**AMERICAN SOCIETY OF HEATING, REFRIGERATING AND**

**AIR-CONDITIONING ENGINEERS, INC.**

**1791 Tullie Circle, NE, Atlanta, GA**

**404-636-8400**

**Technical Committee 4.4**

**Building Materials and Building Envelope Performance**

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

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**TC/TG/TRG MINUTES COVER SHEET**

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

**TC/TG/SSPC: TC 4.4**

**TC Title: Building Materials and Building Envelope Performance**

**Date of Meeting: Wednesday, June 16. Meeting convened at 10:00 am EDT.**

**Location: Virtual**

**DISTRIBUTION**

All members of TC 4.4 plus the following:

TAC Chair

Committee Liaisons

**ADDITIONAL DISTRIBUTION**

Manager of Standards

Manager of Research and Technical Services

**ASHRAE TC 4.4 MINUTES**

**Building Materials and Building Envelope Performance**

# Introductions

The Chair, Diana Fisler, called the meeting to order at 10:00am, which was followed by roll call attendance from leadership team.

# Membership/Roll Call/Attendance (M. Ghobadi, Membership Chair)

Voting Members rolling off June 30, 2021, Chris Schumacher, Dave Yarborough, Florian, Roderick Jackson.

New voting members rolling on July 1, 2021: Marcus Bianchi, Danko Davidovich, Neil Freidberg. Contact TC 4.4 Chair or membership chair if you are interested in being a voting member – note, to be eligible for voting status you must be a Corresponding Member for minimum of 2 years.

## Voting Members and Officers Attended:

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Affiliation** | **Role** | **VM** |
| Diana Fisler | ADL Ventures | Chair | Voting Member |
| Sam Taylor | DOE (retired) |  | Voting Member |
| Florian Antretter | Fraunhofer |  | Voting Member NQ |
| Andre Desjarlais | ORNL |  | Voting Member |

 ***Total Number of VM: 4 (1 non-quorum)***

## Voting Members and Officers Absent:

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Affiliation** | **Role** | **VM** |
| Peter Adams |  Morrison Hershfield |  |  Voting Member |
| Sam Glass | USDA Forest Products Laboratory |  |  Voting Member |
| David Finley | WJE |  | Voting Member/YEA |
| Laverne Dalgleish | AABA |  | Voting Member |
| Fitsum Tariku | BCIT |  | Voting Member |
| Roderick Jackson | NREL |  | Voting Member |
| David Yarbrough | R&D Services |  | Voting Member |
| Chris Schumacher | RDH Building Science |  | Voting Member |

## Corresponding/Provisional Members Attended:

|  |  |  |
| --- | --- | --- |
| **Name** | **Affiliation** | **Role** |
| Wahid Maref | Ecole de Technologie Superieure |  |
| Deborah Callaway | Pabco |  |
| Danko Davidovic | Huber |  |
| Anthony Fontanini | NREL |  |
| Rick Peters | TBS Engineering |  |
| Michael Schmeida | Gypsum Association |  |
| Leslie Scheppelmann | WJE | Webmaster |
| Theresa Weston | The Holt Weston Consultancy, | Standards Chair |
| Jonathan Humble | American Iron & Steel Institute | Liaison |
| Alex McGowan | WSP |  |
| David Roodvoets |  |  |
| Bill Healy | NIST |  |
| Martha VanGeem |  |  |
| Carston Rode | Technical University of Denmark |  |
| Patrick Noonan | Knauf Insulation |  |
| Manfred Kehrer | WJE | Vice Chair |

***Total number of CM, PCM: 16***

## Guests Attended

|  |  |
| --- | --- |
| **Name** | **Affiliation** |
| Brad Carmichael |  |
| Carsten Rode | Technical University of Denmark |
| Soph Davenberry | National Energy Management Institute Committee |
| Chadwick Collins | Kellen Company (XPSA) |
| Pat Huelman |  |
| Philip Boudreaux |  |

***Total number of guests: 6***

# 3. Report from the Chair (D. Fisler, Chair) with Section Head Jamie Bennett

Section head reviewed the new functional group evaluation form designed to assess the functioning of each TC. Completing the form is the responsibility of the Chair with input welcome from members of the TC.

TC leadership has agreed to extend chair’s term by one year.

Section head – V20-D3 updated activity report (on basecamp)

* Objectives section was weak overall for TCs
* MBO (management by objective) spreadsheet – ASHRAE strategic plan has initiatives
	+ TAC is encouraging an additional meeting to discuss/work through the MOB, Jamie recommends having a meeting in the fall.
	+ Andre: what’s the purpose and what will it be used for?
		- Online/virtual meetings/technology to increase the speed of ASHRAE
		- ASHRAE considering hybrid meetings moving forward (Chair and Weston agrees)
* Victor Goldschmidt’s Leadership training initiative (available on basecamp)
	+ Send form to Jamie Bennett for pdh credit

# Approval of Minutes (L. Scheppelmann, Acting Secretary)

The draft minutes from the January 2021 virtual meeting were posted to the ASHRAE Website and Basecamp for review. Unapproved minutes were posted to Basecamp, Chair provided a letter ballot for vote for approval.

***Vote: For 7, Against 0, Abstaining 0 NR 4; MOTION CARRIED (CNV) Andre Desjarlais noted he was present in January. Minutes will be revised to reflect this change***

# Program Subcommittee Report (P. Tabares, Programs Chair)

Seminars for summer virtual meeting (last week in June), some live and some pre-recorded and available online

* 32 (Building Envelopes and their Resilience to Natural Disasters (Andre Desjarlais)
* 50 Holistic Envelope and HVAC Design and Retrofit Considerations in Hot and Humid Locations (Paulo Tabares)
* 77 What Is New on Walls? Advances in Ventilated Cavities (Paulo Tabares)

Sam Taylor proposed a new seminar with TC 4.5.

A separate letter ballot for each co-sponsorship is needed.

Letter ballot needed to approve program. Program approved by letter ballot with vote:

***Vote: For 7, Against 0, Abstaining 0 NR 4; MOTION CARRIED (CNV)***

**Seminars proposed for summer meeting**

Hot, Hot, Hot? Or Future Proofing

Chair: Achilles Karagiozis

SPC 160: hygrothermal modeling, today, tomorrow and the future

paper 1: Wahid Maref

paper 2: Simon Palin: developing THERM to include moisture

paper 3: Florian Antretter

Hot, hot, hot

Chair: Paulo Tabares

Peter Adams: Building in Jamaica. Having to ventilate with OA to solve humidify problems

FSEC is providing two additional speakers

Building envelope recover to wind and flood

Chair: Andre Desjarlais

Speaker 1: Pete Consigli (RIA) restoration industry association Insurance Company

Speaker 2: NRC post-disaster for roofing. (Mehdi Ghobadi to send Suda Molleti’s email to Andre)

Speaker 3: Wildfires…California Energy Commission… envelope code & fire. Andre Desjarlais will contact. He already secured most speakers.

Thermal performance of air permeable claddings (Phoenix or Vegas)

Chicago (Energy Conservation):

Chair: Paulo Tabares

1.-Dolaana PMS 1759

2.- Nate: CFD+ experimental testing: R-value of ventilation brick veneer assembly

3.-Mehdi Ghobadi (NRC): reflective insulation in air cavity

4.- Wahid Maref: thermal performance of building envelope using reflective materials

New chapters in ASHRAE:

Chair: Handbook chair (Laverne Dalgleish)

1.            25 Marcus Bianchi

2.            26 Hua Ge

3.            27 Mikael Salonvaara

Overall view of rainscreens. (for Las Vegas)

Benefit of rainscreens to reduce solar to reduce load

Rainscreen principles and how to avoid issues and connection with performance issue

Danko Davidovic, Wahid Maref, Soph Davenberry and Paulo Tabares to follow up.

Buildings XV conference (December 5-8, 2022 Live) – call for abstracts

 Due by September 30

 Send info to andre desjarlais

 Organizing committee meeting in July

 Fiona dropped out of organizing committee – Manfred wants to be added to committee

# Research Subcommittee Report (M. Bianchi, Research Chair)

### Announcements

* Reminder that Section 4 Research Liaison (RL) is Natascha Milesi-Ferretti (NIST)
* Research Subcommittee Chair Virtual Breakfast will be held on February 9, 2021 at 8:00 AM EST.
	+ Update to TC 4.4 via Basecamp
* Reminder for everyone that the deadlines for RTAR, WS, etc. submissions to RAC:
* March 15
* May 15
* August 15
* December 15

### Active Research Project Status

**1696-RP**, “Thermal, Moisture and Air Transport Property Values for New Building and Insulating Materials”

* PMS: Alex McGowan (Chair), Sam Glass, Theresa Weston, Achilles Karagiozis
* PI: Chris Schumacher (RDH Building Science Laboratories)
* History:
	+ Contract awarded Fall 2015
	+ 2 no-cost extension granted
	+ Presentation was presented to Buildings XIV, Clearwater, Dec 2019
	+ TC 4.4 voted to advance final research report to RAC on recommendation of PMS in June 2020
* Status:
	+ **Final report was submitted to RAC on August 14, 2020**

**1759-RP**, “Impact of Airflow on Thermal Performance of Airspaces behind Cladding (Phase 1 of 2)”

* PMS: Paulo Tabares (Chair), Hua Ge, Jay Crandell, Marcus Bianchi
* PI: Dolaana Khovalyg (EPFL)
* History:
	+ Contract awarded Spring 2018
	+ 1 no-cost extension granted
* Status:
	+ **Final report was submitted to RAC on August 14, 2020**

**1730-WS**, “Research to determine the mass flow rate correlations across standard venting strategies and components in attic spaces with sloped roofs”

* Authors: Anthony Fontanini and David Roodvoets
* History:
	+ W 2014 – RTAR accepted
	+ F 2019 – WS 1 returned (not accepted) returned with comments from RAC
	+ RL says comments should be addressed and we should resubmit WS to RAC for their spring 2020 mtg (March 15, 2020).
	+ Neil Freidberg (then Owens Corning, now LP) attended the virtual meeting in June 2020; Anthony Fontanini was unable to attend. Neil reported that they were still revising the work statement
	+ The group discussed a plan to get the revised WS to RAC for their fall meeting
* Status:
	+ Anthony to revise with support from Neil Freidberg and others
* Actions:
	+ Chris Schumacher to assist Anthony and Neil Freidberg.
	+ **Anthony Fontanini will follow up**

**1857-WS**, “Improved simplified methodology for describing and calculating conduction between buildings and the ground”

* Authors: Neal Kruis and Tim McDowell (TC 4.7)
* History:
	+ W 2020 – TC 4.7 approved WS and Tim McDowell asked TC 4.1, TC 4.4,
	and SSPC 90.1 to consider co-sponsoring
	+ Sp 2020 – TC 4.4 voted to co-sponsor
	(by email ballot: 8/0/0 CNV; 4 non-response)
	+ Paulo Tabares offered to represent TC 4.4 on the project
	+ Tim McDowell submitted a revised version of the WS to RAC on December 4, 2020
* Status:
	+ On January 19, RL communicated to Tim that it was conditionally accepted by RAC and the authors will receive comments
* Actions:
	+ **Marcus will follow up with Neal Kruis to connect Paulo Tabares with them**

### Possible Research Projects

* **RTAR**: “Development of Material Moisture Tolerance Criteria and Evaluation Methodology for Hygrothermal Analysis of Building Enclosures using ASHRAE 160”
	+ Author: Jay Crandell
	+ Still in development. No update because the author did not attend.
* **RTAR**: “Hygrothermal Properties of Aged Construction Materials”
	+ Author: Neal Holcroft
	+ Still in development
	+ ***Diana Fisler has volunteered to assist Neal in this effort. Neal no longer available. Diana to follow up with Suda Moletti.***
* **RTAR**: “Moisture Transfer in Building Materials at High Temperatures”
	+ Author: Sam Glass
	+ Still in development
* **Potential new RTAR:** “Low-slope and ratiometric performance data for reflective technologies in roof assembly applications”
	+ Authors: Wahid Maref, David Yarbrough, Peter Adams
	+ **Wahid will follow up**

### Brainstorming

* Status:
	+ Scheduled for January 28th, 11:00 AM to 1:00 PM EST (See Basecamp)
* From our past brainstorming efforts, we had a Top 10 list:
	1. Air and moisture transport at building envelope interfaces
	2. Characterize impact of air leakage on moisture deposition in assemblies
	3. Develop full characterization of material properties with all dependencies (e.g., temperature, moisture content) and error bands in dependencies for stochastic modeling
	4. Effect of aging on air permeance of assemblies (aging of openings)
	5. Effect of aging on heat, air and moisture related properties
	6. Effects of aging, temperature, and moisture content on thermal conductivity
	7. Field work to better characterize/understand/quantify air movement in and through assemblies (source, path, distribution)
	8. Mold growth risk on common building materials vs. moisture/temperature/time
	9. Normalize interior humidity loads across different climates, weather conditions, building types, building age, occupancy, and construction
	10. Thermal mass and the grid: How can we use the building envelope
1. Virtual brainstorming session earlier this year – over 80 concepts, put together ballot on basecamp
	1. Requesting all members of TC to fill out ballot, send to Theresa Weston with initials on file. Can send to people outside of TC – goal is to get research feedback for industry
	2. HML – high, medium, lowCan add other priorities
	3. Andre – concerns if someone forwards to many people with the same organization/industry/educational community – might skew prioritization

# Standards Subcommittee Report (T. Weston)

**ASHRAE International Standards Participation**

Request by members of the ISO TAG US Committee to have TC 4.4 get involved by reviewing ISO proposed updates and reporting findings and recommendations to the US Committee. Currently under review is “Diagnosing Moisture Damage in Buildings and Implementing Countermeasures Part 1: Principles, Nomenclature and Moisture Transport Mechanisms”. The meeting is Tuesday 1- 3:30 in the Lake Lucerne room.

**Standard 90.1 (a.k.a. Commercial minimum compliance energy standard) Energy Standard for Buildings Except Low-Rise Residential Buildings** (Jonathan Humble - reporting)

*Purpose: To establish the minimum energy efficiency requirements of buildings other than low rise residential buildings for*

1. *design, construction, and a plan for operation and maintenance; and*
2. *utilization of on-site, renewable energy resources.*

Report:

* 2019 edition has been published,
* Committee preparing for 2020 edition by developing work plan (15 + aspirational goals),
* Addendum “av” (Thermal Bridging, related to RP-1365) will be going out for a 2nd public review,
* Mr. Humble continues to report on TC 4.4 activities.
* Preparing for completion of 2022 edition
* Addendum av will be going out to public review after 90.1 votes
* Addendum t – max air leakage rate permitted, size of buildings for mandatory testing, subcommittee reviewed yesterday,
* Addendum af metal building systems – approved and will be included in revisions (correcting errors0
* Addendum s – approved

Mr. Humble continues to report on TC 4.4 activities.

**Standard 90.2 (a.k.a. Residential leadership energy performance code) Energy Efficient Design for Low-Rise Residential Buildings** (Jonathan Humble reporting)

*Purpose. The purpose of this standard is to establish the minimum whole‐building energy performance requirements for energy efficient residential buildings.*

Report:

* Published 2018 edition in 2019,
* Revising title purpose and scope to move from above code to high energy efficiency standard for all residential occupancies to read (Draft at this time) “1. PURPOSE - The purpose of this standard is to establish the minimum whole-building energy performance requirements for highly energy efficient residential buildings”,
* New categories being considered:” 8. renewable energy systems, 9. energy storage systems and their controls and control algorithms, and 10. internet connected control of the systems listed above, 11. energy management systems”.
* Revisiting energy metrics in preparation for the next edition.
* Widen residential occupancy cover

**Standard 160 Criteria for Moisture-Control Design Analysis in Buildings** (Achilles Karagiozis reporting)

*Purpose: The purpose of this standard is to specify performance-based design criteria for predicting, mitigating or reducing moisture damage to the building envelope, materials, components, systems and furnishings, depending on climate, construction type, and HVAC system operation. These criteria include the following:*

*a) criteria for selecting analytic procedures*

*b) criteria for inputs*

*c) criteria for evaluation and use of outputs*

Report:

* Currently working durability (1) Corrosion, (2) Freeze/Thaw
	+ Scope of corrosion research includes metals, primarily steel, and how to predict the conditions in the envelope that will create a corrosive environment.
	+ How will this be translated to standards language and how to perform the assessment?
* Public review of addendum A, closed May 30,

**Standard 189.1 (a.k.a. Green and sustainable standard, not a minimum) Standard for the Design of High-Performance Green Buildings, Except Low-Rise Residential Buildings** (Jonathan Humble reporting)

*Purpose: The purpose of this standard is to provide minimum requirements for the siting, design, construction, and plans for operation of high-performance green buildings to reduce emissions from buildings and building systems, enhance building occupant health and comfort, conserve water resources, protect local biodiversity and ecosystem services, promote sustainable and regenerative materials cycles, enhance building quality, and enhance resilience to natural, technological, and human-caused hazards; …*

Report:

* This is a joint venture project with ASHRAE, IES, AIA, ICC, and USGBC,
* Business agreement between ASHRAE and International Code Council to create one high performance green code for North America,
* Recently published 2018 document entitled the International Green Construction Code which combines the technical requirements of Standard 189.1 and the ICC International Green Construction Code,
* Continue to use ASHRAE Standard 90.1 as the benchmark with modifications for the green code, and
* Preparing to complete all proposals and publish a 2020 ASHRAE edition, and a 2021 International Green Construction Code edition.

New Standards Projects Initiated:

* **Standard 227P Passive Building Design**

*Purpose: This standard provides requirements for the design of buildings that have exceptionally low energy usage and that are durable, resilient, comfortable, and healthy.10/3/19.*

*Out for public advisory review*

* **SPC 228P Standard Method of Evaluating Net-Zero Energy Building Performance**

*Purpose: This standard sets requirements for evaluating whether a building or group of buildings meets a definition of “net-zero energy”. It provides a consistent method of expressing qualifications for net-zero energy buildings associated with the design of new buildings and the operation of existing buildings.*

**Potential New Guidelines:**

* No other new guidelines proposed
* IRC proposal

Sam Taylor would like Standards to include on 62.1, subcommittee chair requested an email to be sent to her with this request and welcomes others to attend the Standards meeting.

# Handbook Subcommittee Report

# Chapters 25,26,27 were revised and submitted for publication. Next chapter due for revision is chapter 45. Peter Adams has agreed to coordinate.

Hua Ge will be taking over as chair, Peter Adams will be taking over Chapter 45.

Simon Pallin will be reviewing language for both TCs.

Alex McGowan will be handling the fenestration section of Chapter 45 (many updates needed for fenestration references, etc.).

Sam Taylor noted that a lot of work is required to revise Chapter 45.

Andrew Desjarlais requested to verify that data from Rp 1696 is not included because it was incorrect. Sam Taylor requests ASHRAE note the issues with the data and the concrete measurements.

# Old Business

Review of TC 4.4. Scope:

No progress was made on scope or vision since last meeting. Discussion will continue on Basecamp in advance of next meeting.

# New Business

* Discussion about reviewing chapter 45 to make sure 1696 data was not included due to concrete measurement issues.
* Sam Taylor: if there is some important research, we should seek funding from other sources.
	+ Diana Fisler: if we are doing research for ASHRAE, seems burdensome for us to seek our own research
* Sam Taylor: Education subcommittees – expanding handbook committee to other publications
	+ If we expand, need to look at quality of research (example chapter 36)

***Minutes by Leslie Scheppelmann – Acting as a Secretary, TC 4.4. Next meeting: Las Vegas (or virtual), January 2022***