

**AMERICAN SOCIETY OF HEATING, REFRIGERATING, AND  
AIR CONDITIONING ENGINEERS, INC.**  
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**TC/TG/TRG MINUTES COVER SHEET**

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

TC/TG/TRG NO.:	<b>4.5</b>	TC/TG/TRG TITLE:	<b>Fenestration</b>	
DATE OF MEETING:	<b>January 31, 2017</b>	LOCATION:	<b>Las Vegas, NV</b>	
DATE ISSUED:	<b>February 2, 2017</b>	RECORDED BY:	<b>Thanos Tzempelikos</b>	
<b>Name</b>	<b>Affiliation</b>	<b>E-Mail</b>	<b>Member (VM, CM, Guest)</b>	<b>Present</b>
<i>Anil Parekh (Secretary)</i>	Natural Resources Canada	<a href="mailto:Anil.Parekh@NRCan.gc.ca">Anil.Parekh@NRCan.gc.ca</a>	VM	N
<i>John Hogan (Standards)</i>	Consultant	<a href="mailto:John.hogan@igc.org">John.hogan@igc.org</a>	VM	Y
<i>Peter Lyons (Handbook)</i>	Peter Lyons and Associates	<a href="mailto:peter.lyons@fenestralia.com">peter.lyons@fenestralia.com</a>	VM-NQ	N
<i>Charlie Curcija (Calculation Methods)</i>	LBNL	<a href="mailto:ccurcija@lbl.gov">ccurcija@lbl.gov</a>	VM	Y
<i>Thanos Tzempelikos (Chair)</i>	Purdue University	<a href="mailto:tzempel@purdue.edu">tzempel@purdue.edu</a>	VM	Y
<i>Joe Hetzel (Vice Chair)</i>	DASMA	<a href="mailto:jhetzel@thomasamc.com">jhetzel@thomasamc.com</a>	VM	Y
<i>William DuPont (Research)</i>	Sunergy	<a href="mailto:waupi@msn.com">waupi@msn.com</a>	VM	N
<i>Robert Hart</i>	LBNL	<a href="mailto:rghart@lbl.gov">rghart@lbl.gov</a>	CM	Y
<i>Paul Turnbull</i>	Siemens	<a href="mailto:Paul.turnbull@siemens.com">Paul.turnbull@siemens.com</a>	CM	Y
<i>Sagar Rao</i>	AEI	<a href="mailto:sagar.rao@outlook.com">sagar.rao@outlook.com</a>	CM	Y
<i>Roger LeBrun</i>	Velux	<a href="mailto:Roger.lebrun@velux.com">Roger.lebrun@velux.com</a>	CM	Y
<i>Mahabir Bhandari</i>	ORNL	<a href="mailto:bhandarims@ornl.gov">bhandarims@ornl.gov</a>	CM	Y

Stanley Yee	Dow Corning	Stanley.yee@dowcorning.com	CM	Y
Hua Ge	Concordia University	Hua.ge@concordia.ca	CM	Y
Dennis Wessel (TAC Liaison)			Guest	Y (part)
Total voting members: 6 Voting members present: 4				

**SCOPE:**

TC 4.5 is concerned with the identification and evaluation of all physical properties of (1) glasses and other glazing materials, (2) shading and shielding materials and devices, and (3) control devices and strategies which influence the radiant, conduction, and convection transfer of both heat and light through fenestration systems. It is also concerned with the development of procedures for calculating and measuring solar heat gain, daylight admission, and heat transfer through fenestration systems.

**COMMITTEE AND MEETING INFORMATION**

**Subcommittee Meetings:**

- TC 4.5 Handbook – Monday (1/30), 4:15 pm-5:15 pm, Forum 22
- TC 4.5 Research - Monday (1/30), 2:15 pm-3:15 pm, Forum 22
- TC 4.5 Program - Monday (1/30), 3:15 pm-4:15 pm, Forum 22
- TC 4.5 Fenestration - Tuesday (1/31), 2:00 pm-4:00 pm, Forum 2

TC Web Site: <http://tc45.ashraetcs.org>

**INTRODUCTIONS AND ROSTER CHECK**

Meeting started at 2:15pm. Voting 6, present 4. Quorum present.

**APPROVE AGENDA**

John Hogan moved to approve; Joe Hetzel second; Agenda was approved (4-0-0).

**APPROVE MINUTES FROM PREVIOUS MEETING**

Minutes from St. Louis meeting: John Hogan moved to approve; Joe Hetzel second; Minutes were approved (4-0-0).

**ANNOUNCEMENTS (TC Chair)**

**1. Roster changes**

- a. Thanos Tzempelikos' term as Chair and VM ends on June 20, 2017. Need to elect new TC Chair.
- b. William DuPonts' term as research subcommittee chair and VM ends on June 30, 2017. Need to elect new VM and research subcommittee chair.
- c. Sagar Rao was nominated as a new VM and research subcommittee chair starting July 1<sup>st</sup>, 2017.
- d. Charlie Curcija was nominated as the new TC Chair starting July 1<sup>st</sup>, 2017.
- e. Mahabir Bhandari was nominated as new VM starting July 1<sup>st</sup>, 2017.
- f. Roger LeBrun was nominated as new VM starting July 1<sup>st</sup>, 2017.
- g. Anil Parekh will serve as TC 4.5 Vice Chair starting July 1<sup>st</sup>, 2017.

TC initiated a vote to approve items (c-g) above. John Hogan moved; Joe Hetzel second; Motion was approved (4-0-0). The new TC leadership starting July 1<sup>st</sup>, 2017, shown below, includes the new members/positions. The revised roster was sent to TAC by Thanos Tzempelikos on Feb. 2, 2017.

## TC LEADERSHIP

Starting July 1<sup>st</sup>, 2017, voting members and subcommittee chairs are:

Charlie Curcija (Chair, Calculation Methods) - VM  
John Hogan (Standards) - VM  
Joe Hetzel - VM  
Anil Parekh (Vice Chair) - VM  
Sagar Rao (Research) –VM  
Roger LeBrun – VM  
Mahabir Bhandari -VM  
Peter Lyons (Handbook) – Provisional NQ Member  
Michael Collins (Program)

## LIAISON REPORTS

### ***Technical Activities Committee (TAC)***

#### ***Standards***

Steve Ferguson talked about code interactions and TC involvement in codes and standards.

#### ***Research Administration Council (RAC)***

Xudong Yang was present during the research meeting and provided comments about WS and RPs.

#### ***Conferences and Expositions Committee (CEC)***

No liaison present

#### ***Handbook Committee***

No liaison present

#### ***Chapter Technology Transfer Committee***

No liaison present

#### ***ASHRAE Learning Institute (ALI) / Professional Development Committee (PDC) –***

No liaison present

#### ***Special Publications***

No liaison present

## SUBCOMMITTEE REPORTS

### ***Calculation Methods (Charlie Curcija)***

- There are concerns with low participation. The TC will discuss if this subcommittee may include standards in the future.

### ***Research (William DuPont). Chaired by Thanos Tzempelikos***

The agenda included:

- Discussion on RTARs, WS, and ongoing RPs
- Discussion and clarification with our research liaison, Xudong Yang, who was present for the entire meeting
- PMS meeting and reporting for RP-1710, contractor present
- Discussion on RP-1414, which has been inactive

#### ***Research Topic Acceptance Reports (RTAR)***

- a. TC 4.5 RTAR Proposal: “Develop Reference Representative Solar Spectra for Solar Heat Gain Calculations in North America,” William C. duPont/Sunergy Consulting & Chris Gueymard/Solar Consulting Services
  - On hold; suggested to be removed from the list.

### Work Statements (WS)

- a. TC 4.5 WS-1789: "Optical and Thermal Performance of Hollow Glass Blocks." *Aziz Laouadi/NRC*
  - This RTAR has been approved by TC 4.5 and submitted to the RAC.
  - It was conditionally accepted by RAC with comments in February 2016. The research liaison approved developing the WS, also addressing the RAC comments.
  - WS needs to be finalized by Aziz and sent to TC 4.5 for voting before submitting to RAC.

### Research Projects (RP)

- a. TC 4.5 RP-1414: "Update of U-factors, Solar Heat Gain Coefficients and Visible Transmittances of Standard Fenestration Units made from Representative Fenestration Frame and Glazing Systems in the Fenestration Chapter of the Handbook of Fundamentals." *Bish Stojanovic of DesignBuilder Software. PMS Chair: Charlie Curcija*
  - There have been significant delays and no results/progress submitted at this point by the contractor. TC members and the research liaison expressed their concerns.
  - PMS needs to vote if the TC grants NCE or if the project should be terminated and go for bid again. Charlie Curcija initiated a ballot vote for PMS members, and should report the PMS vote to the TC within a week.
- b. TC 4.7 and TC 4.5's RP-1588: "Procedure to Create Hypothetical Layer-by-Layer Fenestration Descriptions When Only the Bulk Properties Such as U-factor and SHGC Have Been Defined," *Joe Huang/White Box Consulting*
  - The final report has been submitted. TC voted and approved the final report (4-0-0).
- c. TC 4.5 RP-1710: "Effects of Dynamic Shading Devices on Daylighting and Energy Performance of Perimeter Zones."
  - Kristen Cetin from Iowa State University is the contractor and was present to report on project updates. The contractor has sent updates since last Fall and has not received a response from PMS members. There were concerns about feedback and response from PMS members.
  - The PMS Chair is Anil Parekh, who can only attend one meeting per year. Other PMS members are Charlie Curcija and Willie DuPont. Thanos Tzempelikos agreed to serve as a PMS member to help with project evaluation.
  - The project progress was discussed and the PMS was satisfied with progress. Testing will start in the next few weeks. Comments were provided about changing light fixtures and installing more work plane illuminance sensors to monitor daylight distribution in test rooms.
  - The PMS and the contractor agreed that we should have web meetings, probably every two months, to discuss project progress and answer questions that the contractor might have.

### Long Range Research

- a. Building Integrated Photovoltaics (BIPV). *Chris Gueymard/Solar Consulting Services, Peter Lyons/Peter Lyons & Associates and Anil Parekh/National Resources Canada*
  - This topic needs to be further refined to develop specific RTARs. One major topic should be developing methods for measuring and characterizing BIPV systems for windows (SHGC, Tv, etc.) , and inclusion of properties in IGDB. Another topic has to do solely with visual comfort and glare through such systems.
  - John Hogan mentioned that 90.1 could be a co-sponsor for this topic.
  - Charlie Curcija mentioned that someone from LBNL will take a lead in developing an RTAR.
  - TC 6.7 may be a potential co-sponsor.
- b. "Develop Revise the Shading Chart, (Keys Chart), in the Fenestration Chapter of the Handbook of Fundamentals," *Michael Collins/University of Waterloo, Thanos Tzempelikos/Purdue University, and Peter Lyons/Peter Lyons & Associates*
  - Mike Collins suggested that the existing table in the Handbook of Fundamentals needs to be revised based on current research. An RTAR needs to be developed and submitted.
  - John Wright mentioned that there is progress made by U of Waterloo and will think if an RTAR is appropriate.
- c. "Shading operation in commercial and residential buildings, manual and motorized", *Thanos Tzempelikos/Purdue University*
  - Thanos will draft a basic description for an RTAR to be discussed in TC. 90.1 should be interested.

d. "Measurement and calculation protocol for frit glass", *Charlie Curcija/LBNL*.

**Conferences and Expositions (Mike Collins). Chaired by Thanos Tzempelikos**

**LAS VEGAS PROGRAM, JAN 28-FEB 1, 2017**

**Transactions paper:** "An experimental study and model of a window with STPV", *A. Athienitis, K. Kapsis/Concordia University*

**Conference paper:** "Inside convection coefficients for complex fenestration systems with roller blinds", *J. Wright et al., University of Waterloo*

**LONG BEACH PROGRAM, June 24 - June 28, 2017**

There is a seminar proposed by Jim Coogan and co-sponsored by TC 4.5, 2,2 and the controls TC on perimeter zones controls.

**CHICAGO PROGRAM, January 20-24, 2018**

Conference paper abstracts due March/April 2017

Technical papers due April 2017

Seminars/forum proposals due August 2017

TO BE CONFIRMED:

**Conference/Transaction papers:**

1. "Integrated controls for perimeter building zones", *A. Tzempelikos/Purdue University*
2. "Inference of thermal preference profiles for personalized thermal environment", *A. Tzempelikos, P. Karava/Purdue University*
3. "Daylight dashboard with combined energy and comfort metrics", *Sagar Rao/AEI*
4. "Modeling the Performance of Honeycomb and Cellular Shading Systems," *Charlie Curcija, Jacob Jonsson & Robert Hart/LBNL*
5. "Modeling the Performance of Pleated Shading Systems," *Charlie Curcija, Jacob Jonsson & Robert Hart/LBNL*
6. "Results from NFRC WINDOW6/THERM6 validation projects", *William duPont*

***The program Chair should contact authors, confirm submission, and try to include the submitted papers in one session sponsored by TC 4.5.***

**Handbook (Peter Lyons).**

The 2017 final version of the Handbook Fenestration Chapter and the checklist were submitted to ASHRAE by Peter Lyons on Jan. 24, 2017. The TC voted (5-0-0) to approve the checklist through letter ballot before the winter meeting.

**Standards (John Hogan)**

**TC 4.5 Website (Sagar Rao)**

The new TC website is up and running. Sagar Rao is the webmaster and has updated the web pages.

**OLD BUSINESS**

None.

**NEW BUSINESS**

None.

**ADJOURN**

Approximately 4:15 pm

*Respectfully submitted by Thanos Tzempelikos (TC 4.5 Chair)  
January 31, 2017*