

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

1791 TULLIE CIRCLE, NE/ATLANTA, GA 30329  
404-636-8400

TC/TG/TRG MINUTES COVER SHEET

TC/TG/TRG No. TC5.6

DATE: February, 2005

TC/TG/TRG/TITLE: Control of Fire and Smoke

DATE OF MEETING: 7/2/2005

LOCATION: Orlando, FL

VOTING MEMBERS PRESENT	YEAR APPT'D	VOTING MEMBERS ABSENT	YEAR APPT'D	EX-OFFICIO MEMBERS AND ADDITIONAL ATTENDANCE
Paul Miclea	2003	Sudhir Agrawal	2002	James Buckley, CM
George Hadjisophocleous	2001	John Klote	2002	Larry Felker, CM
David Elovitz	2002	Ray Sinclair	2002	Greg Sanchez, CM
Bob Van Becelaere	2003	Roger Lichtenwald	2004	Dick Graves, Guest
Gary Loughheed	2003	Jeff Tubbs	2004	Ahmed Kashef, Guest
William Webb	2002			Tim Orris, Guest
Stephen D. Carey	2003			Colleen Guest, CM
Paul Turnbull	2001			Robert J. Wasilewski
John Clark	2004			Jerry Kettler, Guest
				Bob Dittrich
				Whitton Mecklar, CM
				Andrew Valence, Guest
				Sean Cassady, Guest
				Joe Brooks, Guest
				John Zhai, Guest
				Kai Kang, Guest

**MINUTES  
ASHRAE TC 5.6  
CONTROL OF FIRE AND SMOKE  
Orlando, FL  
February 7, 2005**

Prepared by: George Hadjisophocleous  
Professor, Carleton University.  
1125 Colonel By Drive  
Ottawa, ON, Canada, K1S 5B6  
Tel. (613) 520-2600 ext. 5801  
Fax (613) 520-3951

**1) Introduction:**

The Committee Chair Dr. Gary Lougheed called the meeting to order at 4:15 pm.

**2) Identification of Voting Members:**

Voting members were identified to assist voting procedures. Eight of fourteen members were present at the beginning of the meeting. A ninth member arrived later during the meeting.

**3) Minutes of Previous Meeting:**

The minutes of the previous meeting in Nashville were unanimously approved as distributed.

**4) Subcommittee Reports:**

**a) Research**

Paul Turnbull presented the following report of the research subcommittee.

<b>RESEARCH PROJECTS- Current</b>			
<b>Project Title</b>	<b>Contractor</b>	<b>Monitoring Committee Chairperson</b>	<b>Report Made At Meeting</b>
RP1108 – Cable Fire in Plenums	NRC	Fred Clark	Yes
RP1247 – Balcony Spill Plumes	NRC	John Klote	Yes

<b>LONG RANGE RESEARCH PLAN</b>				
<b>RANK &amp; TITLE</b>	<b>RTAR</b>	<b>W/S WRITTEN</b>	<b>APPROVAL</b>	<b>TO RAC</b>
1. 1300-TRP - Maximum velocity of make-up air in atrium smoke control applications	Accepted	Yes	Yes	Yes
2. WS-1328 - Develop algorithms for smoke movement modeling in large, multi-compartment, buildings.	Accepted	Yes	Pending	Yes
3. How sprinklers affect smoke management in a large space		No	No	No
4. Investigate when, and when not to use deployable smoke barriers; what parameters		No	No	No

affect performance				
5. Design of emergency smoke exhaust and make-up air locations: - adequate separation and dilution criteria		No	No	No

### Research Projects Overview

- RP1108 (Cable Fire in Plenums). The report on this project was received in March 2004. The PMS (John Klote, Bill Webb, and Fred Clark) reviewed the report, and determined that the basic substance of the report was acceptable, but there were a few issues that they would like to have addressed. Comments were returned to NRC just prior to the Nashville meeting. NRC has since produced a revised report, which has been reviewed by the PMS. The PMS is satisfied with the revisions to the report and recommends acceptance of the final report. The committee voted to accept the report.
- RP1247 (Balcony Spill Plumes). NRC had difficulty in obtaining sufficient smoke exhaust to get a good variation in the height of the smoke layer above the balcony. This issue has been resolved and the test program is moving ahead. However, this issue delayed the test program. NRC is planning to go back and repeat some of the earlier tests to improve the results.

The modeling portion of the project is well underway and is showing good results. Early indications suggest that the results from the modeling, as well as those from the experiments will provide a good basis for determining air entrainment into the plume and developing/verifying the correlations.

NRC has requested a no-cost extension of the project to June 30, 2005. It is anticipated that the technical papers from this project will be presented at the June 2006 ASHRAE meeting in Quebec City.

### Long Range Research Plan

- 1300-TRP (Maximum Velocity of Make-Up Air in Atrium Smoke Control Applications). RAC approved this Work Statement at its' meeting in Nashville, and opened this project for bids. Eight bids were received. The Proposal Evaluation Subcommittee (consisting of Bill Webb, Jeff Maddox, Roger Lichtenwald, and Paul Turnbull) has completed its evaluation of the bids, and the committee voted on their recommendation during a closed session.
- WS-1328 (Develop Algorithms for Smoke Movement Modeling in Large, Multi-Compartment Buildings). Currently, designers of Smoke Control systems are forced to use multiple tools for fire growth and contaminant dispersion in a back-and-forth approach, using the results from one tool as the input to the next, then the results from the second back into the first, etc. to completely model multi-compartment buildings. This project is to develop an algorithm that could be incorporated into a single design tool that would be able to model smoke movement through multi-compartment buildings.

The Work Statement was accepted by the RAC, pending a revision to address 5 points. John Klote revised the Work Statement to address the issues brought up by RAC, and circulated it to the TC for a letter ballot. The revised Work Statement was resubmitted to ASHRAE, and is expected to go out for bids in Spring 2005.

- Stairwells and Open Doors: From TRP-1203, we learned that the pressurization air in the stairwell dilutes combustion products in the stairway significantly even with the stair door on the fire floor open. Because of the limits of computer models we have now, this information needs further study. The algorithm project should develop a tool that can be used for this, but a large

scale fire project would help to develop supporting data. The payoff for this project is that there is a high probability that we will learn that we do not need to design stairwell pressurization systems to maintain pressure when doors are open.

- Long Atria: We know almost nothing about the how long an atrium can be before the smoke exhaust approach is no longer applicable. The question is how long an atrium can be before the smoke in the upper layer tends to fall to the floor. Considering the significance of heat transfer for the mechanisms involved, scale modeling is inappropriate. A project involving full scale fires would be appropriate. Gary Loughheed will review existing publications on the subject.
- How sprinklers affect smoke management in a large space. The purpose of this topic is to define the top parameters that determine how sprinklers affect the level of life safety in a smoke environment. Items of concern include changes to egress time and visibility issues (lowering the smoke layer) when sprinklers are activated. Currently available tools do not address the interaction of sprinklers with the smoke control system. The results of this project would lead to test parameters for a project that would require full-scale testing of the identified conditions. Ray Sinclair volunteered to coordinate further investigation onto this topic with the help of Jeff Tubbs, Raj Kapoor, Bill Webb, and Larry Felker. Ray is investigating the possibility of developing a seminar on this topic, which may help to further define the project.
- Investigate when, and when not to use deployable smoke barriers; what parameters affect performance. The scope of this project would include identifying what types of architectures would benefit, and in what size and/or geometry of the space these are useful. Additional areas that may need investigation include: performance of vertical vs. horizontal, response time to deploy, reliability, testing, rated performance, and design issues.
- Design of emergency smoke exhaust and make-up air locations for adequate separation and dilution criteria. The project would examine generic building shapes and surroundings, use numerical dispersion modeling, and physical scale modeling tests in a wind tunnel to determine dilution levels for a number of intake and exhaust designs. The results of this project could be summarized for future handbook use.
- The effect of stack effect on smoke control systems. What is the impact of reverse stack effect on natural venting smoke exhaust designs? At what point should stairwells be divided into multiple compartments to control stack effect? While this topic is of interest, a literature search would need to be performed to determine whether sufficient data already exist to answer these questions, or if a research project is required to develop the data.

## b) Program

Program subcommittee Chair Bill Webb reported on future program plans as follows:

1. Symposium, Denver, June 2005; Application of CFD to Fire and Smoke Control, Bill Webb – Program Moderator
  - Basics of CFD – George Hadjisophocleous
  - Application Paper – John Klote
  - Application Paper – Ray Sinclair
  - Application Paper – Jeff TubbsAll papers submitted and reviewed.
2. Seminar, Denver, June 2005; Fire and Smoke Detection Technology, Jeff Tubbs – Program Moderator
  - Fire and Smoke Detector Hardware – possibly John Cholin
  - Detector Activation Time – Chris Marrion
  - Smoke Detection in Atria – John Klote

- Lessons Learned – Paul Turnbull or Sanjay
  - Reliability of Smoke and Heat Detectors – George Hadjisophocleous
3. Symposium, Chicago January 2006; Tenability and Risk, John Klote – Program Moderator
    - Overview of Tenability and Risk – Richard Bukowski
    - Tenability Criteria – Richard Gann
    - Fire Loads & Fire Type – George Hadjisophocleous
    - Egress and Human Behavior – Jim Milke
    - Risk of Wind Effects – Ray Sinclair
 Status: Papers must be submitted by April 2005.
  4. Seminar, Chicago January 2006; Fire and Smoke Control Hardware – Back to Basics, Bill Webb – Program Moderator
    - Smoke Control Fans – Joe Brooks
    - Fire and Smoke Dampers – Robert Van Becelaere
    - Actuators – Larry Felker
    - Control Systems – Paul Turnbull
  5. Seminar, Quebec City June 2006; Smoke Control and the Codes, George Hadjisophocleous – Program Moderator
 Status: Possibly topics include the IBC, the NFPA code, NFPA 92A and NFPA 92B. So many things are happening with codes and standards that it was felt that the subcommittee should wait to choose the specific topics.
  6. Symposium, Quebec City June 2006; Balcony Spill Plumes, Bill Webb – Program Moderator
 Modelling, NRC  
 Experiments, Gary Lougheed  
 Modelling, George Hadjisophocleous  
 Application of Balcony Spill Plumes, Solicit paper from RWDI, Arup, Klote
  7. Seminar, Dallas, January, 2007; Effects of Sprinklers on Atrium Smoke Control; Ray Sinclair – Program Moderator
  8. Symposium, Long Beach, June 2007; RP1300 – Smoke control make-up air velocity – Bill Webb – Program Moderator

### **c) Membership**

John Clark has invited meeting participants that are not members of the committee to become corresponding members. He asked them to give him a business card indicating their interest to become corresponding members or members of the committee.

### **d) Handbook**

Material for the handbook should be submitted by May 15, 2006 in order to be in the 2008 Handbook publication. Material should be user friendly. Users of the handbook are engineers, contractors and students. New material can also be published annually on a CD.

## **e) Standards**

The subcommittee is responsible for Guideline 5. They are still waiting for Guidelines 0 and 1 to be finalized before starting work on 5.

## **f) Specification Documents for Smoke Control Exhaust Fans**

Bob Van Becelaere reported AMCA has a draft document going out to membership for comments. Should have it ready by the next meeting.

## **g) Website**

Bob Van Becelaere asked committee members to send him any material they would like to post on the website. ASHRAE will have a parallel website on which they will post membership of committees minutes of meetings and other relevant material. Paul Miclea indicated that there will be training for website monitors at the next meeting in Denver.

## **h) AHJ Education**

Sub-committee Chair Dave Elovitz reported that the sub-committee has been unable to establish a channel to disseminate information to AHJ community and does not expect to be able to develop one. He therefore recommended discontinuing the effort, even though the need continues to be real. Members of the committee decided to accept the recommendation and discontinue this subcommittee.

## **5) Intra-Society Liaison Reports:**

### **TC 1.4**

Larry Felkler reported that 1.4 has nothing going on that is relevant to 5.6.

### **a) TC5.2 – Duct Design**

Bob Van Becelaere indicated that there is nothing to report.

### **b) TC5.9 – Enclosed Vehicular Facilities**

Paul Miclea reported that 5.9 have a symposium co-sponsored with 5.6 and that the committee will meet Tuesday at 3:00 pm.

### **c) TC5.10 – Kitchen Ventilation**

John Clark reported on the ventilation requirements of large restaurants located in shopping malls, and that there should be a relationship between kitchen ventilation and dining room exhaust system.

### **d) TC7.9 – Building Commissioning**

There is ongoing work on testing of kitchen hoods to develop test procedures. Guideline 0 has been completed and is expected to be published soon. Guideline 1 is about 80% done. It is expected to be ready for public review by the summer meeting.

### **e) TC9.1 – Large Building Air Conditioning Systems**

Nothing to report.

**f) TC9.8 – Large Building Air Conditioning Applications**

Liaison needed

**g) TC9.10 – Laboratory Systems**

Liaison needed.

**TC9.12 – Tall Buildings**

TC 9.12 had no program in Orlando. They plan to do case studies of the HVAC systems in four of the worlds tallest buildings.

**6) Inter-Society Liaison Reports:**

**a) CIBSE (Chartered Institute of Building Services Engineers)**

Nobody to report

**b) NFPA 80 – Standard for Fire Doors and Fire Windows**

Bob Van Becelaere reported that the committee is drafting recommendations for the installation and maintenance of fire dampers that will be a new Chapter in NFPA 80. They are expected to be ready for public comments by June.

**c) NFPA 90A – *Installation of Air Conditioning and Ventilating Systems***

Bob Van Becelaere reported that the committee met in December to resolve the many comments they received. One of the hot issues is the frequency of cycle or maintenance of fire dampers. It appears that the recommendations are for hospitals to be every six-years and for other applications every 4-years.

**d) NFPA 92A– *Recommended Practice for Smoke Control Systems* and NFPA 92B – *Guide for Smoke Management Systems in Malls, Atria, and Large Areas***

Paul Turnbull reported that both of these documents are being converted to Standards. 92B has already been approved and is expected to be published soon as a Standard. Committee for 92A met in December and the document is out for ballot. Results are not in yet, however it is expected that it will be approved in Las Vegas at the next meeting.

**e) UL (Underwriters Laboratories)**

UL 555 meting is scheduled for March 3<sup>rd</sup> in Fort Lauderdale to discuss whether they will require testing in accordance with AMCA Standard 520.

**f) AMCA (Air Movement and Control Association)**

AMCA Standard 510 Methods of Testing Heavy Dampers for Rating and Standard 520 Laboratory Methods of Testing Actuators were approved as American National Standards on October 7, 2004.

AMCA has develop recommendations for the periodic inspection, testing and maintenance of fire ,

smoke and other life safety related dampers. This document will be presented to the code bodies for inclusion in their damper maintenance section.

AMCA is currently working on a multi-section damper test proposal for approval by UL where a client can test combinations of small section dampers to achieve a large multi-section listing. Specific duct sealants are also being tested for approval by UL.

## **SFPE**

Nothing reported.

## **7) Old Business**

Nothing

## **8) New Business**

8a) Review of smoke management handbook. John Klote has undertaken the task to improve the handbook. An ad-hoc committee Chaired by George Hadjisophocleous is set-up to review changes made. Some of the changes that will be made are the inclusion of fan performance and material on plug holing. Dick Graves, Bill Webb and Gary Lougheed volunteered to become members of the ad-hoc committee.

8b) Smoke Control for penitentiaries. After some discussion the committee decided that this is not an area where they can contribute.

## **9) Adjournment**

The meeting was adjourned at 6:00 pm.