

**AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS, INC.
1791 Tullie Circle, N.E./Atlanta, GA 30329
404-636-8400**

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 02.01 DATE 01/24/06

TC/TG/TRG TITLE Physiology and Human Comfort

DATE OF MEETING Tuesday LOCATION Palmer House Hilton, Chicago

<i>Distribution: All Members of TC/TG/TRG plus the following:</i>	
TAC Section Head:	Gary Phettaplace
TAC Chair:	Eckard Groll
All Committee Liaisons As Shown On TC/TG/TRG Rosters:	Paul Cabot – Standards Kimball Ferguson – Special Publications Mark Hydeman – Professional Development Comm Spencer Morasch – Program Guy Perreault – Chapter Technology Transfer Jeff Spitler – RAC John Wells - Handbook
Manager Of Standards	Claire Ramspeck
Manager Of Research & Technical Services	Mike Vaughn

**ASHRAE TC 2.1 Physiology & Human Environment
Draft Meeting Minutes
Chicago Meeting
January 24th, 2006**

ASHRAE TC ACTIVITIES SHEET

DATE: January 2006

TC NO. TC 2.1

TC TITLE: Physiology & Human Environment

CHAIR: Peter Simmonds

SECRETARY:

TC 2.1 MEETING ATTENDANCE

Name	Affiliation	Email	TC	Research	Program/Handbook/ Productivity
Peter Simmonds	IBE Consulting Engineers	Peter.simmonds@ibece.net	X		
Eric Adams	Carrier	eric.adams@carrier.utc.com	X	X	
James Bushnell	HVAC Consulting Service	jimb@abac.com	X	X	X
Larry Berglund	US Army Inst of Env.. Med.				
Paul Lebbin	KSU	plebbin@ksu.edu	X	X	
Sitaraman Chandra Sekhar	National University of Singapore	bdgscs@nus.edu.sg	X	X	
Gwelen Paliaga	Taylor Engineering				
Jaap Hogeling	Netherlands	j.hogeling@isso.nl	X		
Jim Simek	Boeing		X		
Kenneth Roy	Armstrong World Industries	kproy@armstrong.com	X	X	
Chuck Dorgan	University of Wisconsin	cedorgan@wic.edu	X		
Lily Wang	University of Nebraska, Lincoln	Lwang4@unl.edu		X	
Hal Levin	Building Ecology Group	hal.levin@buildingecology.com	X		
P. Ole Fanger	DTU	fanger@mek.dtu.dk	X		
Bjarne Olesen	DTU	bwo@mek.dtu.dk	X	X	
Glenn Hedman	University of Chicago				
Byron Jones	Kansas State				
Rob Woodward	Carrier				
Peter Malone					

TC 2.1 Physiology & Human Environment Main Meeting

Meeting Schedule

TC 2.1 Physiology & Human Environment (15/10)(screen/E) Tuesday 1:00-3:30p Montrose 1 (7)

TC 2.1 PMS 1257 (15/10)(screen/E) Sunday 2:00-3:00p Parlor G (6)

TC 2.1 Research (15/10)(E) Sunday 3:00-5:00p Parlor G

TC 2.1 Handbook/Productivity (15/10)(Screen/E) Sunday 5:00-7:00p Parlor G

Main Committee Agenda

1. **Call to Order:** 1:09 p.m.
2. **Read Scope:** TC 2.1 is concerned with the relationship of man's living environment, as altered by air conditioning, heating, and ventilation systems to his comfort health and productivity.

3. Introduction of Members, Guests, and Liaisons

Roll Call: **Quorum: 7/11** voting members present.

MEMBERS	PRESENT?
Peter Simmonds	Y
Eric Adams	Y
Gwelen Paliaga	Y
Larry Berglund	Y
James Bushnell	Y
Nicholas Rajkovich	
Alison Kwok	
Paul Lebbin	Y
Amy Musser	
James Readon	
Sitaraman Chandra Sekhar	y
Diotima Von Kempster	INTERNATIONAL MEMBER
David Wyon	INTERNATIONAL MEMBER

4. Anaheim Meeting Minutes Approval:

MOTION: approve Nashville minutes: Moved Musser, Seconded Adams

Discussion: none.

Motion Passed, 7-0-0 CNV (Chair Not Voting).

5. Liaison Reports

TAC Chairman – Eckard Groll

TAC Section Head – Gary Phettaplace

Standards Liaison – Paul Cabot

Special Pubs Liaison – Kimball Ferguson

Professional Development Committee (EDUC) Liaison – Mark Hydeman

Program Liaison – Spencer Morasch

Chapter Technology Transfer Liaison – Guy Perreault

RAC Research Liaison – Jeffrey Spittler

Handbook Liaison – John Wells III

Staff Liaison (Standards) – Claire Ramspeck

Staff Liaison – Michael Vaughn

6. Chair's Report – Peter Simmonds

From Chair's meeting:

Announcements

- Action Item Review

7. Subcommittee Reports

Programs – James Bushnell

QUEBEC CITY (June 2006)

- Symposium: Jim Bushnell (list of papers sent)

Dallas (January 2007)

Research – Eric Adams

1330-URP	2.1	RECOMMEND FUND OR NOT BY JAN. 2006	1330-URP	RECEIVED DEC. 2004, P.I. CAN'T START TIL 2006
1128-RP	2.1	PROVIDE NEW ESTIMATED END DATE FOR	1128-RP	CURRENT CONTRACT END DATE IS FEBRUARY 2005
1160-RP	2.1	TC APPROVE FINAL REPORT	1160-RP	RECEIVED JAN. 2003
1257-RP	2.1	PROVIDE NEW EST. END DATE OR FINAL RPT	1257-RP	CURRENT CONTRACT END DATE IS DECEMBER 2005
1269-RP	2.1	PROJECT UNDER CONTRACT AS OF 10/05	1269-RP	P.I. MUST SUBMIT PROGRESS REPORTS TO MORTS

1330 URP was withdrawn and not considered.

Review Projects:

RP-1160 "Limiting Criteria for Human Exposure to Low Humidity"-David Wyon

- final report submitted to ASHRAE. The final report has been approved by a previous TC meeting with the condition that the contractor must submit their data to ASHRAE. Please let the chairman know when the data has been submitted.

RP-1128 "Combined Effect of the Thermal Environment and Acoustics on Human Comfort in HVAC Controlled Buildings," Dale Tiller.

Contractor is requesting a second no cost extension for 6 additional months.

MOTION: no cost 6-month extension for RP-1128. Moved Simmonds, Seconded Lebbin.

Discussion: none.

Motion Passed, 7-0-0

RP-1257 "Indoor Environmental Effects on the Performance of School Work by Children"

- Contractor is requesting a no cost extension

MOTION: no cost 6-month extension for RP-1128. Moved Adams, Seconded Lebbin.

Discussion: none.

Motion Passed, 7-0-0

RP- 1269 Occupant responses and energy use in buildings with moderately drifting temperatures. DTU – Bjarne Olesen.

- Contract signed in October. Update given at research subcommittee meeting.

Work statements:

Work statement “ASHRAE Standard 55 Users manual” Peter Simmonds

MOTION: To approve the workstatement . Moved Adams, Seconded Levin.

Discussion: none.

Motion Passed, 7-0-0

This workstatement was approved in June 2005

RTAR: “Energy Conservation, Air-conditioning and productivity in hot-humid tropical regions”. David Wyon.

MOTION: to approve the RTAR. Moved Adams, Seconded Bushnell

Discussion: none.

Motion Passed, 7-0-0

This RTAR was submitted to ASHRAE on 11 March 2006.

Standards – Wayne Dunn (Peter Simmonds) SSPC 55

- Continuous maintenance to be worked on. (proposal for 3 classes, compliance, draft/turbulence, mandatory)

Honors and Awards Peter Simmonds

- The Ralph J Nevins award was discussed in an executive session.

Handbook – Larry Berglund

Larry would like some help with the handbook as he has been carrying the torch long enough.

Productivity – Chuck Dorgan

- No report.

Webmaster – Nick Rajkovich

Old Business

none

New Business

- Renew roster.

Next Meeting

June Quebec City

Adjournment

2:40P



Meeting Agenda

TC 2.1 Physiology and Human Environment

Research Subcommittee

22 January 2006 , 2:00 – 5:00 PM;

Chicago, IL

Palmer House, Parlor G (6)

Please note for the future: An LCD projector for computers is NOT available for the research subcommittee meeting. I apologize for the inconvenience.

1. 2:00 – 3:00 Report on “Indoor Environmental Effects on the Performance of School Work by Children” – PMS 1257: Sipes (chair); Reardon, Federspiel

this report was not given

2. 3:00 Call to order – Adams

3. Research Projects – Ongoing:

- RP1128 “Combined effect of the thermal environment and acoustics on human comfort in HVAC controlled buildings”

PI: Dale Tiller

PMS: In’t Hout, Levin (chair), Roy, Adams, Olesen

Final Report delivered to PMS at the meeting. Dale Tiller will be editing the document for style. PMS will read and generate any content changes to Dale. PMS will provide chair with recommendation via e-mail prior to Quebec City. Letter ballot expected. End date for contract approximately June 06. Contractor should inform ASHRAE of no-cost extension. Recommended to full TC to grant a no-cost extension until June ’06.

- RP-1160 “Limiting Criteria for Human Exposure to Low Humidity”

PI: David Wyon

PMS: Sipes(chair), Tanabe, Jones, DeDear

PMS asked to send to ASHRAE the data from the contractor. It has not received the data. PMS has recommended acceptance (and a TC vote was taken previously) when the data has been delivered.

- RP - 1257 “Indoor Environmental Effects on the Performance of School Work by Children” -

PMS: Sipes, Reardon, Federspiel

A 6-month extension was asked for by the contractor. Estimated end date: June ’06. Recommended to full TC to grant a no-cost extension until June ’06.

First paper submitted to ASHRAE research journal. Seminar paper planned for Dallas or Long Beach. Bjarne Olesen gave update. Main results to date: As room air temperature decreases, performance improves. As ventilation rate increases, performance improves.

- RP – 1269 – “Occupant responses and energy use in buildings with moderately drifting temperatures” – Bjarne Olesen
PMS: Alison Kwok; Peter Simmonds, Jap Hogeling
Contract signed in October. Bjarne Olesen gave update: Phase I experiments and computer simulations of energy use started
- RP - 1332 “Revisions of the ASHRAE thermal comfort tool to maintain consistency with standard 55-2004” Charlie Huizenga
PMS: Sipes; Simmonds (chair)
Charlie is asking for comments. Program to be sent to committee members for detailed input.

4. Research Proposals Under Review by PES:

none

5. long-range research plan:

- RTAR - Energy conservation, air conditioning and productivity in hot-humid tropical regions. – David Wyon – Chandra Sekhar led a discussion of the revised RTAR. Committee recommends that TC2.1 accept the RTAR for submission to RAC with one change: A final sentence is to be added that summarizes the experimental data to be taken, the main analysis, and to include in the analysis “sustainability”. Vote: 17-0-0
- Standard 55 Users Manual – Peter Simmonds – idea rejected by SPLS – research subcommittee voted to recommend that TC2.1 reaffirm our commitment to this research proposal and find the correct group to approve the RTAR
- Thermal and air quality effects on sleep – David Wyon – The new version received comments that will be submitted to the author.

6. Work statements / RTARS / List for Long Range Plan

At the next meeting, a new long-range research plan will need to be submitted. I would urge all people with research ideas to write them up in RTAR format and submit them to me well before the Quebec City meeting so that they can be distributed for comments. Traditionally, the most-well developed RTARs are ranked higher in the prioritization.

Current List

- Human response to air movement, Part 2: airflow direction-Arsen Melikov – Bjarne to communicate with Arsen to determine if a revised RTAR can be submitted to the committee to review and comment.

- Mixed Mode Buildings – Gail Brager will send a revised RTAR to committee members prior to the next meeting so that comments can be given at the next meeting.
- Indoor environmental conditions in homes. (Hal Levin)
- Kitchen Thermal Comfort – a revised RTAR from TC 5.10 was received at the meeting. TC 5.10 would like TC 2.1 to co-sponsor the research and for TC2.1 to have significant contribution to the work. TC 5.10 is looking for help in finishing the RTAR. RTAR will be forwarded to all members with a proposal to find individuals who can help write the RTAR. It is included below.

Unique Tracking Number Assigned by MORTS _____
 RESEARCH TOPIC ACCEPTANCE REQUEST (RTAR) FORM
TC/TG: 5.10 (Kitchen Ventilation) and 2.1 (Physiology and Human Environment)

Title: Thermal Comfort In Commercial Kitchens

Research Category:

(1) Indoor Air Quality, Comfort and Health, (2) Design Tools, (3) Energy Conservation

Research Classification: Basic and Applied Research

TC VOTE:
 (for-against-abstentions-absent-total)

TC Priority:
 2

Estimated Cost:
 The project has an estimated cost of \$95,000.

Other Interested TCs:

Possible Co-funding Organizations: none

Application of Results:

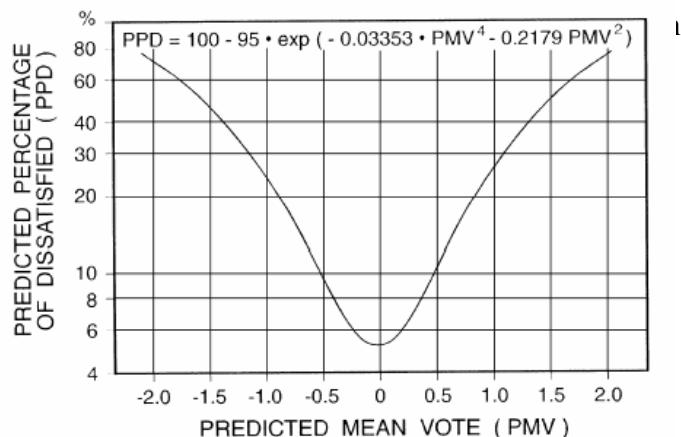
Applications Chapter 31 (Kitchen Ventilation), Standard 154 (Ventilation for Commercial Cooking Operations), Standard 55 (Thermal Environmental Conditions for Human Occupancy), Fundamentals Chapter 8 (Thermal Comfort)

State-of-the-Art (Background)

ASHRAE has defined the thermal sensation scale to quantify thermal comfort of occupants (ASHRAE Standard 55-2004) in a space as shown in Table 1. A model of dissatisfaction in a space versus the comfort of people (one measure of which is predicted mean vote or PMV) was developed for general indoor spaces has in Figure 1.

Table 1. Thermal Sensation Scale

Value	Sensation
+3	Hot
+2	Warm
+1	slightly warm
0	Neutral
-1	slightly cool
-2	Cool
-3	Cold



The six primary factors identified in Standard 55-2004 which impact the comfort level of people are (1) metabolic rate, (2) clothing insulation, (3) air temperature, (4) radiant temperature, (5) air speed, and (6) humidity. While these have been well evaluated for general spaces (such as office buildings), there has been little or no work done analyzing the thermal comfort in real-world kitchens. One aspect of commercial kitchens that is not typical of a general space is that thermal comfort is driven by the load from cooking appliances – namely from the large amount of radiation that can both heat up the kitchen space and directly impact the comfort of staff. Estimates of radiation loads from appliances vary from 17% to 48% depending on the type of appliance (ASHRAE Fundamentals, Chapter 30). Furthermore, the surface temperature of these appliances can be as high as several hundred degrees which is something not typically encountered in general spaces. The existing data on the affect of thermal radiation on occupancy comfort is shown in Figure 2 and represents a temperature difference up to only 41.4 F between the surfaces and the occupants.

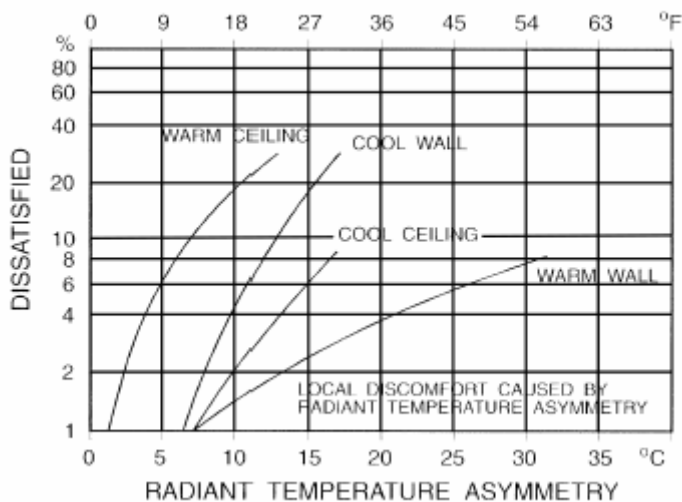


Figure 2. Asymmetric Thermal Radiation

Advancement to the State-of-the-Art:

No public domain data is currently available on the level of thermal comfort that exists in commercial kitchens today. The purpose of this study is to develop baseline data which can be used to analyze comfort in kitchens. First, this project will provide a source of reference data to evaluate the level of thermal comfort in commercial kitchens. It is expected that the primary 6 parameters will all be measured in actual kitchens to determine the breadth of conditions that exist today in kitchens along with conducting surveys for the staff to ascertain their comfort levels in that environment.

One outcome of this study will be a laboratory evaluation on the impact of thermal radiation on the dissatisfaction level in a space, similar to what is shown above in Figure 2. The temperature differences in kitchens between the occupants and the appliances can be several hundred degrees.

Justification and Value to ASHRAE:

The restaurant industry is the nations largest employer outside of the government (National Restaurant Association, 2005). The restaurant industry employs 12.2 million people in the United States. Understanding the currently state of thermal comfort in kitchens is the first key to providing a controlled and comfortable environment for occupants.

Objective:

The objective of the research project is to quantify what thermal conditions exist in real-world restaurants as well as performing laboratory analysis to define what relative impact parameters such as thermal radiation, air temperature, humidity, velocity and the other primary comfort factors have on the thermal comfort of occupants in the space.

Key References:

ASHRAE Standard 55-2004, “Thermal Environmental Conditions for Human Occupancy”, ASHRAE, 2004.

ASHRAE Handbook of Fundamentals 2005, Chapter 30 – Nonresidential Cooling and Heating Load Calculations, ASHRAE, 2005.

National Restaurant Association, Restaurant Industry Fact sheet, 2005.