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**DRAFT**

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

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

TC/TG/MTG/TRG No. TC 4.1 DATE 6/27/2022

TC/TG/MTG/TRG TITLE Load Calculation Data & Procedures

DATE OF MEETING Monday 6/27/2022 LOCATION Hilton, Thom Thomson (C) - Hybrid

MEMBERS PRESENT	YEAR APPTD	MEMBERS ABSENT	YEAR APPTD	EX-OFFICIO MEMBERS AND ADDITIONAL ATTENDANCE
JingJuan Feng		Steven Bruning		Jim Pegues
Rolando Legarreta				WenBin Ng
Rachel Spitler				Sonia Brown
Glenn Friedman				Liam Buckley
Robert Doeffinger				Jason DeGraw
Brain Rock				Bryan Morris
Chris Wilkins				Vrunda Patel
Larry Sun				Stephen Roth
Som Shrestha				Vance Payne
				Laurie Burgarella
				Curtis Fong
				Siddharth Bhat
				Patrick Pease
				Ashkay Jindal
				Danielle Monfet
				Elyse Malherek
				Marie-Hélène Talbot
				Ed Janowiak

**DISTRIBUTION: All Members of TC/TG/MTG/TRG plus the following:**

TAC Section Head: Vance Payne

SH4@ashrae.net

All Committee Liaisons As Shown On TC/TG/MTG/TRG Rosters (Research, Standards, ALI, etc.)	Research: <a href="mailto:natascha.milesi-ferretti@nist.gov">natascha.milesi-ferretti@nist.gov</a> ; Handbook: <a href="mailto:datadigm-analytics@outlook.com">datadigm- analytics@outlook.com</a> Staff: <a href="mailto:shammerling@ashrae.org">shammerling@ashrae.org</a>
Mike Vaughn, Manager Of Research & Technical Services	MORTS@ashrae.net

Note: These draft minutes have not been approved and not the official, approved record until approved by the TC.



# ASHRAE Technical Committee 4.1

## ASHRAE TC 4.1 Load Calculation Data & Procedures

### Full Committee Agenda

2022 ASHRAE Summer Meeting

Hybrid Conference

In-Person: Hilton, Thom Thomson (C)

1. Call to order [2:36 PM EDT] Jingjuan (Dove) Feng

2. ASHRAE Code of Ethics Commitment Jingjuan (Dove) Feng  
*"In this and all other ASHRAE meetings, we will act with honesty, fairness, courtesy, competence, integrity and respect for others, and we shall avoid all real or perceived conflicts of interests."* (See full ASHRAE Code of Ethics: <https://www.ashrae.org/about-ashrae/ashrae-code-of-ethics>)

3. Roll call – Determination of a Quorum Rachel Spitler

JingJuan "Dove" Feng	06/30/2024	Robert Doeffinger	06/30/2023
Rachel Spitler	06/30/2022	Brian Rock	06/30/2024
Rolando Legarreta	06/30/2025	Chris Wilkins	06/30/2025
Glenn Friedman	06/30/2023	Larry Sun	06/30/2024
Steven Bruning (Absent)	06/30/2022	Som Shrestha	06/30/2024

Quorum was determined with nine present, one absent.

4. Introductions All

- In Person Sign-In sheet
- Remote Sign-In google doc sheet:  
<https://docs.google.com/spreadsheets/d/1FN89KPANjFZzO1n5qcvOdUwiFKOq9r2PqUK4oPsf9jU/edit?usp=sharing>

5. Scope, Mission Statement Jingjuan (Dove) Feng  
Scope: TC 4.1 is concerned with the identification and compilation of engineering data and the development of procedures for calculating heating, cooling, refrigeration, and ventilating loads of structures.  
Mission Statement: To serve practitioners by advancing the data and procedures of load calculations

6. Agenda additions All

7. Liaison reports (as they arrive) Liaisons  
a. Section Head Vance Payne  
TAC is starting to spool down the TC mergers, but there is still time to let TAC know if you want to merge.  
TAC would like TCs to do interim virtual meetings between ASHRAE meetings to keep business moving.

TC 4.1 Web Site: <https://tc0401.ashraetcs.org/>



## ASHRAE Technical Committee 4.1

Beta version of roster and activity forms should be coming out soon.  
Email TCstaff@ASHRAE.net for any issues we have or outstanding questions.

- |  |                          |
|--|--------------------------|
| b. Chapter Technology Transfer   | Christopher Adams        |
| c. Research  | Natascha Milesi Ferretti |
| d. Handbook  | Bass Abushakra, PhD      |
| [There is a new handbook liaison – Eric Granzow (egranzow@olsson.com)] |                          |
| e. Staff, Research/Tech Services                                       | Steve Hammerling         |
| f. TAC Chairman  | Larry Smith              |

### 8. Chair's Report

Jingjuan (Dove) Feng

- a. Chair's Goal
  - i. Encourage new member involvement
    - Support subcommittee chairs to complete tasks
    - TC leadership path: serve as Subcommittee Chair – Secretary – Vice Chair -- Chair
- b. Announcement from TC Chairs Breakfast Meeting
  - i. Updated FG MOP - available at [www.ashrae.org/TAC](http://www.ashrae.org/TAC)
    - Changes to FG MOP
  - ii. TC Re-Org update
  - iii. The Professional Development Committee (PDC) is seeking ideas for new ASHRAE Learning Institute (ALI) courses

### 9. Approval of minutes from 2022 Virtual Winter Meeting

Jingjuan (Dove) Feng

- a. Approved on 03-28-2022: Brian Rock moved to approve, Second by Chris Wilkins. Approved 10-0-0-0-CV

### 10. Subcommittee reports

- |  |                |
|--|----------------|
| a. Programs  | Rachel Spitler |
| General TC consensus was to proceed with a speed seminar submission for Atlanta, with a number of short presentations on specific topics connected to Load Calculations. Larry Sun offered to chair and take point on putting together the seminar proposal. Refer to Programs Subcommittee Report for more information. |                |
| b. Research  | Som Shrestha   |
| Co-sponsorship for TC 4.2's WS was approved on 04-30-2022: Glenn Friedman moved to approve, Steve Bruning seconded. Approved 10-0-0-0-CV. Refer to Research Subcommittee Report for more information.  |                |
| c. Handbook  | Jim Pegues     |
| Refer to Handbook Subcommittee Report for more information.  |                |
| d. Standards   | Glenn Friedman |
| There was no update.   |                |
| e. Liaison   |                |
| <ul style="list-style-type: none"><li>i. Building Decarbonization Task Force – Som</li></ul> Task force meets Tuesday morning; they are looking for TC expertise in volunteers.  |                |



## ASHRAE Technical Committee 4.1

Looking to make 90.2 a decarbonization standard.

**[Lost audio for the remainder of the meeting]**

ii. Other?

f. Web site

Jim Pegues

### 11. Old Business

Jingjuan (Dove) Feng

a. Responsible subcommittee MBO update?

### 12. New Business

Jingjuan (Dove) Feng

### 13. Adjourn [4: PM EDT; lost audio at 4:27 PM]

Jingjuan (Dove) Feng



# ASHRAE Technical Committee 4.1

## Meetings

### TC 4.1 Load Calculation Data and Procedures

Monday 6/27/2022, 2:30 - 4:30 PM EDT

In person: Hilton, Thom Thomson (C)

Remote: <https://events.rdmobile.com/Sessions/Details/1370104>

Meeting number: 2330 367 5485 Password: TC4.1

### TC 4.1 Subcommittee Meeting:

Sunday 6/26/2022, 3:30 - 5:30 PM EDT

In person: Hilton, Toronto II (C)

Remote: [https://teams.microsoft.com/l/meetup-join/19%3ameeting\\_OTAyMmVjOGEtZGM2YS00MmNkLTlhOWUtMzZhMWE1ZmRIYjAw%40thread.v2/0?context=%7b%22Tid%22%3a%22543eaf7b-7e0d-4076-a34d-1fc8cc20e5bb%22%2c%22Oid%22%3a%2286230958-1662-4948-b6f8-ecd7550ddcec%22%7d](https://teams.microsoft.com/l/meetup-join/19%3ameeting_OTAyMmVjOGEtZGM2YS00MmNkLTlhOWUtMzZhMWE1ZmRIYjAw%40thread.v2/0?context=%7b%22Tid%22%3a%22543eaf7b-7e0d-4076-a34d-1fc8cc20e5bb%22%2c%22Oid%22%3a%2286230958-1662-4948-b6f8-ecd7550ddcec%22%7d)

## Programs

### Load Calculations for the ASHRAE Headquarters Building: The Transition to the Heat Balance Method

Sunday 6/26/2022, 11:15 AM - 12:30 PM EDT

In person: Provincial (2)



# ASHRAE Technical Committee 4.1

## Research Subcommittee - Report

### TC 4.1 Load Calculation Data and Procedures

June 27, 2022

Research Subcommittee Chair: Som Shrestha [shresthass@ornl.gov](mailto:shresthass@ornl.gov)

Research Liaison for Section 4:

Natascha Milesi-Ferretti [rl4@ashrae.net](mailto:rl4@ashrae.net)

#### **Agenda:**

1. Report from Research Subcommittee Chairs meeting Monday, June 27, 6:30 AM – 9:15 AM
  - RAC Chair for SY 2022-2023 Omar Abdeaziz
  - RAC Vice-Chair for SY 2022-2023 William Murphy
  - Section 4 Liaison Natascha Milesi-Ferretti
  - Current budget is 1.8 million
2. TC 4.1 sponsored ongoing projects:
  - 2.1 RP 1816: Reporting the Energy Use and Heat Gain from Imaging Equipment.  
Sponsoring Committees TC 9.06 (Healthcare Facilities), TC 4.1, and 4.7 (Energy Calculations)  
TC 4.1 liaison on the PMS: Glenn Friedman  
PI: Walt Vernon, Contractor: Mazzetti
    - The contractor got access to hospitals that they did not have earlier in the pandemic
    - Current timeline: complete field testing and MOT draft Sep 2022, a draft report on field test Dec 2022, final report Feb 2023
3. RTARs and work statements:
  - 3.1 WS 1850: Evaluation of ASHRAE Design Day Procedure against recorded weather data.  
Sponsoring Committees: TC 4.02 (Climatic Information), TC 4.1, and TC 5.6 (Radiant Heating and Cooling).  
TC 4.1 liaison on the PMS: Glenn Friedman
    - Waiting for research funding for bidding
  - 3.2 WS 1857: Improved simplified methodology for describing and calculating heat conduction between buildings and the ground.  
Sponsoring Committees: TC 4.7 (Energy Calculations), TC 4.1, and TC 4.4 (Building Materials and Building Envelope Performance)  
TC 4.1 liaison: Glenn Friedman
    - Timothy McDowell from TC 4.7 is working with the Section 4 research liaison to respond to RAC's comments. Once the research liaison signs off on the changes, it will go into the queue for funding. It does not have to go back to RAC.



## ASHRAE Technical Committee 4.1

3.3 WS 1923 “Prepare Climatic Design Conditions for the 2025 ASHRAE Handbook - Fundamentals and ASHRAE Standard 162”

Sponsoring Committees: TC 4.02 (Climatic Information) and TC 4.1

TC 4.1 liaison on the PMS: James Pegues

- The Project Evaluation Subcommittee met in January and a contractor is selected

3.4 TC 4.1 Co-Sponsor TC 6.5 (Radiant Heating and Cooling) RTAR “The Impact of Direct Solar Radiation on the Design and Performance of Radiant Cooled Floors”

TC 6.5 is working on the RTAR. Contact Fred Bauman / Jonathan Woolley / Peter Simmonds. Dove Feng is coordinating it with Fred & Jonathan.

3.5 TC 4.2 WS “A decision and evaluation framework to validate weather time series and statistics for use in building performance analysis and design”

Sponsoring Committees: TC 4.2, TC 4.7 and TC 4.1

TC 4.2 contact: Parag Rastogi

TC4.01 voted 10-0-0-CV in support to co-sponsor the WS

RAC returned the WS

#### 4. Potential research topics or tasks

4.1 Update the residential building chapter:

Follow-up with Residential Building Committee to seek their support (Chip Barnaby)

4.2 Dynamic thermostat setpoint to reduce the HVAC load: calculation methods and impact analysis.

Reduction in the HVAC load and equipment size can be synergistic to ASHRAE’s building decarbonization initiative. Chip Barnaby and Chris Wilkins to lead drafting an RTAR. Potential co-sponsors TC 4.2 and 4.7.

#### 5. Any other potential research topics



**TC 4.1 Programs**  
**Toronto - Hybrid, Sunday, June 26, 2022**

Rachel Spitler [rspitler@cyntergy.com](mailto:rspitler@cyntergy.com), Programs Chair

## **PROGRAMS**

1. **Report By:** Rachel Spitler [rspitler@cyntergy.com](mailto:rspitler@cyntergy.com), Chair.

2. **MBO:**

- a. Description: Provide essential knowledge about load calculations data and procedures through training.  
Metric: Presenting programs at conferences.

3. **Current Program:**

- a. **Load Calculations for the ASHRAE Headquarters Building: The Transition to the Heat Balance Method**  
Sunday, June 26, 11 AM – 12:30 PM; Provincial (2)  
Abstract: Many mechanical design engineers calculate peak cooling and heating loads using traditional methods: Radiant Time Series, Transfer Functions, CLTD. A current trend is the transition to tools using the ASHRAE Heat Balance (HB) Method. To support this transition, this seminar explains key issues practitioners must be aware of for successful use of the HB method, including quality control review.  
Chair: Glenn Friedman, P.E., Fellow ASHRAE, Taylor Engineers, Alameda, CA  
1. **Setting the Stage: Learning Heat Balance Load Calculation Sensitivities**  
Glenn Friedman, P.E., Fellow ASHRAE, Taylor Engineers, Alameda, CA  
2. **Key Heat Balance Application Considerations: Part 1**  
James Pegues, Member, Carrier Corporation, Syracuse, NY  
3. **Key Heat Balance Application Considerations: Part 2**  
Liam Buckley, CEng, BEMP, Member, IES Ltd., Walnut Creek, CA

4. **Future Program:**

- a. Submission deadline is Tuesday, August 9, 2022 for the 2023 Winter Conference (Atlanta, Georgia). The meeting itself is February 4-8, 2023.
- b. The 2023 Annual conference is scheduled for June 24-28, 2023 in Tampa, Florida.
- c. Future Program Ideas
  - i. Further Considerations in the Transition to the Heat Balance Method using New ASHRAE HQ Building [follow-up to the Toronto seminar]
  - ii. Seminar on Load Calculations using BIM Models
  - iii. Seminar including Workflow of Process for Cooling and Heating Load Calculations (Forum or Seminar) & Energy Calculations, Energy vs. Load Processes, Sample Comparisons of Loads results from different Energy softwares (Sun/Landreth, Roth?) [TC 4.7]
  - iv. Ventilation and Infiltration
  - v. Load Calculations for Dehumidification & Load Calculations and Equipment Selections for Water Cooled [Peak Load vs. Water Cooled] & Load Calculations and Sizing for Evaporative Cooling [Essentially, moisture ties it together]

**TC 4.1 Programs**  
**Toronto - Hybrid, Sunday, June 26, 2022**

- vi. Load Calculations for System Designs for Electrification and Decarbonization
  - vii. Load Calculation “Nuggets”/Load Calculations Speed Seminar [would be integrated with the publications request; <10 minutes on 5-6 topics; may be a Workshop; focus on how to check your loads or have confidence in them]
  - viii. How Load Calculations Interact with Other ASHRAE Chapters [Communicate with other TCs for this]
    - Weather
    - Infiltration
    - Building skin color [Som – TC 4.4]
    - Ventilation [Som to help connect]
    - Fenestration, dynamic windows [Som to help connect]
-

**TC 4.1 Programs**  
**Toronto - Hybrid, Sunday, June 26, 2022**

**PROGRAM TRACKS for Atlanta:**

- Track 1: Fundamentals and Applications Track Chair: Anoop Peediayakkan  
Email: [peediayakkan@gmail.com](mailto:peediayakkan@gmail.com)
- Track 2: HVAC&R Systems and Equipment Track Chair: Billy Austin  
Email: [baustin@shultzeg.com](mailto:baustin@shultzeg.com)
- Track 3: Refrigerants and Refrigeration Track Chair: Brian Fronk  
Email: [brian.fronk@oregonstate.edu](mailto:brian.fronk@oregonstate.edu)
- Track 4: Grid Resilience and Thermal Storage Track Chair: Nohad Boudani  
Email: [nohadb@inco.com.lb](mailto:nohadb@inco.com.lb)
- Track 5: Pathways to Zero Energy Emissions and Decarbonization Track Chair: Som Shrestha  
Email: [shresthass@ornl.gov](mailto:shresthass@ornl.gov)
- Track 6: Multifamily and Residential Buildings Track Chair: Lina Maged Hashem  
Email: [lina\\_lmf@hotmail.com](mailto:lina_lmf@hotmail.com)
- Track 7: Operations and Maintenance Track Chair: Suzanne LeViseur  
Email: [sleviseur@haddadeng.com](mailto:sleviseur@haddadeng.com)
- Track 8: Building Simulation and Virtual Design in Construction Track Chair: Alekhya Kaianathbhatta  
Email: [alekyha\\_k@rogers.com](mailto:alekyha_k@rogers.com)
- Mini-Track: Innovative Responses to Supply Chain Challenges



# ASHRAE Technical Committee 4.1

## TC 4.1 Handbook Subcommittee - Report

**June 26, 2022**

Handbook Subcommittee Chair: [james.f.pegues@carrier.com](mailto:james.f.pegues@carrier.com)  
rev1

### 1. Work Schedule for 2025 Handbook – Fundamentals

Work Phase	Date or Timeframe	Description
1. Review	Thru Dec 2022	Review chapter to identify revisions and additions.
2. Construction	Jan 2023 – May 2024	Make revisions and additions
3. Approval	Jun 2024	TC 4.1 votes to approve revisions
4. Submission	Jul 2024	Submission of revised chapters to ASHRAE staff.
5. Publication	Jun 2025	Handbook sent to members.

### 2. Review of 2021 Chapter 18 – Non-Residential Calculations

#### a. Chapter Review

Review delayed due to document access issues.

Recruiting volunteers to review Chapter 18

See Tables 1-4 in reference section for status of tables, figures, research projects, and other topics.

### 3. Review of 2021 Chapter 17 – Residential Calculations

#### a. Chapter Review

Recruiting volunteers to review Chapter 17

#### b. Approach for Chapter 17

What is needed: Update examples with more modern residential design and construction data, comment on decarbonization issues, seek residential domain expertise to identify needs, contribute details.

Residential committee has not replied to Chip regarding support for chapter update.

Actions:

Jim Pegues to make inquiries through our Handbook Liaison

Chip Barnaby to make inquiries through Standard 90.2 chair



## ASHRAE Technical Committee 4.1

### 4. Cooling and Heating Load Calculation Guide Discussion

- a. TC 4.1 approached by  
Adeeba Mehboob, Chair ASHRAE Publications Committee  
Rob Hoadley, Publications Committee member tasked with initiative
- b. Background  
Tim Wentz, presidential member, heard feedback ASHRAE publications too theoretical; that younger members consume technical information differently than older members.  
ASHRAE may need to package tech information differently to reach younger engineers.
- c. Survey  
Publications committee conducted survey of membership during Dec 1220  
640 responses;
  - 32% from YEA members; 46% from consulting engineers or A/E firms
  - 94% in favor of application guides
  - 49% have highest interest in application guide related to ASHRAE Handbook – Fundamentals
  - 52% have highest interest in application guide for Cooling and Heating Load Calculation
- c. Proposed Pilot Project  
Publications asking TC 4.1 to consider pilot project to develop such a guide  
Concept: 30-50 page publication strongly focused on application rather than theory  
Would be a sister publication to our Load Calculation Application Manual, not a replacement  
Currently a concept. Funding for development TBD.
- d. Request to TC 4.1  
Is this a viable concept?  
Is this a project TC 4.1 could pursue?
- e. TC 4.1 Discussion Results
  - An application guide has value. Would be helpful to younger engineers
  - Discussed a process guide concept explaining the steps in assembling data and performing a load calculation. Communicates fundamental concepts and application advice can be woven into this structure.
  - Rolando noted the 1977 ASHRAE Handbook has something like this.
  - BUT – TC 4.1 strongly feels a publication is the wrong format for younger engineers. A publication will not be successful. To reach younger engineers this must be a series of short videos. That's the only way it will be successful
  - CONCEPT – A series of short videos that strung together provides complete application guidance for the load calculation process. A series of short 10 min videos will be viewed. One large 60-min video will not be viewed. PPT slides with narration. Include animation where feasible. Leverage ASHRAE Conference seminar content where possible.
  - TC 4.1 is tentatively planning a "speed seminar" for Atlanta of 5-6 short fundamentals presentations to try out this concept. I seeking Publication Committee support if needed to get this on the program.
  - ACTION: Jim Pegues to report discussion results back to Publications committee. Seek buy-in for this concept. Explore feasibility of the short video approach.



## ASHRAE Technical Committee 4.1

### REFERENCE MATERIAL

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#### 1. Management by Objectives Discussion

Proposed Handbook Subcommittee objectives, based on subcommittee discussion:

Objective	Metric
Produce Handbook – Fundamentals chapters which:	
a. Convey current state of the art for Non-Residential and Residential Load calculations	Number of total research projects and TC 4.1 sponsored or co-sponsored projects whose data is incorporated in 2025 chapters.
b. Convey pertinent results of ASHRAE Research to the membership and industry	Same as “a”.
c. Provide effective instruction to experienced HVAC engineers. (by providing effective examples of load calculation processes)	Number of chapter reviews by mid-career engineers. Number of recommendations implemented in chapter.
d. Provide effective instruction to early career HVAC engineers. (ditto on examples).	Number of chapter reviews by early-career engineers. Number of recommendations implemented in chapter.
e. Source of procedures and data for tool developers.	Number of chapter reviews by tool developers. Number of recommendations implemented in chapter.

Notes:

- Objectives above are based on what committee sees as the purposes for producing Chapters 17 and 18 of the Handbook-Fundamentals
- Work to recruit both mid-career and early-career members to review chapter and provide feedback. Diversity of viewpoints is important for achieving objectives (a), (c), (d).
- When working with reviewers, customize the review form to add specific questions to drive feedback on how well the chapter serves engineer’s technical needs.
- One need expressed in discussion is for guidance on how to qualitatively review results. How to judge whether results of an engineer’s calculation (manual, spreadsheet, computer) are correct.

#### 2. Proposal from Cool Roof Rating Council (CRRC)

From Sarah Schneider, Deputy directory, CCRC:

*The Cool Roof Rating Council (CRRC), is interested in submitting a proposal to ASHRAE Technical Committee 4.1 that will introduce the basic principles of cool roofs to Chapters 17 and 18 of the Handbook of Fundamentals. As you may know, ASHRAE 90.1 and 90.2 both contain cool roof provisions, but the HOF does not go into detail about how the radiative properties of a roof’s surface*



## ASHRAE Technical Committee 4.1

(i.e. solar reflectance and thermal emittance) play a role in the building's energy use. We believe that such descriptive information would be helpful to users of 90.1, 90.2 and the HOF.

Discussed whether Chapter 45 (Building Envelopes) is a better location for this material.  
Continuing discussion on this point.

### 3. Initial Proposed Revisions for 2025 Handbook

Section	Modification or Addition	Assignment
Section 6	Further updates to RTS section for rooms cooled by radiant cooling systems	TBD
Table 2	Update to use LPD data from ASHRAE 90.1-2022	Jim Pegues
Tables 4A, 4B	Update to use motor efficiency data from ASHRAE 90.1-2022	Jim Pegues
Table 13	Single Layer Glazing Data – Validate vs latest WINDOW software version. Update if necessary	Jim Pegues
Table 18	Check material layer properties against Chapter 26. Update if necessary.	Jim Pegues
Tables 16,17	Revise wall and roof CTS tables if material properties in Table 18 change.	Jim Pegues
Sections 9.1 thru 9.5	Example Problem a. Revise results if material layer properties and CTS tables change. b. Revise results if design weather procedures in Chapter 14 change.	Jim Pegues
All	Synchronize and tabulate equation nomenclature.	Jim Pegues
Figures 9,10	Check data in graphs versus latest CTS tables. Update if necessary.	Jim Pegues

## REFERENCE MATERIAL

**Table 1. Evaluation of Data Tables in 2021 Edition Chapter 18**

Table #	Content	Last Updated	Comments
1	Occupant Heat Gains	2017	See Table 4, Chapter 9
2	Lighting Power Densities	2021	90.1-2019. Update to 90.1-2022
3	Lighting Fixture Heat Gains	2017	LED data added in 2017.
4A	Motor Minimum Efficiencies 60hz Genl Purpose	2021	90.1-2019. Update to 90.1-2022
4B	Motor Min Efficiencies – Polyphase Small Motors	2021	90.1-2019. Update to 90.1-2022
5A	Unhooded Electric Kitchen Appliances	2013?	2009 research data
5B	Hooded Electric Kitchen Appliances	2017	RP-1631 2015.
5C	Hooded Electric Kitchen Appliances – During Idle	2017	2009 data but contents expanded.
5D	Hooded Gas Kitchen Appliances – During Idle	2017	2009 data but content expanded
5E	Hooded Solid Fuel Appliances – During Idle	2013?	2009 data
5F	Warewashing Equipment	2021	From RP-1778 (2020)
6	Typical Medical Equipment	1999?	
7	Typical Laboratory Equipment	1999?	



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Table #	Content	Last Updated	Comments
8A	Typical Desktop Computers	2017	Bach + Sarfraz, RP-1742, 2018
8B	Typical Laptops and Docking Stations	2017	Bach + Sarfraz, RP-1742, 2018
8C	Typical Tablet PC	2017	Bach + Sarfraz, RP-1742, 2018
8D	Typical Monitors	2017	Bach + Sarfraz, RP-1742, 2018
9	Typical Printers	2017	Bach + Sarfraz, RP-1742, 2018
10	Heat Gain for Miscellaneous Equipment	2017	Bach + Sarfraz, RP-1742, 2018
11	Load Factors for Types of Offices	2017	Bach + Sarfraz, RP-1742, 2018
12	Diversity Factor for Different Equipment	2017	Bach + Sarfraz data
13	Single Layer Glazing Data – Window 7.4.6	2021	Window 7.7.10 LBNL 2019 data.
14	Rad/Convective Splits for Internal Heat gains	2010?	Nigusse 2007
15	Solar Absorptance Values of Various Surfaces	?	Data from 1990, 2000, 1971
16	Wall Conduction Time Series Tables	2021	Synched with latest material data
17	Roof Conduction Time Series Tables	2021	Synched with latest material data
18	Thermal Properties of Layers	2021	Synched with chapter 26
19	Nonsolar RTS Values, Light to Heavy Construct.	?	Still valid
20	Representative Solar RTS Values, Light to Heavy	?	Still valid
21	RTS Representative Zone Constructions	?	Still valid
22	Average U-Factor for Basement Walls	?	Still valid
23	Average U-Factor for Basement Floors	?	Still valid
24	Heat Loss Coefficient Fp of Slab Floors	?	Still valid
25	Common Sizing Calculations in Other Chapters	?	Check and update references
26	Summary of RTS Load Calculation procedures	2013	Still valid
27	Room Characteristics – Opaque Envelope + Fenestration	2021	Valid
28	Room Characteristics – Internal Heat Gains	2021	Valid
29	Monthly/Hourly 5% Design Temperatures	2021	Valid
30	Lighting Load	2021	Valid
31	Radiant Time Series and Conduction Time Series Factors for Example Problem	2021	Valid
32	Input Data for Calculation of Sol-Air Temperatures	2021	Valid
33A	Wall Component of Solar Irradiance for July	2021	Valid
33B	Wall Sol-Air Temperatures, Heat Input, Heat Gain, and Cooling Load for July	2021	Valid
8B	Typical Laptops and Docking Stations	2017	Bach + Sarfraz, RP-1742, 2018





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Table #	Content	Last Updated	Comments
34	Window Heat Gain for July (No Blinds or Overhang)	2021	Valid
35	Window Cooling Loads for July (No Blinds or Overhang)	2021	Valid
36	Window Cooling Loads for July (Blinds and No Overhang)	2021	Valid
37	Window Cooling Loads for July (Blinds and Overhang)	2021	Valid
38	Example Office Cooling Loads, July Design Day	2021	Valid
39	Example Office Cooling Loads, September Design Day	2021	Valid
40	Room Peak Cooling Loads for Different Room Orientations	2021	Valid
41	Peak Heating Load Calculation	2021	Valid

**Table 2. Evaluation of Figures in 2021 Chapter 18**

Fig #	Content	Last Updated	Comments
1	Heat Gain vs Cooling Load Flow Diagram	?	Still valid.
2	Thermal Storage Effect of Load from Lights	?	Still Valid
3	Lighting Heat Gain for Recessed Fluorocnt Fixtures	2006	Fisher et al
4	Office Eqpt Load Factor Comparison	1994	Wilkins + McGaffin
5	Schematic of Heat Balance Processes in Zone	?	Still valid
6	Schematic of Wall Conduction Processes	?	Still valid.
7	Schematic View of General Heat Balance Zone	?	Still valid
8	Overview of Radiant Time Series Method	?	Still Valid
9	CTS for Light to Heavy Walls	?	Check
10	CTS for Walls with Similar Mass and Various Ins.	?	Check
11	RTS for Light to Heavy Construction	?	Check
12	Heat Flow from Below Grade Surface	?	Still valid
13	Ground temperature amplitude	?	Still valid
14	Below Grade Parameters	?	Still valid
15	Schematic of Typical Return Air Plenum	?	Still valid.
16	Single-Room Example office	2021	Still valid



## ASHRAE Technical Committee 4.1

**Table 3. Research Projects that may Yield Data**

#	Subject	Comments
RP-1816	Heat Gain from Imaging Equipment	On hold due to pandemic
WS-1850	Evaluation of ASHRAE Design Day Procedure against Recorded Weather Data	Co-sponsor with TC 4.2. Approved and out for bid.
WS-1857	Improved simplified methodology for describing and calculating heat conduction between buildings and the ground.	Co-sponsor with TC 4.7. Conditionally approved.
RTAR	Prepare climatic design conditions for 2025 ASHRAE Handbook – Fundamentals and ASHRAE Standard 169	Co-sponsor with TC 4.2.
RTAR	Formalizing thermal comfort calculations for children.	TC 2.1. May provide occupant heat gains
RTAR	Heat Gain from Refrigeration Equipment	Cognizant TC?

**Table 4. Tasks Carried Over From 2017 Handbook Cycle**

#	Subject	Comments
1	Synchronize variable naming	Deferred from 2021. (assigned to Jim Pegues)
2	Rooms with radiant cooling systems	Incorporate further information about calculating room loads in rooms using radiant cooling systems. Specifics TBD.