.

- Opportunities for web meetings
  Handbook – had several
  Research – had project-specific calls, but none for developing RTAR ideas).
  Programs?
  Standards?
  Main TC?

- Basecamp - ASHRAE’s preferred method of TC communication. Demonstration in ‘new business.’
6. Subcommittee reports

6.1 Standards Development subcommittee – Akshay Bhargava

Only one standard, ASHRAE 51 is under the cognizant of this TC with nothing to report. He suggested that a list of any fan related standard could be maintained in basecamp and edited by any TC member. https://public.3.basecamp.com/p/GPHYHb3hDY1kgp44QdVuD9if

The idea was introduced regarding the appointment of a liaison to SPCs.

6.2 Handbook Content Development subcommittee – Zhiping Wang

TC 5.1 approved the fan section in the Handbook via a letter ballot with a vote of 8 yes, 0 no, 0 abstentions, and 4 not voting.

Patrick Chinoda will take over as the S/C chair at the start of the next cycle. Ideas for next cycle were solicited. It was thought that ASHRAE Terminology (Index / Definitions) needs to be compared with the handbook terminology and be updated if needed.

6.3 Research Subcommittee – Brian Reynolds

Brian Reynolds reported on the activities of RAC and the Research S/C. His report is attached.

After the winter 2019 meeting, a TC 5.1 letter ballot on the approval to co-sponsor RP 1835 passed with a vote of 8 - For, 2 - Against, 1 – Abstention, and 1 – not voting. Reason/comments from those two voting against are attached. RAC reviewed results of the letter ballot and Brad Cochran (the WS author) made changes that were satisfactory to those voting no. The Research S/C voted to recommend approval of the revised WS

Motion ASHRAE TC 5.1 -07- 2019  
Recommended by Research Subcommittee  
Moved by: Brent Fullerton

To approve the work statement RP-1835 dated, June 13, 2019.

Passed with vote of 9-0-0  
Chair not voting

6.4 Program Development Subcommittee – Jaime Yeh

Jaime reported on the S/C meeting held yesterday. Her report is attached. In addition, it was reported that hot topics will become part of this S/C.

7. Website Report – Harold Dubensky

Harold could not attend but his website report is attached.

8. New Business

Akshay demonstrated the features and use of Basecamp.

9. Time and Place of Next Meeting

Interim TC or S/C meetings may be held via web / phone at the call of the chairs. The next full TC meeting is scheduled for the Winter meeting in Orlando, FL.

10. Adjournment
The meeting adjourned at 6:18 pm CDT.

Attachments:
1) TC 5.1 Research Subcommittee Report
2) Previous letter ballot comments of WS 1835
3) TC 5.1 Program Subcommittee Report
3) Website analytics report
7 Research Topic Acceptance Requests (RTAR)
   1 Accepted
   2 Accepted with comments
   3 Rejected
13 Work Statements
   1 Accepted
   5 Conditionally accepted
   7 Returned
Wednesday - Contractor Selections for 6 Projects (27 bids)
PMS meetings are open to membership
In-person meetings at summer and winter meetings
- schedule far enough in advance to include in program
Teleconference
- MORTS/Donna will set up doodle poll and GoTo Meeting
Make sure that ex-officio members are invited
- Liaison
- MORTS

Project Monitoring Subcommittee (PMS) Training for all new PMS members
- Spring webinar held on April 25
- Fall webinar being scheduled – stay tuned
RAC is developing a training webinar for Proposal Evaluation Subcommittee (PES) members

Similar to the RTAR for research projects, but addresses issues relevant to publication efforts
Key differences:

<table>
<thead>
<tr>
<th>PTAR</th>
<th>RTAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Publication Need</td>
<td>Research Need</td>
</tr>
<tr>
<td>Target Audience</td>
<td>Project Objectives</td>
</tr>
<tr>
<td>Why funded effort vs.</td>
<td>Approach</td>
</tr>
<tr>
<td>volunteer</td>
<td>Relevance and Benefit to ASHRAE</td>
</tr>
</tbody>
</table>

TC will fill out and submit PTAR form to MORTS
If Publications Committee approves and RAC concurs, the TC may prepare a Work Statement for Publications (WSP)

Key difference between WSP and WS

<table>
<thead>
<tr>
<th>WSP</th>
<th>WS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposed Table of Contents</td>
<td>Scope/Technical Approach</td>
</tr>
</tbody>
</table>

RAC will ensure:
- Publication project is biddable
- Appropriate evaluation criteria to compare bids

Current status:
- Pilot effort, if interested talk to liaison
Notes from the Research Chair Subcommittee Meeting

1. Research Liaison – Dennis Loveday
2. Selected ppt slides

**WS & RTAR’s in progress**

WS and RTAR updates will be distributed (or put in ‘Base Camp’) after Kansas City.

3. 1769-RP (Experimental Evaluation of the Efficiency of Belt Drives for Fans)
   - PMS members are Craig Wray, Tim Mathson (Chair), Eric Tinglof, and Brian Reynolds
   - First interim report has been approved. Includes literature review.
   - The Principal Investigator has left. The PMS met with the contractor, MORTS, and RL to come up with a plan for how to proceed. Contractor to present a proposal by the end of July. Project currently on hold. About 10% of the budget has been spent.
   - Request permission from Mike Vaughn to distribute the interim report (Basecamp).

4. WS-1829 (Parallel fans)
   - Authors – Kim Osborn, Patrick Chinoda
   - Several conference calls since Atlanta
   - Received RAC review comments just prior to Kansas City
   - Request from Asesh to include resulting array performance with one or two fans down.

5. New proposed RTAR (EC motor and fan)

Brian Reynolds
• Output will be a guideline for comparing EC fan & motor technology vs traditional centrifugal plenum fan with induction motor & controller.
• Authors Tim Mathson and Rad Ganesh. Armin (representing TC 1.11) also contributing.
• Several meetings since Atlanta including liaison review.
• Subcommittee review in Kansas City. Need another liaison review before ready for a TC ballot.
• May be more suitable for the new PTAR format (Publication Topic Acceptance Request)
• Proceed with RTAR format for now and convert to PTAR if/when that becomes available.

6. WS 1835 (Brad Cochran) - Characterizing the Performance of Entrained Flow Stacks from TC 9.1, PES has volunteers from TC 5.1. Craig Wray will be on PMS.
   • Motion to recommend to the main committee to approve the changes to the WS. Unanimous vote by the subcommittee (19)

   • In Atlanta requested help to rework the RTAR
   • Co-sponsorship requires someone from TC 5.1 needs to be on the PMS.
   • Did not have time for discussion in Atlanta.
   • No recent contact, may withdraw support.

8. **Are there any ideas, suggestions for Fan Research topics?**
   • A call for Fan Research suggestions and RTAR authors went out before Kansas City and also posted in Basecamp.
   • Can Basecamp be used for posting Fan Research suggestions?
   • VFD Efficiency (joint with TC 1.11) Armin, Dustin There are IEC standards.

Brian Reynolds
• Repeatability of instrumented inlet rings that are calibrated in an AHU (Armin) Armin, Adam Adam Sterne (ACME), and Tim Mathson to draft an RTAR. Suggestion to include TC 1.2, SPC 41.1. By Orlando.

• Houston - Load profile (real-world) information - John Bade, Gus (AHRI), Dustin, Craig. Design point vs. actual operating point.

• Any interest in being the next Research Chair? Succession & mentoring ideas.
Commenter #1, reason for no vote:

- I am very much in favor of this research project, but concerned about the work statement as written.

- The PMS proposed includes wind wake analysis companies who could benefit financially from a certain outcome of this research. I am not opposed to their presence, but there are no fan manufacturers or representatives of AMCA on the PMS. AMCA members have developed test standards for induced flow fans and they should be represented on the PMS.

- Fans used for this research should be tested per AMCA 210 and AMCA 260 in an accredited lab prior to field testing. The pitot traverse at the outlet of the fan will not provide an accurate measurement of airflow. This is important for the correlation to downstream plume rise and spread.

- Concentration measurements are used to determine plume rise and spread. The plumes should be characterized by concentration as well as plume rise and spread. This may be obvious but is not listed specifically.

- There is not much detail given on the conventional stack. Swirl from a conventional fan and stack would impact downstream measurements of plume rise and spread. This would be a fairly easy variable to add to the testing. Suggest simply testing a conventional stack with significant swirl and one with no swirl. But the WS does not give detail on this fan.

- Energy efficiency is riddled throughout the WS. Suggest eliminating the any measurement of power and therefor ignoring efficiency in the objectives of this WS. The power will be dependent on the individual fan design and duty point. These shouldn’t be used to compare with other fans in the project. Stick with the correlation between downstream plume characteristics and fan outlet velocity characteristics.

Commenter #2, reason for no vote:

I have discussed this with several manufacturers of induced flow fans and, although solidly in favor of the need and purpose of the research, it is felt that there were too many questions that need resolution in the Work Statement (dtd. 2-25-2019) to vote for the co-sponsorship at this time. A partial list of the issues within the current WS1835 wording:

1. Is one conventional fan (a non-induced type fan) with a round duct mounted on top of the fan sufficient to be a benchmark? Is the fan centrifugal, axial or mixed flow? And if one of those, will the test guarantee that the other fan types generate fully developed velocity profiles?
2. What is the stack geometry for the conventional fan?

3. Is a stack of five diameters mounted on top of the fan a benchmark that truly represents applications in the market? Or should some other fan/stack combination be used?

4. Conventional fan(s) should be AMCA Certified in accordance with AMCA Standard 210 and Publication 211.

5. Are five induced flow fans to be tested sufficient to provide an adequate sample from which to conclude that the results are generally attributable to all induced flow fans as a fan type? If not, how should the test sample selection and quantity be modified to assure this?

6. Induced flow fans should be AMCA Certified in accordance with AMCA Standard 260 and Publication 211. This assures measurement and validation of the fan outlet airflow rate, outlet area, and nozzle velocity (inlet airflow rate divided by nozzle discharge area).

7. At 20,000 fan inlet CFM, what is the required fan inlet SP, and where and how will it be measured for all fans tested? Methodology needs to be clearly stated.

8. There are many references in the WS to energy. Fan power for all fans tested should be recorded. Methodology needs to be clearly stated.

It was also thought that there should be some representation of induced flow fan manufacturers on the PMS. I am willing to be an active member of the PMS that could represent fan manufacturers. I could also coordinate an effort from a small group of IFF manufacturers to recommend amendments to the WS fan selection and fan test set up which is more conducive to advancing the knowledge of air systems and send to Brad Cochran and TC 9.10.
1. Upcoming Conferences

2020 Winter Conference, Orlando, FL Feb 1-5, 2020

<table>
<thead>
<tr>
<th>TRACKS</th>
<th>DESCRIPTION</th>
<th>TRACKS</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HVAC&amp;R Fundamentals and Applications</td>
<td>5</td>
<td>High Efficiency Design and Operation</td>
</tr>
<tr>
<td>2</td>
<td>Systems &amp; Equipment</td>
<td>6</td>
<td>Big Data and Smart Controls</td>
</tr>
<tr>
<td>3</td>
<td>Refrigeration and Refrigerants</td>
<td>7</td>
<td>Ventilation, IAQ, and Air Distribution Systems</td>
</tr>
<tr>
<td>4</td>
<td>Cutting Edge Approaches</td>
<td>8</td>
<td>Standards, Guidelines and Codes</td>
</tr>
</tbody>
</table>

CHALLENGE 2020 - Fill all of track 7 with programs from section 5

Basecamp: https://3.basecamp.com/3106353/projects/10894950

Ventilation, IAQ and Air Distribution Systems: This track solicits submissions pertaining to the design, operation and study of ventilation and air distribution systems in residential and commercial buildings. The intersection of these systems with respect to indoor air quality and health effects are also of significant interest for this track.

Track Chair: Robert Cox - bob.cox@jacobs.com

DATES & DEADLINES:

<table>
<thead>
<tr>
<th>DATE</th>
<th>EVENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>4/22/2019</td>
<td>Accept/Reject Notifications for Conference Paper Abstract</td>
</tr>
<tr>
<td>6/7/2019</td>
<td>Website Opens for Seminar, Workshop, Forum, Debate, and Panel Proposals</td>
</tr>
<tr>
<td>7/8/2019</td>
<td>Final Conference Papers Due / Request for Conference Paper Sessions Due</td>
</tr>
<tr>
<td>7/26/2019</td>
<td>Accept/Revise/Reject Notifications for Conference Papers</td>
</tr>
<tr>
<td>8/2/2019</td>
<td>Seminar, Workshop, Forum, Debate, and Panel Proposals Due</td>
</tr>
<tr>
<td>8/9/2019</td>
<td>Revised Conference Papers / Final Technical Papers Due</td>
</tr>
<tr>
<td>8/26/2019</td>
<td>Accept/Reject Notifications for Conference and Technical Papers</td>
</tr>
</tbody>
</table>
2020 Annual Conference, Austin, TX June 27-July 1, 2020

<table>
<thead>
<tr>
<th>TRACKS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>8</td>
</tr>
<tr>
<td>9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DATES &amp; DEADLINES:</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/12/2019</td>
</tr>
<tr>
<td>8/30/2019</td>
</tr>
<tr>
<td>12/2/2019</td>
</tr>
<tr>
<td>12/20/2019</td>
</tr>
<tr>
<td>1/13/2020</td>
</tr>
<tr>
<td>2/10/2020</td>
</tr>
<tr>
<td>2/18/2020</td>
</tr>
<tr>
<td>3/2/2020</td>
</tr>
<tr>
<td>5/1/2020</td>
</tr>
<tr>
<td>6/1/2020</td>
</tr>
</tbody>
</table>

2. Potential Programs List

1. Plastic Fans in Ducted Air Distribution Systems
   A. Conference / Track: Orlando Track 7
   B. Speakers:
      1. Brian Rodgers (UL)
      2. John Taecker (UL)

2. System Curves (Title to be finalized)
   A. Conference / Track: Orlando Track 7 (?)
   B. Speakers:
      1. Michael Feuser
      2. TBD – System Effects?
   A. Conference / Track: Orlando Track 7 (?)  
   B. Speakers:  
      1. Chait Johar – The Rise of CAE in Turbomachinery (Fans)  
      2. TBD - Geoff Sheard?  
      3. TBD - CFD for application, possibly car park / jet fan?  

4. Panel – Fan Efficiency metrics in codes and regulations around the world  
   A. Conference / Track: Orlando Track 7 (?)  
   B. Speakers:  
      1. FEI - TBD  
      2. FEG - Lee Buddrus?  
      3. Chinese, European – Joe Brooks will see if he can find any speakers through AMCA Asia / AMCA Europe  
      4. CFM/Watt (large diameter ceiling fans)  

5. **Possible co-sponsor with TC 5.10 - Exhaust Fans for Commercial Kitchens**  
   A. Conference / Track: Orlando Track 7 (?)  
   B. Speakers:  
      1. UL762 Fundamentals – Mark Skierkiwicz  
      2. Upblast, Utility Set, InLine and High Velocity Discharge Pros/Cons – Terry McCabe  
      3. Motor HP, Static Pressure Considerations – Brent Fullerton  

6. Forum or Panel – Pros & Cons of component efficiency regulations  

7. Forum – EC motors vs. induction motors  

3. **Other Notes**  

1. Please contact Jaime Yeh and Armin Hauer with any new program ideas or to volunteer as a speaker for any of the proposed programs.  
2. If programs are rejected, will be considered for presenting during future TC 5.1 “Hot Topics” session.  
   a. Joe Brooks will look into possibility of using AMCA’s FEI course.
### Audience Overview

#### Overview

- **Users**: 193
- **New Users**: 180
- **Sessions**: 236
- **Pageviews**: 412
- **Pages / Session**: 1.75
- **Avg. Session Duration**: 00:01:17
- **Bounce Rate**: 67.37%
- **New Visitor**: 13%
- **Returning Visitor**: 87%

#### Country Statistics

<table>
<thead>
<tr>
<th>Country</th>
<th>Users</th>
<th>% Users</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>137</td>
<td>70.98%</td>
</tr>
<tr>
<td>Canada</td>
<td>8</td>
<td>4.15%</td>
</tr>
<tr>
<td>China</td>
<td>6</td>
<td>3.11%</td>
</tr>
<tr>
<td>India</td>
<td>5</td>
<td>2.59%</td>
</tr>
<tr>
<td>United Arab Emirates</td>
<td>4</td>
<td>2.07%</td>
</tr>
<tr>
<td>Brazil</td>
<td>3</td>
<td>1.55%</td>
</tr>
<tr>
<td>Mexico</td>
<td>3</td>
<td>1.55%</td>
</tr>
<tr>
<td>Germany</td>
<td>2</td>
<td>1.04%</td>
</tr>
<tr>
<td>Egypt</td>
<td>2</td>
<td>1.04%</td>
</tr>
<tr>
<td>Finland</td>
<td>2</td>
<td>1.04%</td>
</tr>
</tbody>
</table>

© 2019 Google