



ASHRAE Technical Committee 5.6

ASHRAE TC5.6 Control of Fire and Smoke Draft Meeting Minutes Seattle Meeting June 2014

These draft minutes have not been approved and are not the official, approved record until approved by this committee.

TC/TG/TRG No. TC5.6

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

LOCATION: Seattle

| VOTING MEMBERS PRESENT | VOTING MEMBERS ABSENT | Ex-MEMBERS and ADDITIONAL ATTENDANCE |
|---------------------------|--------------------------|--------------------------------------|
| Peter McDonnell | Ahmed Kashef | Tim Orris |
| ED Koop | Kai Kang | James Buckley |
| Gary Andis | William Black | John Klote |
| Kevin Cheng Chang | David John | Byron Hagan |
| Matthew Davy | | Curtis Peters |
| Paul Turnbull | | Julian Rochester |
| Gerald Kettler | | Eli Howard |
| Bob Sibilski | | Yoon Ko |
| Josiah Wiley | | Yuan Li |
| | | David Hahm |
| | | Dahai Qi |
| | | Leon Wang |
| | | Ken Peet |
| | | Nohad Boudani |
| | | Samir Traboulsi |
| | | Valentina Nedelcu |

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The Committee Vice-Chair Peter McDonnell called the meeting to order

Identification of Voting Members

Chairman's Remarks – Peter McDonnell

- ASHRAE will send letters of appreciation by request to committee member employers. An email will be sent from ASHRAE with a link to request letters of appreciation.
- ASHRAE is asking committees to hold meeting several times during the year to increase committee productivity. Phone conferences provide increased participation without travel costs.
- ASHRAE is searching for members to review technical papers. Please contact the secretary if you are interested.
- Chicago conference (Jan 2015) will have a track on Life Safety.
- ASHRAE is asking all members to keep biography information current. The biography information can be accessed after logging onto the ASHRAE website.
- The ASHRAE master calendar is available through Google.
- ASHRAE carefully reviews speaker evaluation forms. Please make sure to seriously consider scores on the speaker evaluation forms. ASHRAE may require low scoring speakers to complete training before speaking at future ASHRAE events.
- Roster changes are effective July 2.



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PROGRAMS – Valentina Nedelcu

Conference Paper, Session 12. Tuesday July 1, 11:00- 12:30 (Room 608)

Fire and Smoke Safety Design for Large and Tall Buildings.

Chair: Paul Turnbull

Speakers:

John Klote.

Design Fires for Large and Tall Buildings.

Ahmed Kashef/Yoon Ko.

Results of Fire Experiments to Quantify Residential Design Fires.

Leon Wang.

A Hand Calculation Method of Smoke Movement through High Rise Building Shaft.

Technical Paper Session 8. Wednesday July 2, 8:00-9:30 (Room 611)

Computational Fluid Dynamics and Hand Calculations: Fan Pressure, Duct Fittings and Smoke Control

Co-sponsor with 5.01 Fans

Chair: William Webb.

Mikhail Nudelman Improvements of Computational Relations for Fan Pressures in HVAC Systems.

Ali Hasan. Analyzing the Effects of Air Flow Distribution on Measurement and Control Equipment

Positioned Downstream and Close to an Air Duct elbow for the Purpose of Optimizing System

Performance Using CFD Technique.



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PROGRAMS – Valentina Nedelcu (cont.)

Future meetings schedule updates:

| Winter Conferences | Annual Conferences |
|--|---------------------------------|
| Jan 24-28, 2015 Chicago, IL | Jun 27-July 1, 2015 Atlanta, GA |
| Jan 23-27, 2016 Orlando, FL | Jun 25-29, 2016 St. Louis, MO |
| Jan 28- February 1, 2017 Las Vegas, NV | |

Chicago 2015 Winter Conference.

www.ashrae.org/chicago

Conference Paper Abstracts are due March 24th, 2014

Technical Papers are due April 14, 2014

- Track 1 Systems and Equipment
- Track 2 Fundamentals and Applications
- Track 3 Industrial Facilities
- Track 4 Large Buildings: Mission Critical Facilities and Applications
- Track 5 Energy Efficiency
- Track 6 Life Safety**
- Track 7 Design of Energy and Water Efficient Systems
- Track 8 Hospital Design and Codes

For Chicago 100 conference paper abstracts were accepted and authors were invited to submit conference papers.

August 11, 2014 – Seminar, Forum, Workshop Proposals Accepted online

July 7, 2014 – Final Conference Papers due and will then go through a single blind review.

Aug 18, 2014- Final Technical Papers. The papers are currently undergoing review.

Atlanta 2015 Annual Conference .

www.ashrae.org/atlanta

- Track 1 Systems and Equipment
- Track 2 Fundamentals and Applications
- Track 3 Research Summit
- Track 4 Refrigeration
- Track 5 Building Operation, Maintenance and Optimization/Commissioning
- Track 6 Indoor Air Quality
- Track 7 Modeling throughout the Building Life Cycle
- Track 8 High Performance Buildings
- Track 9 Moving Advanced Energy Design Guidance to the Mainstream



PROGRAMS – Valentina Nedelcu (cont.)

September 22, 2014 – Conference Paper abstracts and Final Technical Papers due

January 5, 2015 – Final Conference Papers due

The Atlanta meeting will be the third annual Research Summit that brings together researchers to present and discuss the latest research.

Future Proposed Programs

During the Program Sub-Committee Meeting each of the scheduled/proposed TC5.6 program events was re-visited in terms of: event type, proposed meeting date, topics, chair and speaker availability.

Chicago, January 2015

- **Seminar** – Alternative Fire and Smoke Detection Technologies for Smoke Control Applications.
Paul Turnbull – Moderator
Possible papers by George Hadjisophocleous, Ahmed Kashef and Matthew Davy.
The program has been submitted prior to the meeting.
On September 8th is the deadline for receiving the answer on acceptance of the program.

Atlanta, June 2015:

- **Conference** - Smoke Control in Secure Facilities.
Collaboration with TC 9.4 Justice Facilities.
Peter McDonnell is the liaison with TC 9.4

Chair to be assigned.
Possibility of 4 papers.

- **Conference** : CFD of Smoke Management
Chair: Paul Turnbull
Papers:
John Klote- Atria Tenability Analysis for Smoke Control System.
Bill Black –Stairwell Pressurization and the Movement of Smoke during a High-Rise Fire. A smoke movement program is used to determine the influence of open fire escape doors on the distribution of smoke inside a high rise building during a fire.
Leon Wang-



PROGRAMS – Valentina Nedelcu (cont.)

Orlando, January 2016:

- **Technical Papers:** Make-up Air Velocity for Smoke Control in Atria.
University of Maryland RP-1600 final results.

St- Louis, June 2016:

- **Conference-** Pressure Testing of the Buildings. Experiments.
Chair: Leon Wang
Possible papers by NRC (Experiments, Test Data), Mike Ferrara and Leon Wang

Other Proposed Programs:

- **Seminar**– Special issues related to smoke control in large volume spaces.
Jeff Tubbs - Moderator.
John Klote- Smoke control in Long Spaces.CFD capabilities/ limitations.
John Clark- Smoke removal in Shopping Malls. Case studies where was needed.

Future program topics.

Zone Smoke Control required in hospitals.
Balcony Spill Plumes.



TC5.6 Research activities – Paul Turnbull

Active Research Projects:

RP-1600 Make-up Air Velocity for Smoke Control in Atria (#2)

- Project is to further investigate the effects of make-up air in excess of 200 fpm on performance of an atrium smoke exhaust system.
- Research is being done by University of MD.
- Paul Turnbull had multiple discussions by phone and email with Christine Pongratz (MS student from Fire Protection Engineering) and Jim Milke regarding the project.
- Received a draft report (100+ pages) detailing the work that has been completed to date, and distributed it to the PMS.
- The report includes:
 - Literature review including a comparison of past makeup air velocity studies with FDS 6.0 (Chapter 4)
 - Details of the FDS model configurations, and diagnostics used for this study, including a Simulation Matrix (Chapter 3)
 - An analysis method for predicting the increase in smoke production at higher makeup air velocities, alpha, and the explanation of the developed engineering tool (Chapter 5)
 - An analysis method for predicting the change in separation distance at higher makeup air velocities, including an explanation of the engineering tool developed (Chapter 6)
 - Summary of the work and suggestions for future work (Chapter 7)
- Preliminary results:
 - Smoke Layer Height**
 - Simulations conducted in 10 meter-tall Atrium with makeup air injected through a duct mounted vent located close to the fire
 - 1 MW, 2.5 MW and 5 MW fire simulated with makeup air vent located close to the base/ slightly elevated from base, with velocities of 0 m/s, 1 m/s, 1.25 m/s, 1.5 m/s, 1.75 m/s.
 - Results showed that for makeup air > 1 m/s, the smoke production rate is increased. However, a smoke layer DOES form and the plume is not destroyed. The smoke layer height does descend below intended the height as a result of the increased smoke production.
 - Created Engineering Tool to calculate the smoke production increase (alpha) from the fire size, burner area, makeup air vent size, vent elevation, and makeup air velocity (not to exceed 1.75 m/s)
 - The alpha value will be used to increase the mechanical exhaust (allowing for greater makeup air velocities, which decreases the wall area required for makeup air inlets).
 - Separation Distance**
 - Simulations were run in open space with 1 MW, and 5 MW fire
 - Radiant heat flux gauges tracked the heat flux in line with the increase makeup air velocities (from vent)
 - Results show increase heat flux in line with makeup air velocity
 - Engineering Tool: Similarly designed with another adjustment factor for separation distance (to be applied to the equation in NFPA 92 for calculating separation distance)



TC5.6 Research activities – Paul Turnbull (cont.)

Work remaining

- Complete simulations for compartment height of 30 meters
- Most simulations have been run and preliminary results show that the increased makeup air has almost no effect on the smoke layer height (does not descend) The volume of makeup air is limited by the vent size, vent size is increased and makeup air velocity is increased to 3.5 m/s
- Results will be presented with a discussion relevant to the engineering tool proposed for 10 meter compartment results
- Need to run additional simulations for makeup air supplied at different heights, and for makeup air supplied off-axis from the plume.

Estimate of time remaining

- Complete report is expected in August.

TRP-1447: (Performance of Pressurized Stairwells with Open Doors)

- Project is to investigate the need for compensating stairwell pressurization systems, to further investigate observations seen in RP-1203 (modeling study of stairwell pressurization systems).
- Work is being done by National Research Council of Canada.
- Yoon Ko reported on the progress of the project on behalf of Gary Loughheed.
 - They have completed initial CONTAM simulations to confirm previous results from RP-1203.
 - NRC has provided a detailed test plan to PMS and is waiting for confirmation from PMS to continue.
 - Plan to conduct preliminary fire tests in July-Sep 2014 to develop the fuel package for the 10-story tests.
 - Setup and instrument the full-scale test facility in Sep-Nov 2014
 - Run the 10 full scale tests in Dec 2014 – Feb 2015.
 - Perform tenability analysis March – May 2015.
 - Prepare final report by Sep 2015.

New RTAR 1644 (Smoke Control in Long Atria):

- Main goal is to determine when existing calculations are no longer valid. Designer could then choose how to deal with it (treat as multiple atria, use CFD, etc.)
- RTAR was reviewed by the RAC and was returned with comments requesting further revision and clarification. . Main comments:
 - Lacks details about deliverables
 - Please address budget concerns
 - Unclear how data would be used by ASHRAE
- Project includes full-scale or scale-model testing and CFD modeling. Current cost estimate in RTAR is \$150K. Past projects suggest this is too low for full-scale testing, which agrees with RAC concerns. Need cost estimate from committee members familiar with this type work before it can be submitted.
- Paul Turnbull was to revise the RTAR and forward it to John Klote for review. Revision was not completed due to lack of time.

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Weather data

- During discussions at the Research subcommittee meeting, it was noted that the weather data that is published in the ASHRAE handbook is not in a form that is readily used for smoke control design.
- John Klote will take the lead and contact the TC responsible for the weather data about what info is needed for smoke control, so that future updates to the ASHRAE weather data will be more useful for smoke control designers.



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Report on NFPA Smoke Management Committee (NFPA92) activities given during TC5.6 meeting -Paul Turnbull

NFPA Smoke Management committee met Feb 26 in Orlando to review and act on 9 Public Comments on NFPA 92, and 1 Public Comment on NFPA 204 (Smoke Vents).

Most of the Comments involved changes to Definitions: Draft Curtain, Plume, Smoke Barrier

An earlier revision to NFPA92 deleted the requirement for automatic weekly self-test per UL864. A Public Comment added "as specified by the engineer of record". Some members of the committee attempted to overturn the previous deletion for one cycle by individually contacting many committee members during the balloting, in order to wait for the next IBC - which will include alternate compliance path for the UL864 weekly self-test. That effort was unsuccessful, so the deletion of weekly self-test and addition of "as specified by the engineer of record" stood, meaning that **there is now no requirement or recommendation in the standard for an appropriate verification interval**. This will probably come up on the floor at the NFPA meeting in June 2015.

There was one Public Comment on NFPA204 to update reference documents.