



180 Technology Parkway
Peachtree Corners, GA 30092
404-636-8400

FINAL APPROVED

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 07/05/2025

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

DATE OF MEETING Monday 6/23/2025 LOCATION Sheraton Phoenix, Coronado Boardroom (Lev3)

MEMBERS PRESENT	YEAR APPTD	MEMBERS ABSENT	YEAR APPTD	EX-OFFICIO MEMBERS AND ADDITIONAL ATTENDANCE
Chip Barnaby	2022			Carrie Brown
Liam Buckley	2024			Charlie Curcija
Glenn Friedman	2024			Martin Eseverri
Suzanne Levisieur	2022			James Lowry
Ardeshir Moftakhari	2022			Ed Janowiak
Jim Pegues	2024			Mark Malkin
Rachel Spitler	2022			Danielle Monfet
Chris Wilkins	2021			Brian Rock
				Stephen Roth
				Jeff Spitler
				Russell Taylor
				Graham S. Wright
DISTRIBUTION: All Members of TC/TG/MTG/TRG plus the following:				
TAC Section Head: Kyle Gluesenkamp			SH4@ashrae.net	
All Committee Liaisons As Shown On TC/TG/MTG/TRG Rosters (Research, Standards, ALI, etc.)			Staff: shammerling@ashrae.org	
Mike Vaughn, Manager Of Research & Technical Services			MORTS@ashrae.net	

Note: These final meeting minutes were approved by vote of TC 4.1 on February 2, 2026.



ASHRAE Technical Committee 4.1

ASHRAE TC 4.1 Load Calculation Data & Procedures

Full Committee Meeting Agenda

2025 ASHRAE Summer Conference Hybrid Meeting

In-Person: Sheraton Phoenix, Coronado Boardroom, Level 3

Summary of Votes Taken

	Motion	Result	Vote
1	Approve 2025 Orlando Winter meeting minutes	Passed	7-0-0-0-CNV
2	Approve submission of 'Fundamentals of Load Calculations' seminar for Las Vegas winter conference	Passed	7-0-0-0-CNV
3	Approve reorganization of TC 4.1 Handbook chapters into Workflow and Theory chapters.	Passed	7-0-0-0-CNV

Summary of Action Items

	Assigned To	Action
1	Rachel Spitler	Change the TC 4.1 PES/PMS for RP-1850 to Chip Barnaby
2	Rachel Spitler	Recruit committee members to review and provide feedback on the Load Calculation Applications Manual draft PTAR.
3	Chris Wilkins Glenn Friedman Suzanne LeViseur James Lowry Rolando Legarreta	Committee members who will be serving on a Project Evaluation Subcommittee (PES) must take on-line training for those duties. On ASHRAE.org search for "PES Training" and then click the link to download the MP4 training file.

1. **Call to order** Rachel Spitler

2. **ASHRAE Code of Ethics Commitment** Rachel Spitler

"In ASHRAE meetings, we will act with honesty, fairness, courtesy, competence, inclusiveness and respect for others, which exemplify our core values of excellence, commitment, integrity, collaboration, volunteerism and diversity, and shall avoid all real or perceived conflicts of interest."
(See full ASHRAE Code of Ethics: <https://www.ashrae.org/about/governance/code-of-ethics>)

3. **Roll call – Determination of a Quorum** Jim Pegues

8 of 8 voting members present. Quorum exists

4. **Introductions** All



ASHRAE Technical Committee 4.1

5. Scope, Mission Statement

Rachel Spitler

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

No additions

7. Liaison reports

Liaisons

a. Section Head

Kyle Gluesenkamp

- Will offer assistance for any issues committee members are working on.
- ASHRAE has a new strategic plan. Aligning research and programs with strategic plan helps research and programs to be accepted.
- There is a new, ASHRAE simplified rules of order. Good resource.

b. Chapter Technology Transfer

Christopher Adams

Did not attend.

c. Research

Dennis Landsberg

Did not attend. Attended subcommittee meetings on Sunday

d. Handbook

Eric Granzow

Did not attend.

e. Staff, Research/Tech Services

Steven J Hammerling

Did not attend.

f. Standards

Mr Philip J Naughton

Did not attend.

g. TAC Chairman

James S Bennett

Did not attend.

8. Chair's Report

Rachel Spitler

a. TC Chairs Breakfast

- 2025-2028 Strategic Plan has been issued. Available on ASHRAE.org
- Program submissions for Las Vegas are open now. 84 of 129 submissions for Phoenix were accepted.
- Members can subscribe to government activities announcements.
- Subject matter expert program is accepting applications
- Members have an opportunity to join ISO TAG groups (International Standards Organization, Technical Advisory Groups).
- Multidisciplinary Task Group (MTG) for Generative AI has been formed. Stephen Roth is a member of the committee.
- See further details in the updated agenda posted on our BaseCamp site and included in the appendix to these minutes.

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



ASHRAE Technical Committee 4.1

9. Approval of minutes from 2025 Winter Meeting

Rachel Spitler

Motion: Approve 2025 Orlando Winter Meeting Minutes

Motion By: Suzanne Levisieur

Second By: Jim Pegues

Vote: 7-0-0-0-CNV (for-against-abstain-absent-Chair-Not-Voting)

10. Subcommittee reports

a. Programs:

James Lowry

- Due date for submissions for Las Vegas winter conference is August 1.
- Proposal: Seminar for Fundamentals of Load Calculations. (1) Loads Workflow – Stephen Roth. (2) Do My Loads Make Sense – speaker needed. Extending Loads to Sizing – Jim Pegues.
- Future – Load Calculations using BIM
- Future – Glenn Friedman– Forum on load calculations for low energy buildings. What is different and what is needed for these calculations? What are the special considerations? What are pros and cons? How does that affect warmup? Sensible heat ratio? How does it affect critical buildings? Low energy buildings and heat pump buildings? Idea for 2026 Summer Conference in Austin.

Motion: Approve submission of Fundamentals of Load Calculations seminar for Las Vegas Conference

Motion By: (Not recorded)

Second By: (Not recorded)

Vote: 7-0-0-0-CNV (for-against-abstain-absent-Chair-Not-Voting)

b. Research:

Ardi Moftakhari

- RP-1860 – Heat Gain from Medical Imaging Equipment – Still waiting for report.
- RP-1923 – Climate data update for 2025 HOF – Finished except for technical paper.
- RP-1857 – Simplified method for ground conduction load calculation – Work has started. One PMS meeting so far.
- WS-1959 – Update people heat gain data for cooling load calculations – Work statement has been approved by Research Activities Committee (RAC). Waiting to go out for bidding. Likely will go out in next bid release. Project Evaluation Subcommittee (PES) is comprised of: Chris Wilkins, Glenn Friedman, Suzanne LeViseur, James Lowry, Rolando Legarreta. Chris shared there is PES training (on-line) that must be taken prior to serving on a PES committee. Two RAC members (Dennis Landsburg and a second one) will attend the PES meetings to ensure proper procedure.
- RP1850 – Evaluates shapes of cooling design day weather profiles (temperature and humidity) based on measured weather data. – TC42 is revising the WS to resubmit. Chip Barnaby and Jim Pegues will speak to TC 4.2 to see if they can incorporate heating design into the project. Change TC 4.1 representative to project monitoring subcommittee to Chip Barnaby.
- RTAR 1860 – Simplified method for calculating heating warmup load – Rejected by RAC. Chris Wilkins and Ardi Moftakhari are working on revisions and will re-submit. Will explain details more fully. Would like TC 4.1 to vote approval for revised RTAR by August 1. Glenn recommends a letter ballot so everyone can vote on final wording of RTAR. Consensus is in favor of a letter ballot.



ASHRAE Technical Committee 4.1

- Future Research - Research on use of AI to convert BIM model into analytical building geometry model that can be used for load calculations.
- Future Research - Dynamic heating load calculation project – This was discussed at the subcommittee meeting on Sunday. It was decided a separate research project is not needed. Development of heating design day weather profiles will be added to the WS-1850 project scope. The Fundamentals Handbook chapter will reference the concept of 24-hour steady periodic heating load calculation. What remains to be determined is whether an update to Standard 183 will be needed.
- 2029 Climate Data. TC 4.2 is asking TC 4.1 to co-sponsor this project as we have in past cycles. TC 4.2 will share the draft work statement. TC 4.2 is asking TC 4.1 to review and submit comments by July 15. Then vote by letter ballot by August 1
- General News – The new ASHRAE Strategic Plan has been issued. Current research fund is \$4M. Ten projects have been released for bidding. August 15 is the next research submission deadline.

c. Handbook

Jim Pegues

- 2025 ASHRAE Handbook – Fundamentals is due to publish July 1. Members will receive the Handbook PDF. Printed copies will ship to those who purchased a print copy.
- 2029 ASHRAE Handbook – Fundamentals – Now through December 2027 is the construction period. From January to June 2028 we will be in final review and approval. The draft must be submitted for publication during July 2028. The Handbook will be issued in June 2029.
- Revision of TC 4.1 chapters for 2029 Handbook.

TC 4.1 has been working on reorganization of chapters since 2023.

Currently formulating outline for chapters.

Concept is to have one chapter for workflow and one chapter for theory.

At subcommittee meeting, we discussed the latest straw man outline. A lot of good discussion and feedback. Next iteration of the outline is in the Handbook Subcommittee report on BaseCamp and attached to these minutes.

Discussion about whether reorganization is too large a project to handle. Recommendation is to proceed with action plan to finish the outline, then to rearrange existing content in the new outline framework. At that point it will become clear how much work is required to fill in gaps and adapt existing material. That can be a GO / NO-GO decision point. At this point it is unclear how much work will be involved. Glenn Friedman noted we don't have to fill all the gaps for 2029. We could leave some open for future attention.

Discussion about whether revision of material in the Handbook is best, or if this kind of material should be in the Load Calculation Applications Handbook (LCAM). Brian Rock feels college students would use Handbook for first college course, and LCAM for advanced coursework. Also that architects and contractors are also most likely to use the Handbook. As a counterpoint, Jeff Spitler uses the LCAM for his introductory college course.



ASHRAE Technical Committee 4.1

Motion: Approve reorganization of TC 4.1 Handbook chapters into Workflow and Theory chapters.

Motion By: Glenn Friedman

Second By: Chip Barnaby

Vote: 7-0-0-0-CNV (for-against-abstain-absent-Chair-Not-Voting)

d. Standards

Glenn Friedman

- Currently no activity on TC 4.1's two standards: Standard 183-2024 – *Peak Cooling and Heating Load Calculations in Buildings Except Low-Rise Residential Buildings* and Standard 203-2018 (RA 2021) – *Method of Test for Determining Heat Gain of Office Equipment Used in Buildings*.
- In view of the addition of a 24-hour steady periodic calculation method for peak heating load, Glenn feels we need to consider whether Standard 183 requires revision. A decision is needed before the next reaffirmation date which is 2027.

e. Web Site

Jim Pegues

- Web site is up to date.

11. Old Business

Rachel Spitler

- a. Publication Topic Acceptance Request (PTAR) for updating Load Calculation Applications Manual was drafted by Jeff Spitler. Jeff is seeking volunteers to review and comment on the draft. He feels this would especially benefit from a practitioner review and to add justification from the practitioner point of view.

Discussion about the motivation for updating the LCAM. The last publication was 2014. Given it has been 11 years since publication, it feels like the time is right. A significant amount of new research has been completed to provide updated heat gain data.

Rachel Spitler will follow-up with committee members to review and provide feedback on the PTAR.

12. New Business

Rachel Spitler

- a. Membership – Chris Wilkins rolls off as a voting member on June 30. A replacement is rolling on to keep voting membership at 8. Rachel is checking who that new voting member is.

13. Adjourn [Time 3:24 MST]

Rachel Spitler

Motion: Adjourn

Motion By: Chris

Attachment:

Attachment 1 – Full Committee Agenda

Attachment 2 – Handbook Subcommittee Report

Attachment 1:
Full Committee Meeting Agenda



ASHRAE Technical Committee 4.1

ASHRAE TC 4.1 Load Calculation Data & Procedures

Full Committee Meeting Agenda

2025 ASHRAE Summer Conference
Hybrid Meeting [See ASHRAE 365 for Link]
In-Person: Phoenix Sheraton, Coronado Boardroom (Level 3)

1. Call to order Rachel Spitler

2. ASHRAE Code of Ethics Commitment Rachel Spitler

"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 Jim Pegues

Chip Barnaby	6/30/2026	Ardeshir Moftakhari	6/30/2026
Liam Buckley	6/30/2028	Jim Pegues	6/30/2028
Glenn Friedman	6/30/2028	Rachel Spitler	6/30/2026
Suzanne LeViseur	6/30/2026	Chris Wilkins	6/30/2025

4. Introductions All

- a. In Person Sign-In sheet
- b. Updates to the agendas

5. Scope, Mission Statement Rachel Spitler

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



ASHRAE Technical Committee 4.1

7. Liaison reports (as they arrive)

Liaisons

- | | |
|----------------------------------|---------------------|
| a. Section Head | Kyle Gluesenkamp |
| b. Chapter Technology Transfer | Christopher Adams |
| c. Research | Dennis Landsberg |
| d. Handbook | Eric Granzow |
| e. Staff, Research/Tech Services | Steven J Hammerling |
| f. Standards | Philip J Naughton |
| g. TAC Chairman | James S Bennett |

8. Chair's Report

Rachel Spitler

- a. Notes from Chair's Training:
 - i. Society-level council and committee nominations are due September and February; you can nominate yourself or someone else.
 - ii. The 2025-2028 strategic plan is out currently.
 - iii. 129 programs were submitted for Phoenix, of which 86 were accepted. Programs submissions for Las Vegas are now open through Friday, August 1.
 - iv. ASHRAE's Government Affairs group puts out frequent email updates; if you wish to receive them, you have to manually subscribe. They are also still taking applications for Subject Matter Experts for their SMEs for GOEs pilot program.
 - v. MTG.GenAI's report showed there was TC 4.1 representation – confirmation on that representation.
 - vi. There are also still opportunities for TC members to engage with ISO TAGs.

9. Approval of minutes from 2025 Winter Meeting

Rachel Spitler

10. Subcommittee reports

- | | |
|--------------|-----------------|
| a. Programs: | James Lowry |
| b. Research: | Ardi Moftakhari |
| c. Handbook | Jim Pegues |
| d. Standards | Glenn Friedman |
| e. Web Site | Jim Pegues |

11. Old Business

Rachel Spitler

12. New Business

Rachel Spitler

13. Adjourn

Rachel Spitler

Attachment 2:

TC 4.1 Handbook Subcommittee Report



ASHRAE Technical Committee 4.1

TC 4.1 Handbook Subcommittee - Report

June 22, 2025

Handbook Subcommittee Chair:

james.f.pegues@carrier.com

rev1

Agenda:

1. Status and Schedule – 2025 Handbook – Fundamentals
2. Status and Schedule – 2029 Handbook - Fundamentals
3. Proposed Reorganization of Chapters 17 and 18

Discussion:

1. Status and Schedule – 2025 Handbook - Fundamentals

- a. Chapter 17 and 18 submitted for publication during July 2024.
- b. Publication proofs received, reviewed, returned during April 30 – May 10 period.
- c. 2025 Handbook will be published July 1. Print copies available. PDFs sent to members.

2. Status and Schedule – 2029 Handbook - Fundamentals

- a. Planning for Chapters 17 and 18 has been underway since June 2023
- b. Standard schedule for current publication cycle

Work Phase	Date or Timeframe	Description
1. Review	Jun 2025 – Jan 2026	Review chapter to identify revisions and additions.
2. Construction	Jan 2026 – Dec 2027	Make revisions and additions
3. Approval	Jan 2028 - Jun 2028	TC 4.1 votes to approve revisions
4. Submission	Jul 2028	Submission of revised chapters to ASHRAE staff.
5. Publication	Jun 2029	Handbook published and sent to members.



ASHRAE Technical Committee 4.1

3. Proposed 2029 Load Calculation Chapter Reorganization

a. Reorganization Objective

- To better serve primary audience (consulting engineers and early career engineers), significantly reorganize and rewrite material in Chapters 17 and 18.

b. Plan of Attack

- Develop outline for reorganized material
- Evaluate whether to merge Residential and Non-Residential material
- Plug existing material into new outline framework to establish baseline material
- Adapt existing material as needed to suit new objectives
- Identify gaps. Develop new material to fill gaps.
- Committee reviews to iterate until acceptable.

c. Current Reorganization Concept

- Develop 2 chapters: (1) Workflow, (2) Theory. Addresses key needs and resolves usage issues with existing material.
- Chapter 17 – Load Calculation Workflow –A kind of “cookbook” or “manual of procedures” for how to calculate loads ‘What do I do first?’ ‘What do I do next?’ Fills important need for new engineers. Includes tables of reference data for heat gains and RTS factors. Light on math, equations, and technical detail. Refers to sections in Theory chapter for that discussion. Includes examples.
- Chapter 18 – Load Calculation Theory – Explains the underlying theory and mathematics for Radiant Time Series Method, Heat Balance Method, and design heating calculation. Serves as reference material

d. Discussion Topic #1 – Straw Man Outline

A straw man outline for the Workflow and Theory chapters was discussed. First the high level outline was described and then a lower-level outline was discussed. There was general support for the approach and organization. Multiple suggestions for revising and refining the outline were made including the following. Tables 1a and 1b show the revised outline incorporating these changes.

- Consider discussing sensitivity. That is, what heat gains or load components have the greatest effect on room load.
- Add placeholders in the outline for the sections that would discuss residential load calculation workflow and theory. Also add a placeholder for the 24-hour steady periodic heating load calculation.
- System Loads should be included in the chapter (this was a discussion question in the



ASHRAE Technical Committee 4.1

- outline). This should be a separate section following all the room load sections because it applies equally regardless of how room loads were calculated. Talk about how you use room load results to develop equipment sizing information. Talk about the issues of peak coincident load and sum of peaks for fan and coil sizing. Move safety factor discussion into this System Loads section. If a safety factor is used, the recommended time is after system load calculation. Otherwise, if implemented earlier in room loads, that has a compounding effect that can result in far oversized equipment.
- Switch the order of Heat Balance Method (HBM) and Radiant Time Series Method sections. HBM should come first. This also synchronizes the order of discussion in Chapters 17 and 18.
 - Move discussion of heating load calculations so it is first in the workflow chapter outline and comes before cooling. It applies the simplest concepts which should come first. And it synchronizes the order with the theory chapter.
 - The section on prior, historical methods from the 2021 and 2015 Handbook editions is missing from the outline. Add it back in detailed outline. We want to keep this.
 - Dynamics – When you explain the concepts of heat storage and release, consider using solar heat gain as the example. It is a basic and widely applicable example people can relate to. An alternate idea is to use exterior wall conduction as the base example. That involves two time delays – first for the time for heat flow from exterior to interior wall surface. Then for the conversion of the radiant portion of the interior surface heat gain to load. One drawback to using wall conduction is in modern buildings this is a relatively small load component.
 - There was agreement the full TC should vote to endorse the overall concept of reorganizing into Workflow and Theory chapters so the decision is formally recorded. This might be needed as documentation when the reorganization is presented to and discussed with the ASHRAE Handbook staff.

e. Discussion Topic #2 – Chapter Organization Examples

At the Orlando meeting individual members commented that past editions of the Handbook – Fundamentals provided good organization. The action item was to outline those past editions and see what could be learned. We did not have time to discuss this topic, but outlines are shown in Tables 2, 3, 4 on the following pages. Those past editions (1989 and 1997) mixed theory, math, workflow, application together. In spite of mixing all the content, the order of presentation was logical and there was a summary table for each of the methods (Transfer Functions, TETD/TA, CLTD/CLF) which listed the load components and key calculation equations. Those summary tables are a simple form of a workflow chart and that may be why members felt these were good organization examples.

Table 1a. 2029 ASHRAE Handbook – Chapters 17, 18 – Proposed High Level Outline – rev2 2025-06-23

Outline	Comments, adapted material from 2025.
Chapter 17 – Load Calculation Workflow	
1. Introduction	Explain purpose, organization of chapter
2. Data Collection Workflow	Cookbook for collecting input data for load calculations
3. Heating Calculation Workflow using Instantaneous Heat Loss Method	Cookbook for single point steady state heating load calculation
4. Heating Calculation Workflow using 24-Hour Steady Periodic Method	Cookbook for 24-hour steady periodic heating load calculation
5. Cooling Load Calculation Workflow using Heat Balance Method	Cookbook for calculating cooling loads via HBM
6. Cooling Load Calculation Workflow using Radiant Time Series	Cookbook for calculating cooling loads via RTSM
7. Cooling Load Calculation Workflow using Residential Heat Balance Method	Cookbook for calculating cooling loads via Residential HBM
8. Cooling Load Calculation Workflow using Residential Load Factor Method	Cookbook for calculating cooling loads via RLF Method
9. System Load Calculation & System Sizing Workflow	Cookbook for calculating system loads and sizing airflow rates
References	
Chapter 18 – Load Calculation Theory	
1. Introduction	Explain purpose, organization of chapter.
2. Fundamentals Principles of Load Calculations	Fundamental terms and concepts similar to 2025 content
3. Steady State Load Calculations / Peak Heating Load Calculation	Basic theory, principles, equations for calculating steady state loads
4. Dynamic Load Calculation Principles	Basic theory, principles for calculating dynamic loads
5. Dynamic Cooling Load Calculations: Heat Balance Method	Application of theory for calculating dynamic cooling loads via HBM
6. Dynamic Heating Load Calculations: Heat Balance Method	Application of theory for calculating dynamic heating loads via HBM
7. Dynamic Cooling Load Calculations: Radiant Time Series Method	Application of theory for calculating dynamic loads via RTSM
8. Dynamic Cooling Load Calculations: Residential Heat Balance Method	Application of theory for calculating dynamic loads via Residential HBM
9. Dynamic Cooling Load Calculations: Residential Load Factor Method	Application of theory for calculating dynamic loads via RLF Method
10. HVAC System Loads and Equipment Sizing	Extra considerations for system level load calculations and sizing
References	

Table 1b. 2029 ASHRAE Handbook – Chapters 17, 18 – Proposed Second Level Outline – rev2 2025-06-23

Outline	Comments, adapted material from 2025
Chapter 17 – Load Calculation Workflow	
1. Introduction	Purpose and content of this chapter. Overview of chapter organization
2. Data Collection Workflow	
2.1 Workflow Overview	Provide a high-level overview of objective and steps.
2.2 Outdoor Design Conditions and Climatic Data	Reference tables in Climatic Data chapter as needed.
2.3 Indoor Design Conditions	
2.4 Building Geometry	Floor plans, areas, orientations, rooms, and room usage
2.5 Envelope Assemblies and Materials	Include 2025 Table 18 – Thermal Properties of Materials, Table 14 – Solar Absorptance values.
2.6 Fenestration Data and Performance	Reference tables in Fenestration chapter.
2.7 Internal Heat Gains and Operating Schedules	Include 2025 Table 14 – radiative / convective splits
Occupants	Include 2025 Table 1 – Occupant Heat Gains
Lighting	Include 2025 Table 2 – Lighting Power Density by Space Usage, Table 3 – Lighting Heat Gain Parameters
Electric Motors	Include 2025 Tables 4a, 4b – Motor BHPs
Appliances	Include 2025 tables for cooking appliances, hospital and laboratory equipment, office equipment, computer equipment ware washing equipment, laboratory equipment (5A, 5B, 5C, 5D, 5E, 5F, 6, 7, 8A, 8B, 8C, 8D, 9, 10,11)
Other Sources of Heat Gain	
2.8 Infiltration Rates	
3. Heating Calculation Workflow using Instantaneous Heat Loss Method	Cookbook for single point steady state heating load calculation
3.1 Workflow Overview	Provide a high-level overview of process steps.
3.2 Calculate Loads due to Above Grade Exterior Wall Heat Loss	Using the equations with collected data to calculate loads
3.3 Calculate Loads due to Below Grade Exterior Wall Heat Loss	Ditto
3.4 Calculate Loads due to On or Below Grade Floor Heat Loss	Ditto
3.5 Calculate Loads due to Roof Heat Loss	Ditto
3.6 Calculate Loads due to Interior Wall Heat Loss	Ditto
3.7 Calculate Loads due to Fenestration Heat Loss	Ditto
3.8 Calculate Loads due to Infiltration Loss	Ditto
3.9 Calculate Room Sensible Heating Load	Summation of component loads to obtain room totals
3.10 Example Heating Load Calculation	Reconfigure 2025 example to demonstrate this workflow
4. Heating Calculation Workflow using 24-Hour Steady Periodic Method	Cookbook for 24-hour steady periodic heating load calculation
4.1 Workflow Overview	Provide a high-level overview of the rationale for a 24-hour steady-periodic design heating calculation. Explain potential applications. Explain

Outline	Comments, adapted material from 2025
	the workflow. This is a placeholder at this point. Not sure if more material than the overview will be needed. This is TBD as of rev2.
5. Cooling Load Calculation Workflow using Heat Balance Method	Cookbook for calculating cooling loads via HBM
5.1 Workflow Overview	Provide a high-level overview of the workflow process steps. This might be the only section because Heat Balance has to be calculated with software. So data collection establishes input to that software. There is nothing more from a workflow standpoint.
6. Cooling Load Calculation Workflow using Radiant Time Series	
6.1 Workflow Overview	Provide a high-level overview of process steps.
6.2 Calculate Loads due to Internal Heat Gain	
Occupants	Using the equations with collected data to calculate loads
Lighting	Ditto
Electric Motors	Ditto
Appliances	Ditto
Load due to Other Sources of Internal Heat Gain	Ditto
6.3 Calculate Loads due to Exterior Wall and Roof Heat Gain	Ditto
6.4 Calculate Loads due to Interior Wall Heat Gain	Ditto
6.5 Calculate Loads due to Fenestration Heat gain	Ditto
6.6 Calculate Loads due to Infiltration	Ditto
6.7 Calculate Room Sensible and Latent Cooling Loads	Summation of component loads to obtain room totals
6.8 Example Cooling Load Calculation – Radiant Time Series	Reconfigure 2025 example to demonstrate this workflow
7. Cooling Load Calculation Workflow using Residential Heat Balance Method	Cookbook for calculating cooling loads via Residential HBM
7.1 Workflow Overview	As of rev2 this is a placeholder. More evaluation needed to determine how to organize the material for this section. Those details will be coming in a later revision to the outline.
8. Cooling Load Calculation Workflow using Residential Load Factor Method	Cookbook for calculating cooling loads via RLF Method
8.1 Workflow Overview	As of rev2 this is a placeholder. More evaluation needed to determine how to organize the material for this section. Those details will be coming in a later revision to the outline.
9. System Load Calculation & System Sizing Workflow	Cookbook for calculating system loads and sizing airflow rates
9.1 Workflow Overview	Overview of the objectives and workflow
9.2 Calculate system loads	Discussion of calculating system loads such as ventilation, fan heat gain
9.3 Workflow for calculating supply airflow rates	Discussion of one key use for peak loads – calculating supply airflow
9.4 Workflow for calculating supply fan airflow rates	Discussions of coincident peak load and airflow; sum of peaks
3.10 Apply Safety Factor, if Necessary	Application of cooling and heating safety factor, and considerations
References	

Outline	Comments, adapted material from 2025
Chapter 18 – Load Calculation Theory	
1. Introduction	Purpose and content of this chapter; its relationship to Chapter 17
2. Fundamentals of Load Calculations	1. Cooling Load Calculation Principles
2.1 Terminology	1.1 Terminology
2.2 Heat Flow Rates	1.1 Terminology / Heat Flow Rates
Space Heat Gain or Loss (sensible and latent)	
Space Load	
Space Heat Extraction Rate / Heat Addition Rate	
Cooling and Heating Coil Load	
3. Steady State Load Calculations Principles	
3.1 Key Principles of Steady State Load Calculations	New
3.2 Application for Peak Heating Load Calculation	7. Heating Load Calculation
3.3 Steady State Heat Loss Calculations	7.1 Heat Loss Calculations
Calculation of Heat Loss for Above Grade Surfaces	
Calculation of Heat Loss for At or Below Grade Surfaces	
Infiltration Heat Loss	
3.4 Heating Safety Factor and Load Allowances	7.2 Heating Safety Factor and Load Allowances
3.5 Other Heating Load Considerations	7.3 Other Heating Load Considerations
Table A. Summary of Peaking Heating Load Calculation Equations	New
4. Dynamic Load Calculation Principles	
4.1 Key Principles of Dynamic Load Calculations	New
4.2 Application to Peak Cooling Load Calculation	1.2 Cooling Load Calculation Methods
4.3 Internal Heat Gains	2. Internal Heat Gains
4.3.1 Occupants	2.1 People
4.3.2 Lighting	2.2 Lighting
4.3.3 Electric Motors	2.3 Electric Motors
4.3.4 Appliances and Equipment	2.4 Appliances
4.4 Opaque Envelope Heat Gain	New
4.5 Fenestration Heat Gain	4. Fenestration Heat Gain
Direct Solar, Diffuse Solar, and Conductive Heat Gain	4.1 Fenestration Direct Solar, Diffuse Solar, and Convective Heat Gain
Exterior Shading	4.2 Exterior Shading
4.6 Infiltration Heat Gain	3.1 Infiltration
4.7 Latent Heat Gain from Moisture Diffusion	3.2 Latent Heat Gain from Moisture Diffusion
4.8 Latent Heat Gain from Other Sources	3.3 Other Latent Lods
5. Dynamic Cooling Load Calculations: Heat Balance Method	5. Heat Balance Method
5.1 Key Principles of the Heat Balance Method	5. Heat Balance Method and 5.1 Assumptions

Outline	Comments, adapted material from 2025
5.2 Calculation Procedure	5.2 Elements
5.2.1 Overview	5.2 Elements
5.2.2 Outdoor Face Heat Balance	In 5.2: Outdoor Face Heat Balance
5.2.3 Wall or Roof Conduction Process	In 5.2: Wall Conduction Process
5.2.4 Indoor Face Heat Balance	In 5.2: Indoor Face Heat Balance
LW Radiation Exchange Among Surfaces	
SW Radiation from Lights	
LW Radiation from Internal Sources	
Transmitted Solar Heat Gain	
Using SHGC to Calculate Solar Heat Gain	In 5.2: Using SHGC to Calculate Solar Heat Gain
Indoor Air Heat Balance	In 5.2: Air Heat Balance
Space Load	5.3 General Zone for Load Calculation
5.2.5 Input Data Required	5.5 Input Required
5.2 Heat Balance Mathematical Description	5.4 Mathematical Description
6. Dynamic Heating Load Calculations: 24-Hour Steady Periodic Loads	
6.1 Key Principles for 24-Hour Steady Periodic Design Htg Load Calc	In rev 2 this is a placeholder. Need to determine content here explaining theory and application of Heat Balance for 24-hour steady periodic calculation of peak heating loads.
7. Dynamic Cooling Load Calculations: Radiant Time Series Method	6. Radiant Time Series Method
7.1 Key Principles of the RTS Method	6.1 Assumptions and Principles, 6.2 Overview
7.2 Calculation Procedure	6.3 RTS Procedure
7.2.1 Overview	6.3 RTS Procedure
7.2.2 Opaque Envelope Heat Gain	6.4 Heat Gain Through Exterior Surfaces
Sol Air Temperature	
Conduction Time Series	
7.2.3 Heat Gain Through Interior Surfaces	6.5 Heat Gain Through Interior Surfaces
7.2.4 Calculating Cooling Load	6.6 Calculating Cooling Load
Opaque Envelope Load Components	
Fenestration Load	
Internal Loads	
Infiltration Load	
Other Latent Loads	
Table A. Summary of RTS Load Calculation Procedures	Table 26. Summary of RTS Load Calculation Procedures
8. Dynamic Cooling Load Calculations: Residential Heat Balance Method	
8.1 Key Principles for Residential Heat Balance Method	In rev 2 this is a placeholder. Need to determine content here explaining theory and application of Heat Balance for residential peak cooling load calculations.

Outline	Comments, adapted material from 2025
9. Dynamic Cooling Load Calculations: Residential Load Factor Method	
9.1 Key Principles for 24-Hour Steady Periodic Design Htg Load Calc	In rev 2 this is a placeholder. Need to determine content here explaining theory and application of the Residential Load Factor Method.
10. HVAC System Loads and Equipment Sizing	8. System Heating and Cooling Load Effects
10.1 Zoning	8.1 Zoning
10.2 Ventilation Loads	8.2 Ventilation
10.3 Air Heat Transport Systems	8.3 Air Heat Transport Systems
On/Off Control Systems	
Variable Air Volume Systems	
Constant Air Volume Reheat Systems	
Mixed Air Systems	
Heat Gain from Fans	
Duct Surface Heat Transfer	
Duct Leakage	
Ceiling Return Air Plenum Temperatures	
Ceiling Plenums with Ducted Return	
Underfloor Air Distribution Systems	
10.4 Use of Peak Room Loads to Calculate Supply Airflow Rates	In rev 2 this is a placeholder. To be refined/elaborated in a later revision
10.5 Central Cooling and Heating Plants	In rev 2 this is a placeholder. To be refined/elaborated in a later revision
10.6 Central Cooling and Heating Plants	8.4 Central Plants

Table 2. 1997 ASHRAE Handbook – Fundamentals – Chapter 28 – Summary Outline

Outline	Comments
Chapter 28 – Non-Residential Cooling & Heating Load Calculations	
1. Introduction	
2. Cooling Load Principles	
2.1 Principles	Basic concepts and principles
2.2 Space Cooling Load Calculation Techniques	Overview of Heat Balance, TETD, TFM, CLTD/CLF methods
2.3 Initial Design Considerations	Data assembly
2.4 Heat Gain Calculation Concepts	Envelope heat gain calculations – wall, roof, fenestration
2.5 Heat Sources in Conditioned Spaces	People, lighting, power, appliances, with tables
2.6 Infiltration and Ventilation Heat Gain	Ventilation, infiltration, standard air
2.7 Latent Heat Gain through Permeable Materials	
2.8 Heat Gain from Miscellaneous Sources	
2.9 Heating Load Principles	Very short.
3. Transfer Function Method Calculation Procedures	
3.1 Basic Principles	
Table 10 – Summary of TFM Load Calculation Procedures	1-page summary of key equations
3.2 Heat Gain by Conduction through Exterior Walls & Roofs	Theory, mathematics, factor tables, short examples
3.3 Heat Gain through Interior Partitions, Floors, Ceilings	Theory, mathematics, factor tables
3.4 Conversion of Cooling Load from Heat Gain	Theory, mathematics, factor tables
3.5 Sensitivity of Parameters – Nontypical Applications	
3.6 Use of Room Transfer Functions	
3.7 Cooling Load from Non-Radiant Heat Gain	
3.8 Heat Extraction Rate and Room Temperature	Theory, mathematics, factor tables, short examples
3.9 Example Transfer Function Cooling Load Calculation	6 pages long with detailed tables.
4. CLTD/SCL/CLF Calculation Procedure	
4.1 Basic Principles	
table 29 – Summary of CLTD/CLF Calculation Procedures	$\frac{3}{4}$ -page table with key equations.
4.2 Synthesis of Heat Gain and Cooling Load Conversion Procedures	
Exterior Roofs and Walls	Discussion. One equation. References factor tables
Space Cooling Load from Fenestration	Discussion, 2 equations. References factor tables.
Shading Coefficient	Interior and exterior shading of fenestration
4.3 Heat Sources within Conditioned Space	
People	Principles, equations, factor tables, short example

Outline	Comments
Lighting	Principles, equations, factor tables, short example
Power and Appliances	Principles, equations, factor tables, short example
4.4 Example Cooling Load Calculation using CTLD/CLF Method	2 pages
4.5 Limitations of CLTD/SCL/CLF Methods	
5. TETD/TA Calculation Procedure	
5.1 Basic Principles	
Table 43 – Summary of TETD/TA Calculation Procedures	1-page summary of equations
5.2 Treatment of Heat Gain and Cooling Load Conversion Procedures	
5.3 Cooling Load by Time Averaging	
5.4 Example Cooling Load Calculation using TETD/TA	4-1/2 page example with detailed tables.
6. References	

Table 3. 1989 ASHRAE Handbook – Fundamentals – Chapter 26 – Summary Outline

Outline	Comments
Chapter 26 – Air Conditioning Cooling Load	
1. Introduction	
2. Basic Principles	
2.1 Principles	
2.2 Heat Flow Rates	Heat gain, cooling load, extraction rate explained
2.3 Calculation Techniques	Overview of TETD, TFM, CLTD/CLF methods
2.4 Application Experience	When to use TETD, TFM, CLTD/CLF methods
2.5 Initial Design Considerations	Assembling data
3. Heat Gain Calculation Concepts	
Heat Gain Through Exterior Walls and Roofs	Theory, equations, factor tables.
Heat Gain Through Fenestration	Theory, equations, factor tables
Heat Gain Through Interior Surfaces	Theory, equations,
Heat Sources in Conditioned Spaces	
People	Theory, equations, factor tables
Lighting	Theory, equations, factor tables
Power	Theory, equations, factor tables for motors, fans, pumps
Appliances	Theory, equations, factor tables
Hospital and Laboratory Equipment	Discussion
Office Appliances	Theory, equations, factor tables
Infiltration and Ventilation Heat Gain	Ventilation, Infiltration, Standard Air, latent heat gain thru permeable materials.
Heat Gain from Miscellaneous Sources	HVAC fans, duct heat gain and leakage
4. Transfer Function Method Calculation Procedures	
4.1 Basic Principles	
Table 10 – Summary of TFM Load Calculation Procedures	$\frac{3}{4}$ page table containing key equations
4.2 Heat Gain through Exterior Walls & Roofs	Theory, equations, factor tables.
4.3 Heat Gain through Interior Partitions, Floors, Ceilings	Theory, equations, factor tables.
4.4 Conversion of Cooling Load from Heat Gain	Theory, equations, factor tables.
4.5 Heat Extraction Rate and Room Temperature	Theory, equations, factor tables
3.9 Example Transfer Function Cooling Load Calculation	5-1/2 page example with tables.
5. CLTD/CLF Calculation Procedure	
5.1 Basic Principles	

Outline	Comments
Table 27 – Summary of CLTD/CLF Calculation Procedures	¾-page table with key equations
5.2 Heat Gain and Cooling Load Conversion	
Exterior Roofs and Walls	Theory, equations, factor tables
Space Cooling Load through Fenestration	Theory, equations, factor tables
5.3 Heat Sources within Conditioned Space	
People	Theory, equations, factor tables
Lighting	Theory, equations, factor tables
Equipment	Brief discussion
Appliances	Theory, equations, factor tables, examples
5.4 Example	1-page example
5.5 Effective Use of CLTD/CLF Procedures	Brief discussion.
5.6 Error Sensitivity	Brief discussion.
6. TETD/TA Calculation Procedure	
6.1 Basic Principles	
Table 43 – Summary of TETD/TA Calculation Procedures	3/4-page summary of equations
6.2 Heat Gain and Cooling Load Conversion	Theory, equations
6.3 Cooling Load by Time Averaging	Discussion
6.4 Example Cooling Load Calculation using TETD/TA	3-1/2 page example with detailed tables.
7. Residential Cooling Load Calculations	
7.1 Residential Features	
7.2 Cooling Load Components	
7.3 Selection of Cooling Equipment	
7.4 Example	
8. References	
9. Bibliography	

Table 4. Summary Outline – Commercial Load Estimating – Level 1 Overview – Carrier Technical Dev. Program

Outline	Comments
1. Introduction	
2. Load Estimating Basics	
Load Estimate Uses	
Load Estimate Types	Zone load and block load
Load Estimate Outputs	Capacities, load components, equipment selection
Load Estimating Methods	Check figures, manual calculation, software
3. Heat Transfer Methods	Conduction, convection, radiation
4. Calculating a U-Factor	
5. Solar Radiant Energy	Instantaneous heat gain, shading
6. Heat Transfer Theory	Time-related heat storage
7. Climatic Conditions	Outdoor design conditions, indoor conditions
8. Load Components	
External Space Loads	Solar, Transmission, Infiltration, Partitions, Floors, Ceilings
Internal Space Loads	People, Lighting, Plug Loads, Motors, Gas-Fired Equipment, Piping, Tanks, Evaporation
System Loads	Ventilation, duct heat gain, leakage, fan heat gain, plenums
9. Summary	
10. Example Problem	