



# MINUTES

## Handbook Committee

June 28, 2015

Atlanta Hilton

Atlanta, Georgia

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**MEMBERS PRESENT:**

Daniel Dettmers, chair  
Chris Ahne, vice chair, 2015A chair  
Sheldon Jeter, 2015A  
Frank Mills, 2015A  
Forrest Yount, 2016S chair  
Annette Dwyer, 2016S  
Nicolas Lemire, 2016S  
Paul Lindahl, 2016S  
Patrick Marks, 2016S  
Michael Patton, 2016S  
David Yuill, 2017F chair  
Bass Abushakra, 2017F  
Van Baxter, 2017F  
Sheila Hayter, 2017F  
Ramesh Paranjpey, 2017F  
Don Fenton, 2018R chair  
Kelley Cramm, 2018R  
Jay Enck, 2018R  
Scott Fisher, 2018R  
Bill Murphy, 2018R  
Mick Schwedler, Board of Directors Ex-Officio  
Darryl Boyce, Publishing and Education Council chair; Coordinating Officer

**STAFF PRESENT:**

Steve Comstock, Publisher/Director of Publications and Education  
Heather Kennedy, Managing Editor, Handbook  
Mark Owen, staff liaison, Editor/Group Mgr., Handbook and Special Publications  
Nancy Thysell, Handbook Typographer/Page Designer

**VISITORS:**

Vinay Ananthachar, TC 2.5, TC 6.7, TC 7.1  
Peter Armstrong, TC 1.13  
Vikrant Aute, TC 1.13  
Cindy Callaway, Electronic Communications Committee  
Narayanan Chandrasekar, incoming 2019A  
Chuck Gulledge, Publishing and Education Council vice chair  
Bryan Holcomb, incoming 2019A  
Lindsey King, Leadership U  
Mitesh Kumar, Leadership U  
Suzanne LeViseur, incoming 2019A chair  
Harris Sheinman, incoming 2019A  
Lynn Werman, incoming 2019A

**ADDITIONAL DISTRIBUTION:**

Publishing and Education Council  
Chapter Technology Transfer Committee

## MAJOR PASSED MOTIONS

### No. Motion

- 2 To approve/assign a new chapter on optimization for 2017 *Fundamentals* as proposed by TC 1.13 in Attachment B.
- 3 To approve revisions to the Authors and Revisers Guide (ARG) as shown in Attachment C.
- 4 To approve/assign a new chapter on natatoriums for 2019 *HVAC Applications* as proposed by TC 9.8 in Attachment F.
- 5 To approve/assign a new chapter on atriums for 2019 *HVAC Applications* as proposed by TC 9.8 in Attachment G.

## ACTION ITEMS

No.	Responsibility	Action Item
1	Staff	Add out-of-sequence updates to the Word base files.
2	Staff	Provide key (index) terms for download with Word base files.
3	Staff	Add question (see <b>10.3</b> ) as the new #7 on the chapter review form and renumber to match.
4	Staff	Convert chapter review form to online form enabling data capture of reviews for Handbook Committee and TC use and make more prominent. Combine with existing online Handbook Comment Form.
5	Cramm	Take proposal to TAC for promotion of Handbook deadlines and schedules to TC Chairs at TC Chair Breakfast by adding information to their handout.

### 1. Call to Order

Mr. Dettmers called the meeting to order at 10:32 a.m. and noted that a quorum was present.

### 2. Introductions

Mr. Dettmers welcomed all attendees. Members and visitors introduced themselves.

### 3. Approval of Minutes

It was moved and seconded

**(1) to approve the minutes of the committee's January 2015 meeting in Chicago.**

**MOTION (1) PASSED, voice vote.**

### 4. Agenda Updates

There was one addition to the agenda:

- 9.3.1 Proposed new chapter on optimization (TC 1.13).

## **5. Chair's Comments**

### **5.1 Publishing and Education Council (PEC) update**

Mr. Dettmers reported that there were no new or pending Handbook-related action items or motions from the council.

### **5.2 ECC response on collaborative tools motion**

Mr. Dettmers recognized Ms. Callaway, liaison from ECC, who explained the response as follows:

- ECC has been working on this for several years
- The need applies to multiple groups, such as Handbook, Standards, Special Publications, etc.
- The Basecamp tool is in limited trial, with about 30 groups. More communication will be forthcoming on a formal launch, training, help, and best practices by January 2016.
- ECC is proposing a change to the Rules of the Board (ROBs) to address what is allowed regarding posting ASHRAE intellectual property online for collaboration. It would require that all such documents be securely stored on ASHRAE-owned servers or ASHRAE-contracted for fee servers.

Mr. Comstock said that staff will propose development/adoption of a collaborative authoring tool to PEC.

Mr. Owen asked if the use of Basecamp was to be mandatory for authoring groups. Ms. Callaway said not at this point, but that Basecamp has been identified as one tool that complies with the proposed ROB change.

## **6. Board of Directors Ex-Officio (BOD ExO) Member Report**

Mr. Schwedler gave a brief PowerPoint presentation (Attachment A) of Society announcements and news. He thanked committee members for the work they do to get the Handbook produced and out to members.

## **7. Coordinating Officer (CO) Report**

Mr. Boyce, PEC chair and CO, thanked committee volunteers for their work and emphasized how important a contribution the Handbook is. He reported that, in conjunction with current initiatives on globalization, it was again noted that the Handbook is seen globally as “the bible of the industry.” He thanked members for helping maintain the quality of Handbook content.

Mr. Boyce also reported on the work of the Building Performance Alliance, a Presidential Ad Hoc committee formed two years ago to create a “roadmap” for commissioning effective building operations. He said the results may lead to parts of the Handbook expanding on related topics.

## **8. Handbook Editor's Report**

Mr. Owen provided an update of information on distribution and sales for 2014 *Refrigeration* and ASHRAE Handbook Online.

Mr. Owen also reported that, since March 2014, 10.19% of renewing members have been choosing to receive as their 2015 member benefit a subscription to ASHRAE Handbook Online plus the annual CD. Another 3.76% of renewing members are choosing the option to receive all formats—print, CD, and online—for an additional fee. The remaining 86.05% have chosen to receive the print volume with CD.

## **9. Volume Subcommittee Reports**

### **9.1 2015 HVAC Applications**

Mr. Ahne said liaisons should reemphasize the need for TCs to copy Handbook staff on submissions to liaisons; two TCs' revisions were missed for the 2015 print edition because this was not done and the usual means of transmission broke down. Ms. Kennedy noted that both TCs' revisions would be added to the online edition, with a note also added to the errata for the 2015 volume.

Mr. Owen and Ms. Kennedy thanked the 2015 volume subcommittee for their work.

## 9.2 2016 HVAC Systems and Equipment

Mr. Yount reported that 26 chapter revisions have been received for the 2016 edition, with 29 yet to come in. All are slated for submission by end July. All liaisons and seven TC representatives attended the volume/TCs meeting, where emphasis was placed on ensuring positive votes for TC intent, even when no changes are intended for the cycle.

Suggestions received included the following:

- Add training on “closing the loop” on Handbook comments.
- Add a checklist item on comments (Mr. Owen responded that this already exists.).
- Add out-of-sequence updates to the Word base files (**ACTION ITEM #1**—staff).
- Provide key (index) terms for download with Word base files (**ACTION ITEM #2**—staff).
- Add training on citing online content in the print edition (i.e., that it is allowed, and how to do it).

## 9.3 2017 Fundamentals

Mr. Yuill reported that 8 TCs represented at the volume/TCs meeting. All chapters are reported on schedule.

### 9.3.1 Proposed new chapter on optimization from TC 1.13

Mr. Aute explained the proposal (Attachment B). It was moved and seconded

- (2) to approve/assign a new chapter on optimization for 2017 Fundamentals as proposed by TC 1.13 in Attachment B.**

**MOTION (2) PASSED unanimously, voice vote.**

## 9.4 2018 Refrigeration

Mr. Fenton reported all liaisons and one TC representative attended the volume/TCs meeting, and that revision work is under way.

## 10. Subcommittee Reports

### 10.1 Training

#### 10.1.1 Handbook training for liaisons

Mr. Fenton reported that training was conducted earlier in the morning with 13 attendees including a couple of TC Handbook subcommittee chairs.

### 10.2 Functional

#### 10.2.1 Rules of the Board (ROBs)

Mr. Yuill reported no changes.

#### 10.2.2 Manual of Procedures (MOP)

Mr. Yuill reported no changes.

#### 10.2.3 Authors and Revisers Guide (ARG)

Mr. Yuill moved

- (3) to approve revisions to the Authors and Revisers Guide as shown in Attachment C.**

**MOTION (3) PASSED, voice vote.**

#### 10.2.4 Reference Manual

Mr. Yuill reported no changes.

### 10.3 Electronic Media

In addition to the cooperation with ECC mentioned earlier in the meeting, Mr. Yount reported the following discussion and ideas from the subcommittee:

- Recommend promoting the use of the chapter review form by TC Handbook Chairs in year of 1 review.
- Add this question as the new #7 on the chapter review form and renumber to match **(ACTION ITEM #3—staff)**:
  7. Can improvements be made to the organization and readability of the chapter to locate content easily and enhance understanding?
    - Couldn't be better in any way
    - Opportunity for better organization
    - Hard to follow and understand
- Convert chapter review form to online form enabling data capture of reviews for Handbook Committee and TC use and make more prominent **(ACTION ITEM #4—staff)**. (Mr. Owen suggested that this could be combined with the existing online Comment Form.)
- Promote Handbook deadlines and schedules to TC Chairs at TC Chair Breakfast (add information to their handout). Ms. Cramm said she would take this proposal to TAC at their meeting Sunday **(ACTION ITEM #5)**.

### 10.4 Strategic Planning

Mr. Ahne reported that the subcommittee's discussions have addressed the following points:

- Changing the mindset on Handbook revisions from the four-year cycle to continuous, incremental updates
- Using the Revision History provided by staff for the purpose of identifying chapters/TCs needing help
- Providing tools for collaboration
- Providing incentives for Handbook subcommittee chairs, lead authors, and contributors, such as awards, badge ribbons, and/or registration discounts

### 10.5 International

Mr. Mills presented his report (Attachment D).

## 11. Information Items

### 11.1 Year 2014-15 MBOs

Mr. Dettmers reviewed the status of MBOs for 2014-15 (Attachment E).

### 11.2 Year 2014-15 MBOs

Mr. Ahne reported that his MBOs for 2015-16 would be forthcoming.

## 12. Action Items

Mr. Owen reviewed action items from the January 2015 meeting:

No.	Responsibility	Action Item	Status
1	Owen	Add proposals from TC 9.8 for new chapters on natatoriums and atriums to the agenda for the June 2015 meeting in Atlanta.	COMPLETE.
2	Owen	Highlight items needing permissions in Handbook chapter base Word files.	Incomplete, pending conversion of 2015A Word files expected early July.

3	Owen	Add information on how to obtain old Handbook chapters on Handbook Central and in the Authors and Revisers Guide (ARG).	COMPLETE.
4	Owen	Add links from chapters on the CD and online to ASHRAE Terminology as a resource for Handbook users and to gather feedback for TC 1.6.	COMPLETE.
5	Owen	Remove references to "Handbook Online+" from ARG.	COMPLETE.

### 13. Old Business

#### 13.1 TC Workloads

Mr. Dettmers reported no progress on this issue.

### 14. New Business

#### 14.1 Proposed new chapter on natatoriums from TC 9.8

Mr. Mills presented the proposal (Attachment F). It was moved and seconded

- (4) to approve/assign a new chapter on natatoriums for 2019 *HVAC Applications* as proposed by TC 9.8 in Attachment F.

**MOTION (4) PASSED, voice vote.**

#### 14.2 Proposed new chapter on atriums from TC 9.8

Mr. Mills presented the proposal (Attachment G). It was moved and seconded

- (5) to approve/assign a new chapter on atriums for 2019 *HVAC Applications* as proposed by TC 9.8 in Attachment G.

**MOTION (5) PASSED, voice vote.**

### 15. Adjournment

The meeting was adjourned at 12:59 p.m.

Respectfully submitted,



Mark S. Owen  
Staff liaison  
Editor/Group Manager, Handbook and Special Publications

# ASHRAE Update

from the  
President-Elect Advisory Committee





# IAQA Update

- Hiring 8 staff to provide support along with existing staff
- Changing Society year to match ASHRAE's
- Updating membership database
- Meeting in parallel with ASHRAE beginning January 2016

# Strategic Plan: Next Step

- Working with MCI (outside consulting firm) on marketing analysis and implementation
- Plan likely to focus on
  - Marketing outreach
  - Member and chapter experiences
  - Local delivery and member care
  - Partner development
- Global focus

# Presidential Ad Hoc: Impact of Centralized Training on CRCs

- Charge: consider effect of centralized training on attendance at Chapters Regional Conferences (CRCs)
- Recommend whether centralized training for Research Promotion, Membership Promotion and Student Activities committees should be eliminated or returned to CRCs
- To make final recommendations at 2015 Annual Conference

# Presidential Ad Hoc: Effective Use of Volunteer Time

- Charge: identify potential improvements to operations and procedures to improve performance while increasing effective use of volunteer time
- Identified three focus areas
  - Volunteering locally
  - Focusing participation to respect volunteer time
  - Encouraging attendance/participation at Winter and Annual Conferences
- To provide final report at 2015 Annual Conference

# Presidential Ad Hoc: Residential Construction Market

- Discussion on future direction of role in residential arena at 2015 Annual Conference by Board of Directors
- Residential track at 2015 Winter Conference shows clear interest in residential by attendees
  - Some 20 tracks related to residential
  - 933 people attended residential sessions
  - 115 people attended three or more of sessions

# Presidential Ad Hoc: Building Performance Alliance

- Charge: develop a strategy to create training and tools that will enable building operations staff to meet or exceed a building's design performance potential
- Vision is to include representatives from allied organizations
- Final committee report expected at 2016 Annual Conference

# 2016 ASHRAE Conference/AHR Expo Orlando

- Jan. 23-27: ASHRAE Winter Conference, Orlando Hilton
  - Hotel within walking distance of Expo site
  - Conference/hotel registration to open September 2015
- Jan. 25-27: AHR Expo, Orange County Convention Center
  - Slated to be largest AHR Expo outside of Chicago, Illinois
  - 440,000 square feet of exhibit space forecasted

# Join Us!

- **2015**
  - Sept. 30-Oct. 2: **Energy Modeling Conference: Tools for Designing High Performance Buildings**, Atlanta, Georgia
  - Oct. 20-22: **AHR Expo Mexico**, Guadalajara
- **2016**
  - Jan. 23-27: **2016 Winter Conference**, Orlando, Florida
  - Jan. 25-27: **AHR Expo**, Orlando, Florida
  - March 14-16: **6th International Conference on Energy Research and Development**, State of Kuwait
  - April 21: **ASHRAE Webcast**, Realistic Commercial Net Zero Building Design through Energy Conservation and Renewables

# Join Us!

- **2016**
  - Jun 25-29: **2016 Annual Conference**, St. Louis, Missouri
  - Sept. 12-14: **IAQ 2016 Defining Indoor Air Quality: Policy, Standards and Best Practices**, Alexandria, Virginia, co-organized by Air Infiltration and Ventilation Centre (AIVC)
  - Sept. 22-23: **2nd International Conference Efficient Building Design: Materials and HVAC Equipment Technologies**, Beirut, Lebanon
  - Sept. 27–29: **AHR Expo Mexico**, Monterrey, Mexico

## Proposal for New Chapter in ASHRAE Handbook

**Chapter Title:** Optimization Methods

**Potential Handbook Volume:** Fundamentals

**Proposers Name:** Vikrant Aute, Handbook SC Chair, on behalf of TC1.13 (formerly TG1.Optimization)

**Responsible TC:** TC1.13 Optimization (formerly TG1.Optimization)

### Chapter Objectives:

The objective of this chapter is to introduce systematic optimization techniques for design optimization of HVAC&R systems. Specifically, this chapter will introduce the formal terminology, discuss various types of optimization formulations and the corresponding algorithms to solve these problems. The chapter will summarize the latest developments in the fields of optimization and its application to HVAC&R system and component design. Practical aspects of application of optimization methods and lessons learned from the HVAC&R literature will be summarized.

### Benefits to Members

This chapter will serve as a starting point for member interested in HVAC&R optimization. It will not only provide the basic information to get started, but also introduce state of the art in the field of optimization so that the reader can find a clear path forward for his/her design optimization task. Real world HVAC&R engineering examples will be provided to serve as a starting point for the reader. The chapter will include easy to use spreadsheet based examples to assist users in getting started. Additional examples based on freely available optimization platforms could be incorporated as well.

### Input from ASHRAE Members

TC1.13 (formerly TG1.Optimization) hosted a Forum during the 2012 ASHRAE Winter Meeting to seek input from ASHRAE members on the content of such a chapter on Optimization. The forum was well attended and there was overwhelming positive feedback.

The Mind Map on the next page shows the high level feedback that was received for the potential contents of this chapter.

### Other Relevant ASHRAE Chapter

The only other handbook chapter that deals with optimization is:

2015 - HVAC Applications, Chapter 42 - Supervisory Control Strategies and Optimization

This chapter introduces terminology and approaches for control optimization. It covers several application examples but does not cover system design optimization. The proposed chapter will complement this chapter by focusing on some of the underlying concepts as well as advanced methods.

In other words, the existing Chapter on controls focuses on minimizing the operating cost (improving efficiency) of a system, whereas the proposed chapter will focus more on the system design and minimizing first cost, maximizing efficiency and minimizing environmental impact.

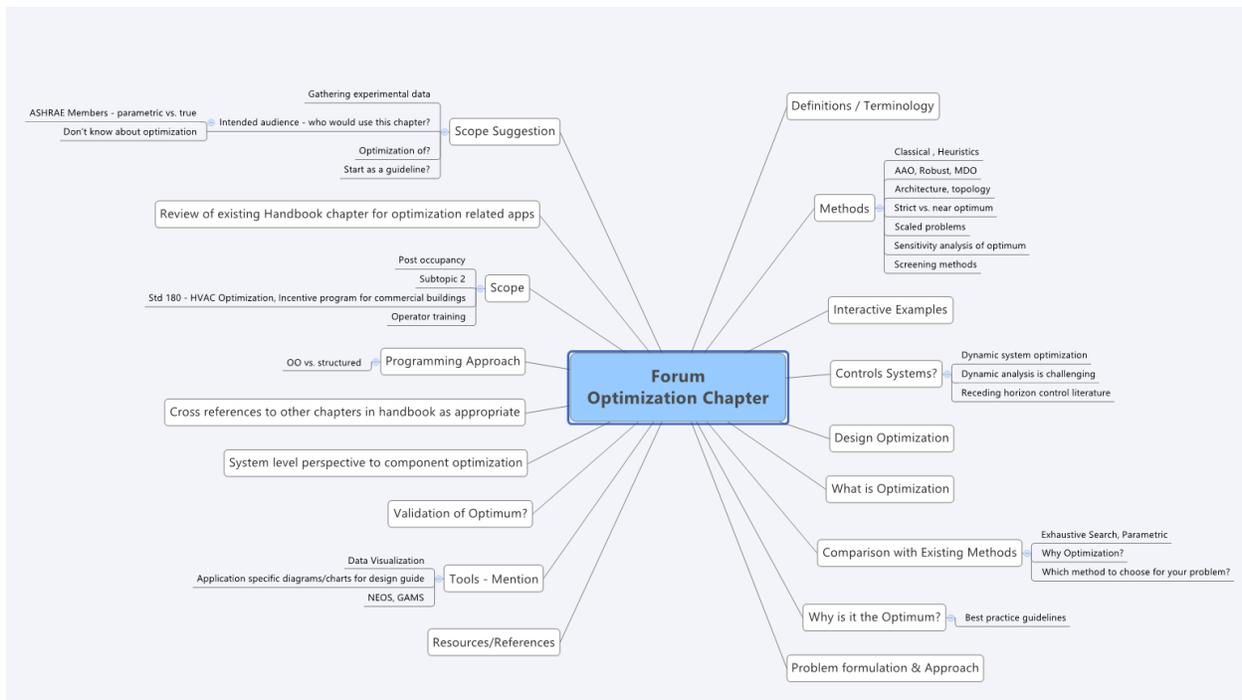


Figure: Mind Map of feedback on potential content of the chapter on Optimization. (High resolution version available separately).

### Background (not really required here, since covered in Ref-1).

Engineers and researchers are often given the task of finding the “optimum” or “optimized” design for a system, such as an air conditioner, or for a given component, for example, a tube-fin heat exchanger. The term “optimum” and the process of optimization itself are viewed differently by different people depending upon the context and understanding.

Consider an example of optimizing a tube-fin heat exchanger. Typically, an engineer has choices of multiple tube diameters, fin types, fin densities, fan blades and motors, tube circuitry, length, etc., to design such a heat exchanger. The number of all possible combinations of these design variables can be significant (e.g., several thousand) and can grow exponentially when tube circuiting is added as another variable.

In conventional design process (Arora 2004), the optimum design is generally the one that the engineer finds as the “best” design. The procedure to arrive at this design mainly depends on the engineer’s skills, experience, intuition, and, last but not least, his/her ability to analyze the effect of multiple variables on the performance of the resulting heat exchanger. Frequently, such a procedure can lead to designs that are better than a baseline design that can satisfy the performance requirements and other system operating and environmental restrictions, but that do not necessarily represent the best possible design in terms of performance criteria. One of the underlying reasons for this is that it is not possible to analyze every possible combination of the design parameters to find and verify which design is the best. On the contrary, in an optimal design process (Arora 2004) or optimization, the engineer must clearly identify the objectives, constraints, and design variables, which are together termed as optimization problem formulation. The objectives are quantitative performance criteria that are generally minimized (e.g., cost) or maximized (e.g., coefficient of performance [COP], efficiency). Constraints are restrictions on the design and typically arise due to operating conditions, laws of physics, and manufacturing aspects to

name a few. This rigorous formulation provides a quantitative basis for assessing design improvements and can often lead to other physical insights into the system or component being optimized.

**References:**

1. Aute, V., 2012, Editorial: Mathematical Optimization - The Systematic Approach to Finding Low-Cost Energy-Efficient System Designs, HVAC&R Research, 18(5), pp. 831-833.
2. ASHRAE Winter Meeting, 2012, Chicago, **Forum:** What should be included in the Handbook Chapter on Optimization, Sponsor: TG1.Optimization, Chair: Vikrant Aute, Sunday January 22, 2012.



# Authors and Revisers Guide

## ASHRAE Handbook

August ~~July~~ 2013 ~~2015~~

### Table of Contents

1.0	<i>Philosophy</i> .....	1
2.0	<i>Administrative Organization</i> .....	2
3.0	<i>Content</i> .....	2
4.0	<i>Proposing a New Chapter</i> .....	3
5.0	<i>Deleting a Section or Chapter</i> .....	4
6.0	<i>Revision Procedure</i> .....	4
7.0	<i>Preparation of Manuscripts</i> .....	6
8.0	<i>Outline for Fundamentals Chapters</i> .....	11
9.0	<i>Outline for Chapters in Other Volumes</i> .....	13
10.0	<i>Electronic Enhancements for ASHRAE Handbook Online+</i> .....	13
	<i>Appendix A: Chapter Revision Process Timeline</i> .....	14
	<i>Appendix B: Chapter Revision Agenda and Meeting Minutes Template</i> .....	17
	<i>Appendix C: Chapter Review Checklist</i> .....	18
	<i>Appendix D: Chapter Approval Checklist</i> .....	20

*This guide is produced and updated by the Society's Handbook Committee and the Handbook editor. Questions regarding this guide or preparation of Handbook chapters should be directed to the Handbook Committee liaisons listed in the TC/TG/TRG rosters or to the Handbook editor.*

## 1.0 PHILOSOPHY

The ASHRAE Handbook is the recognized repository of current engineering procedures and practices in the fields of heating, ventilation, air-conditioning, and refrigeration (HVAC&R). The Society publishes the Handbook primarily to provide practical technical information and data for the design engineer. The information is directed at those who understand engineering principles and use the information as a checklist of procedures, for design data, and to review recent industry practices. Typical users include consulting engineers, equipment designers, plant engineers, contractors, government officials, technicians, and engineering students.

The Handbook does not, however, list all possible calculation methods, all possible equipment choices, or all possible design solutions. Specific designs must always result from the experience and expertise of the engineer after considering economics, owner preferences, local practice, climatic conditions, maintenance and operating costs, and other applicable factors. As such, the material contained in the Handbook is to be used as guidance for the practicing engineer, but cannot substitute for the judgment of the engineer.

## 1.1 Commercialism

The ASHRAE Handbook's scope includes all aspects of HVAC&R technology. Therefore, differing technologies are to be presented accurately in the Handbook and in accordance with the Society's commercialism policy. Material prepared for publication in the Handbook must be written and critically reviewed by the responsible Technical Committee (TC), Task Group (TG), or Technical Resource Group (TRG) to ensure that it is free of bias.

## 2.0 ADMINISTRATIVE ORGANIZATION

Many groups and individuals within ASHRAE participate in the Handbook's production. The following is the division of responsibilities; for further information, read each group's Rules of the Board (ROBs) and Manual of Procedures (MOP):

**Publishing and Education Council**—policy, publishing decisions, financial matters

**Handbook editor and staff**—preparation and publication of the Handbook

- Editor: Mark S. Owen (email: [mowen@ashrae.org](mailto:mowen@ashrae.org))
- Managing editor: Heather Kennedy (email: [hkennedy@ashrae.org](mailto:hkennedy@ashrae.org))

**Handbook Committee**—policy, publishing decisions, chapter assignments, scheduling, coordination, communications

- Chair
- Volume subcommittees (4)
- Subcommittee chairs
- Members/liaisons to technical committees, listed on TC/TG/TRG rosters

**TCs/TGs/TRGs**—prepare and revise chapters

- Handbook subcommittee
- Subcommittee chair
- Chapter reviewers
- Chapter lead author/reviser and other authors/revisers

## 3.0 CONTENT

The ASHRAE Handbook includes four separate printed and electronic volumes, currently entitled Fundamentals, Refrigeration, HVAC Applications, and HVAC Systems and Equipment. One volume is published each year in two editions, one using Inch-Pound (I-P) units of measurement and the other using the International System of Units (SI). Each print volume includes a CD-ROM containing its contents in both I-P and SI units. A web-based edition, ASHRAE Handbook Online, contains all four volumes in both I-P and SI units; its upgraded version, ASHRAE Handbook Online+, adds interactive and supplemental content. The volume sequence is as follows:

### 3.1 Fundamentals

Fundamentals chapters provide concise descriptions of basic engineering principles used in the HVAC&R industry. Lengthy derivations should not be included except by reference. Chapters should address current design information useful to practicing engineers. They address principles of operation and the effect of design parameter changes.

Fundamentals chapters may also provide basic data used in HVAC&R calculations and processes. Tables and graphs are available for design engineers. The Fundamentals volume is also often used as a reference in HVAC&R engineering courses.

## **3.2 Refrigeration**

Refrigeration chapters cover the various types of equipment and systems used in low- and medium-temperature applications in the food industry, the process industry, and in industrial facilities. They do not typically cover human thermal-comfort applications.

Refrigeration chapters may also include basic data such as properties of foodstuffs, and calculations particular to the refrigeration industry. Such information would not normally be found in one of the other volumes, although references to common procedures that appear elsewhere in the Handbook should be used whenever applicable.

## **3.3 HVAC Applications**

Applications chapters provide information to help design engineers use the equipment and systems described in the other volumes. Applications chapters describe how equipment should be used and what to consider when designing for the application being described. This information helps system designers select and use equipment properly. It does not describe how to design components or equipment.

## **3.4 HVAC Systems and Equipment**

System-oriented chapters cover various HVAC systems and illustrate the systems' features and differences. They refer to other chapters or volumes for basic design procedures.

Equipment-oriented sections or chapters cover components or assemblies. The information helps system designers select and others to operate equipment. It does not describe how to design components.

## **4.0 PROPOSING A NEW CHAPTER**

Before writing a new chapter, the potential lead author should review existing and previous volumes' chapters for duplicate material. Determine if any other chapters or sections should be moved to the proposed chapter. Then prepare a one-page chapter proposal that includes key information, such as the chapter title, potential Handbook volume, proposer's name, potential coauthors and reviewers, justification, and an outline. Next, identify the most relevant TC for the topic and present the proposal to its Handbook subcommittee, and if approved, to the full TC. If approved by the TC, forward the proposal to the Handbook Committee liaison for that TC (if the TC has no liaison assigned, the proposal can be sent to the Society Handbook Committee chair and/or the staff Handbook editor). The liaison will then present the idea to the full Handbook Committee, but the proposer may be asked to assist in the presentation and to answer questions. The liaison will then give the proposer and the TC guidance on whether to proceed with writing the chapter, and when and in which volume the potential chapter will likely appear.

After obtaining the Society Handbook Committee's (HBC) approval of the proposal, write the chapter. The full manuscript then requires a detailed review, editing, and recorded approval votes by the TC Handbook subcommittee and the full TC. The completed manuscript and supporting material are then sent to the TC's liaison, who reviews it and either approves or sends it back to the TC for revision. If approved, the liaison sends the manuscript to the Handbook editor for preparation and publication. Be sure to follow the other relevant parts of this guide and observe deadlines to make approval and publication of the new chapter as swift as possible.

## 5.0 DELETING A SECTION OR CHAPTER

Material that is still relevant, even if only important to a small segment of the Society, should continue to appear in the Handbook. However, because the Handbook is a lasting reference, republishing obsolete information is unnecessary. Instead, refer readers to older volumes of the Handbook. If some material is deemed important but not appropriate, or is too voluminous for the Handbook, consider preparing a separate ASHRAE special publication or ASHRAE Handbook Online+ feature where readers can find the information.

Chapter sections may be deleted through the normal revision process. But to delete an entire chapter, have a recorded vote in the responsible TC's Handbook subcommittee and then the full TC. Next, forward the recommendation to the Society's Handbook Committee via the TC's Handbook liaison.

## 6.0 REVISION PROCEDURE

**Reviewers** and **revisers** of Handbook chapters establish the scope of chapters and organize the material. Working with the appropriate TCs, TGs, or TRGs, they develop the philosophy and content of individual chapters following the outlines presented in Sections 8 and 9 of this guide. It is important to follow these outlines for consistency and ease of use by the reader.

Although the Society Handbook Committee is responsible for the publication and editorial policy of the Handbook, TCs, TGs, and TRGs write, review, and revise the chapters. Their Manual of Procedures states:

“Each TC/TG/TRG is charged with the responsibility of preparing and reviewing Handbook chapters within its field of interest and making appropriate recommendations to the Handbook Committee. The TC/TG/TRG is responsible for the technical content of these chapters, but review and revision must be coordinated with the publication schedule established by the Handbook Committee.” (Para. 3.2.1)

It is the responsibility of every TC/TG/TRG member to participate in the review of chapters. TCs/TGs/TRGs should devote significant meeting time to discussing the purpose, content, and revision of their chapters. The Handbook Committee liaison can assist in finding individuals or groups to write and revise chapters. The liaison works with the revising subcommittee to transmit comments, criticism, and suggestions so that the chapter, when complete, reflects current practice. Handbook Committee liaisons also provide the connection between the revising TC/TG/TRG subcommittee and the editor, and are charged with ensuring that the approved chapters are submitted according to schedule.

### 6.1 Typical Four-Year Revision Schedule

Each chapter must be given a detailed review and have necessary revisions made at least every four years. In addition, updates can be made at any time for inclusion in ASHRAE Handbook Online. See Appendices A and B of this guide for sample templates of a chapter revision schedule and meeting agendas/minutes. The following is a summary of a typical four-year revision schedule. Each year is July 1 to June 30:

**End of Year 0:** The chapter is published in the printed Handbook volume, the single-volume CD, and the four-volume ASHRAE Handbook Online.

**Year 1:** The TC/TG/TRG Chair appoints a Handbook subcommittee and its chair. A meeting time is established and the subcommittee then meets at every ASHRAE Annual and Winter Conference. The subcommittee and others review the just-published chapter

and make recommendations for its revision. A lead author/reviser for the chapter is selected.

**Year 2:** The lead author/reviser and others revise the chapter.

**Year 3:** The nearly-complete draft is reviewed by all members of the subcommittee, and then all members of the TC. After any changes are made, the subcommittee chair requests a recorded approval vote by the full TC. When approved, the lead author/reviser completes the chapter approval checklist and submits the revision and supporting material to the TC's assigned Handbook Committee liaison before the required deadline.

**Year 4:** The Handbook editor and staff prepare the chapter for publication and send a proof to the TC's designated final reviewer. After final corrections are made and queries answered, the chapter is complete. At the end of the fourth year, the revision is published and the process begins anew.

## 6.2 Chapter Review

For each chapter, the TC Handbook subcommittee chair selects one or more reviewers to

- check for errors that should be noted in the errata published with the next volume and on the ASHRAE web site ([www.ashrae.org](http://www.ashrae.org)), and corrected in ASHRAE Handbook Online;
- recommend whether the chapter should be discontinued, what revisions should be made, or if no changes are necessary; and
- suggest reviser(s) for the chapter.

A checklist of review questions appears in Appendix C of this guide. The Handbook Committee liaison or the TC/TG/TRG may also send the chapter to external reviewers for comment. The results will be made available to the TC Handbook subcommittee chair.

TCs are encouraged to establish and maintain contact with other professional organizations or associations related to the topic of the TC's Handbook content for the purpose of soliciting reviews of the content between revisions. The TC's members are considered the best source of knowledge regarding the work and expertise of these organizations worldwide; many TC members are also members of these groups.

## 6.3 Chapter Revision

After the chapter review, the TC begins the revision, which lasts up to two years. The lead reviser normally sends interim drafts to various reviewers for their comments. After the draft is finalized, the chapter then receives TC approval by a recorded vote and is sent to the Handbook Committee liaison according to the schedule established by the editor.

## 6.4 Reviser's and TC's Responsibility

Material prepared for possible use in the Handbook is not to be released for publication outside ASHRAE, nor is material used elsewhere to be reprinted in the Handbook without proper review, permission, and referencing. Written permission must be obtained each time copyrighted material is used or reused. Any questions regarding this requirement should be discussed with the Handbook Committee liaison and the Handbook editor.

## 6.5 General Revision Guidelines

- The **audience** is expected to have a college degree or equivalent experience, probably technical; however, they will not generally have expertise in the chapter material.

- Carefully consider and explain the use of and **definitions** for jargon, abbreviations, and acronyms.
- Include **accepted engineering practice** and current information, including new technologies. Place the highest priority on comprehensive technical information and good design practices. Design firms' checklists might be useful to revisers in ensuring that all necessary topics are addressed in the chapter.
- **Design data and procedures** should be as simple and easy to use as possible. Procedures should be appropriate for the accuracy of data available at the point in the design process. *More complex procedures should be included **only** if the increase in accuracy is significant enough to justify the additional effort.* Cite or excerpt information from ASHRAE guidelines and other ASHRAE sources that include appropriate guidance on design narratives.
- Include overview **diagrams** of systems, equipment, and energy flows.
- Chapters in HVAC Applications, Refrigeration, and HVAC Systems and Equipment should not contain **derivations** of equations or discussions of the research process behind the data. The cited references should include this information if needed. Derivations for equations in Fundamentals should be concise. References to other publications, particularly ASHRAE guidelines and other ASHRAE sources, should be used when possible.
- Check for **clarity** and **conciseness**. Wordiness makes a chapter harder to read and understand. Simple figures can often replace or reduce lengthy discussions.
- Eliminate **sales promotion, market data, and unnecessary historical background** from the text. Delete references to this material from the reference list.
- Refer to material in other chapters when possible to **avoid duplication**. Check Fundamentals chapters for basic information. If the information is not complete, coordinate with its responsible TC/TG/TRG to develop the existing information instead of duplicating it in a chapter. Check older versions of the chapter for deleted material that is again relevant. [TCs' designated revisers can obtain PDFs of previous versions of their chapters by contacting Handbook editorial staff.](#)
- Identify **codes** and **standards** related to the chapter; however, the Handbook is not a code. Information that disagrees with existing codes and standards should be noted.
- Include **industry standard details** and **schedules** for different equipment types, if appropriate.

### 6.5.1 Making chapters more practical

An oft-heard criticism of the Handbook is that it has drifted toward theoretical content and away from practical descriptions, methods, and data that are of more direct use to design engineers. In many cases, rules of thumb and simplified procedures are still relevant and should be reintroduced. New and revised simplified procedures should be encouraged as well. These practical methods will not cover all situations or geographic locations, so a challenge to chapter authors or revisers is to help readers identify when these methods could be appropriately used.

To make a chapter more practical for the majority of Handbook users—HVAC designers—ensure that the following objectives are met when revising a chapter:

- The user will have access to industry-recognized rules of thumb for the topic.
- The user will have access to simpler design methods.
- The user will have references to other publications and standards.
- The user will have access to practical examples, tables, diagrams, and other summaries helpful to designers working on similar problems.
- The user will be introduced to the topic in a logical progression for instruction. This may require coordination between multiple TCs and Handbook chapters.

## **6.5.2 Research Results**

Most of a TC's research efforts should ultimately yield methods, data, and conclusions useful to the membership, particularly to practicing engineers. As research projects are proposed and completed, pertinent results should be added to relevant Handbook sections.

## **6.5.3 Extraordinary Events**

Each TC should consider the recommendations in the Report of the Presidential Ad Hoc Committee for Building Health and Safety under Extraordinary Incidents as approved by the Board of Directors, and any subsequent revisions, and include appropriate content in the TC's Handbook chapters.

## **6.5.4 Commissioning, Operation, Maintenance, and Sustainability**

Where applicable, Handbook chapters should contain relevant information on commissioning, operation, maintenance, and sustainability. Each TC is responsible for coordinating this information with the TCs that prepare the main chapters on these topics.

## **6.6 Reference Policy**

The purpose of references is to acknowledge the work of others and to allow readers to find further information. Follow the referencing style presented in Section 7.5 of this Guide.

Authors and revisers should review all references in the chapters they prepare or revise. References should be relevant, substantive, current (or of significant historical importance), and published and readily available in the literature. Because web pages and other electronic communications often change, the underlying publications should be cited instead. But when a web page, or other document that is not published or readily available, is referenced, a legal copy must be submitted with the chapter manuscript, and will be kept on file by the editor.

## **6.7 Redundant Publication**

Do not reuse significant portions of previously published non-Handbook text verbatim, even if you are the original author. Instead, isolate the points that are most relevant to the specific chapter or section topic, rewrite and condense them to meet the readers' needs, and cite the original source for those who want more details. Small sections (e.g., up to five or six sentences) of other works can be quoted directly, but must be clearly indicated as quotations. Even if the source document is public domain, extract and adapt the relevant information and then cite the original source. This policy not only helps ASHRAE avoid unintentional copyright infringement, but also helps preserve the value of both the original sources and the Handbook content, by ensuring that each publication presents unique information and is not merely repeating exactly what another publication said. For questions about quotations or redundant publication, please contact Handbook staff.

## **7.0 PREPARATION OF MANUSCRIPTS**

A Handbook chapter's lead reviser can obtain from the editor the electronic word processing file of the chapter(s) for which a TC has responsibility. However, a markup of a photocopy or electronic file is also acceptable to indicate only minor revisions. Electronic files are required for major revisions. When making electronic revisions, be sure to activate the "track changes" feature of the word processing software so that all changes are shown explicitly for the reviewers, TC, liaison, and editor.

In text, values in the alternate set of units should appear in parentheses after the primary units as in the official Word base files. Complete tables, equations, or figures in the alternate units can simply follow the equivalent primary units item. If you prefer, you can submit separate I-P and SI manuscripts. Round equivalents in the alternate units so that they imply the same accuracy as the primary units.

After the TC approval vote, complete and submit the chapter approval checklist found in Appendix D. Send the checklist, revised manuscript files, and supporting materials to the TC's Handbook Committee liaison, who will review and forward them to the editor.

## 7.1 Preparing Minor Revisions on Paper

Minor revisions on paper can be prepared by indicating corrections and minor changes in the margins of the photocopied chapter. Indicate changes by crossing out the original text and writing the new material in the margin or by marking the location in the manuscript for separately attached text inserts using labels such as "Insert A", "Insert B", etc. Provide electronic files for lengthy text inserts.

## 7.2 Preparing Major Revisions or New Chapters Electronically

If the chapter is new or extensively rewritten, or paperless submission preferred, submit electronic files, with revisions shown using the "track changes" feature. The manuscript should be in a single column with no elaborate formatting or special embedded codes; editorial staff will format the text.

- TC Handbook subcommittee chairs or lead revisers may obtain electronic files for most current Handbook chapters from the Handbook editor or by downloading the official base file from Handbook Central on the ASHRAE web site. Chapters are available in MS Word.
- Submit an electronic file, preferably MS Word (.doc), if the chapter is new or extensively rewritten.

## 7.3 Figures and Tables

- **Black-and-white line drawings** clearly labeled with typical construction or operating features are preferred. Photographs and artwork with shading or color may not reproduce well; however, color figures may be submitted as extra features for ASHRAE Handbook Online.
- **Figure titles (captions)** should be as short as possible while identifying figure content. Lengthier descriptions should be included in text discussion, not in captions.
- Use as **few drawing lines as needed** for clear communication to the viewer of the figure. For example, grids are needed only on charts intended for accurate reading of numerical values. Simplifying graphics to highlight only the important, relevant points helps readers grasp the essentials more quickly.
- **Commercialism.** Do not use illustrations that show a manufacturer-specific external appearance of a piece of equipment. Give credit to a manufacturer only in the rare case where no comparable illustration is available and redrawing the figure is not possible, or for historical purposes only. Refer such cases to the Handbook Committee Liaison for further guidance.
- **Acceptable graphics formats** include WMF, TIF, XLS, DXF, PCX, EPS, BMP, and JPEG. Submit a separate electronic file for each figure. Minimum resolution is 600 dpi. Check graphics before submitting, to ensure that labels are clearly legible and not blurry. Do not embed graphics in final word processing files, but instead indicate in the text after first mention where each graphic file should be inserted via "<insert Figure 1>", for example. Include lists of figure and table numbers and captions. For XLS files, submit source sheets containing data from which charts were generated.

- **Tables** should be either MS Word tables, Excel spreadsheets, or tab-delimited text. Do not submit tables as images.
- Submit tables and figures in **both I-P and SI** versions.
- Figures reprinted from other publications must have **permission** to reprint renewed with each Handbook edition. Please see section 7.10 for more information on permissions, and consult with editorial staff if you have questions.

## 7.4 Measurement Units

- Provide both I-P and SI units for new material.
- Consult ASHRAE pamphlet *SI for HVAC&R* for ASHRAE’s policy on units and the use of SI.
- Alternate units should be rounded so that they imply the same accuracy as the primary units.

## 7.5 References and Bibliography

The ASHRAE Handbook follows a style adapted from that in *The Chicago Manual of Style* for the reference list entries shown at the end of each chapter:

First author’s last name, initials, all additional authors. Date. Article or Book Title (sentence style, i.e., first word capitalized, rest of title lower case). If conference proceedings: proceedings title, volume number, pages, conference name, location, dates, and sponsor/publisher. If journal: journal title, volume number, issue number, pages, publisher, and city. If book: publisher and city.

In the body of the text, use the “author-date” method of citation, i.e. (Einstein 1932) for one author, (Smith and Brown 2001) for two, and (Columbus et al. 1492) for three or more authors.

### 7.5.1 Reference List

Arrange references to specific articles, books, or other works cited in the chapter at its end in alphabetical order by the first or only author’s last name. List all authors in an entry; do not use et al. as is done within the main text for three or more authors.

### 7.5.2 Bibliography

This optional section after the Reference section lists additional uncited sources of information. Present each item in the same format as references. Delete entries that are outdated.

## 7.6 Definitions, Abbreviations, and Symbols

Use definitions that agree with the latest ASHRAE and ANSI standards. [ASHRAE Terminology-of HVAC&R: a free online glossary maintained by TC 1.6. Terminology.](#) defines many terms common to heating, ventilation, air-conditioning, and refrigeration.

Abbreviations and symbols should correspond to those in the Fundamentals chapter on Abbreviations and Symbols. Use one-letter symbols, with subscripts if necessary, in preference to two- or three-letter symbols. Each symbol should have only one definition in a chapter. Try to use the same symbols as in other chapters on related subjects. Define a symbol once after its first use in an equation. If the chapter has more than ten symbols, make a list of symbols and their definitions at the end of the chapter.

## 7.7 Examples

Include examples for clarification where appropriate. Example problems must be expressed in appropriate rational units, not simply converted values, for both the I-P and SI editions. Check all calculations, even if they have been repeated from a previous volume.

## 7.8 Indexing and Linking

Identify important words and topics that should be listed in the Index. Insert in the text any appropriate cross-references to other chapters; these will be hyperlinks in the CD and online editions.

## 7.9 Authority for Data

Give the authority (i.e., cite a reference) for all tabulated data, charts, and recommended numerical design values to enable interested readers to validate the information. For example, cite the underlying research paper published in *ASHRAE Transactions* or elsewhere.

## 7.10 New and Reused Copyrighted Material

It is the revising TC/TG/TRG's responsibility to obtain written permission in each revision cycle to use material copyrighted by a publisher other than ASHRAE. A copy of such written permission must be submitted with the manuscript and applies to both *new and reused* material copyrighted by others. Permission from the publisher is required if the chapter content includes a *reprint* of a figure or table, or quoted text of more than a few lines. Equations and paraphrased key discussion points, properly attributed, do not require permission. Permission is also not needed to use reformatted partial data from tables.

## 7.11 Recommend Publication and Distribution

A recorded vote by the entire TC is required to approve publication of the completed chapter manuscript and any electronic enhancements. The TC must have a recorded vote at a meeting where a quorum is present, or a letter ballot, and the results of the vote must appear in the TC's meeting minutes. After TC approval, send the completed chapter approval checklist (which lists the resulting vote) and files for the manuscript and all figures to your Handbook Committee liaison with cc: to the Handbook editor. The liaison will review the final, approved manuscript and files and officially submit them to the editor.

## 7.12 Contributors

The chapter's lead author/reviser is responsible for submitting a report that includes the name, title, company affiliation, and address of each reviser who made a significant written contribution to the text of the current revision. The editor typically includes no more than three authors/revisers per chapter in the volume's contributing authors list unless requested by the TC. Individuals who reviewed the chapter but did not contribute new content should not be listed as contributors.

## 7.13 Proofs

Electronic proofs of I-P and SI chapters will be sent to the author or lead reviser shown on the submitted checklist for final review. Please review proofs quickly yet carefully, and then return comments promptly to the editor. The editor will confer with the author or lead reviser and Handbook Committee liaison regarding any major editorial changes that may be required in the original manuscript.

## 7.14 What to Include in Submission Package

- Completed chapter approval checklist (see Appendix D of this guide) with all items it requires.
- Electronic files of all text, tables, and graphics. File names of graphics should be clearly identified for their intended location in the manuscript.
- Electronic files may be submitted as e-mail attachments rather than through the mail on media. Use standard file extensions for electronic text and graphics (e.g., .doc, .txt, .jpg).

## 8.0 OUTLINE FOR FUNDAMENTALS CHAPTERS

Chapters in Fundamentals provide concise descriptions of basic engineering principles and data in the form of text, tables, charts, and graphs as used in HVAC&R. The following outline provides guidance to the author/reviser so that chapters whose primary purpose is to present basic information are consistent and easy to follow. Sections that do not apply to a chapter can be omitted.

### Title

Brief, accurate, and informative.

### Contents

Show the major headings in the chapter.

### Introduction

The introduction is a concise statement of the purpose for the chapter. It includes the topic(s) covered, why they are included, and how the information in the chapter relates to HVAC&R. It should not, however, simply restate the table of contents.

### Definition/Description

Include a brief statement of the intended use for the information in this chapter.

### Body/Discussion

The body of the chapter contains some or all of the following items as needed. *Be clear—ask someone who is not an expert in the subject area to review the revised chapter for clarity.*

### Background and Derivations.

- Be concise. Assume that the reader has an engineering degree or equivalent experience.
- Do not repeat the obvious.
- Lengthy derivations should be avoided; it is better to summarize and refer to other authority so that readability is enhanced.
- Use standard symbols, definitions, and units.
- References to proprietary or specific products are not appropriate.

**Calculations.** Are calculations required to use the information properly? Use references to other chapters or special publications when appropriate.

**Illustrations/Examples.** Examples help clarify calculations unique to this information. References to other chapters with notes pointing out the differences may make a better and more complete presentation.

### **Tables/Graphs.**

- Who will use the table or graph? Why? Is this information available electronically?
- Be sure the information is complete. If not, can more information be found elsewhere? If so, give a reference.
- Is there too much detail or not enough to use the table? Should it be reformatted for better usability?
- Is there too much precision used for the data's accuracy? Could the size of the table be reduced without missing anything important?
- Be sure to give authority for figures and tables as well as any qualifying footnotes and other limitations. Just describing them in the text may not be adequate.

### **References and Bibliography**

Arrange references alphabetically by the first or only author's last name. Be sure all sources cited in the text are listed in the References section and are available in the general literature. References not readily available or on file may be deleted from the list by the editorial staff.

## **9.0 OUTLINE FOR CHAPTERS IN OTHER VOLUMES**

Chapters in HVAC Applications and some chapters in Refrigeration provide information that helps the design engineer use the equipment and systems described in other volumes. These chapters describe considerations when designing for a specific application. The information helps the designer select and use equipment properly. It does not describe how to design components or equipment.

Systems chapters cover common HVAC&R systems and illustrate features and differences. Equipment chapters cover arrangements or assemblies to help system designers select and operate equipment. Basic design procedures should be referenced to other chapters. Refrigeration chapters often cover both systems and equipment.

This outline provides guidance to the author/reviser so that chapters whose primary purpose is to present basic information are consistent and easy to follow. Topics that do not apply to a chapter can be omitted.

### **Title**

Brief, accurate, and informative.

### **Contents**

Show the major headings in the chapter.

### **Introduction**

The introduction is a concise statement of the purpose for the chapter. It includes the topic(s) covered, why they are included, and how the information in the chapter relates to HVAC&R. It should not, however, simply restate the table of contents.

### **Definition/Description**

A brief statement of what the application being covered includes and excludes.

### **Body/Discussion**

The body of the chapter contains some or all of the following items as needed. *Be clear—ask someone who is not an expert in the subject area to review the revised chapter for clarity.*

**Component Parts.** Define specific parts. If applicable, include a matrix comparing important characteristics of different types of applications, components, equipment, or systems. Give enough detail so that similar types are distinguishable. Refer to material in other chapters to avoid duplication of lengthy discussions.

**Typical Applications and Restrictions.** For what or where is the application, system, or equipment used? Give examples. Make the reader aware of restrictions on the use of the application. Warn of common equipment/system misuse so that others do not repeat mistakes.

**Advantages/Disadvantages.**

**Operation/Control Considerations.**

**Selection Considerations.**

**Cost Considerations.**

- Initial
- Energy
- Operating/maintenance
- Disposal
- Special local considerations

**Installation Considerations.** Include key installation tasks that the contractor must complete as well as any documentation necessary to ensure that the equipment or system functions as the designer intends. Identify common pitfalls, their consequences, and how to avoid them.

**Operating Considerations and Characteristics.** Where applicable, include commissioning, operation, maintenance, and documentation guidance specific to the equipment described. Each TC that prepares a chapter is responsible for coordinating its specific information with the TCs that prepare the general information on these topics. What are any special characteristics? Is special training necessary for proper operation? Things to consider include sound, vibration, control, power requirements, safety, and access for inspection, testing, and maintenance.

**Calculations.** Include calculations required to properly select and apply equipment to this application. Use references to other chapters when appropriate.

**Special Situations.** Describe factors unique to the application being described in this chapter.

**Illustrations/Examples.** Consider including examples to help clarify the application. References to other chapters with notes pointing out the differences may make a better and more complete presentation.

## **References and Bibliography**

Arrange references alphabetically by the first or only author's last name. Be sure all sources cited in the text are listed in the References section and are available in the general literature. References not readily available or on file may be deleted from the list by the editorial staff.

## **10.0 ELECTRONIC ENHANCEMENTS FOR ASHRAE HANDBOOK ONLINE+**

Although the latest print volume of the Handbook is the official version, the four-volume ASHRAE Handbook Online+ is designed to provide the most complete and useful electronic HVAC&R reference available. It includes (1) all Handbook chapters, with the latest updates and corrections, in searchable electronic format, and (2) interactive and supplemental tools and

features developed or obtained by ASHRAE Technical Committees. See the [Handbook Central](#) page of the ASHRAE web site ([www.ashrae.org](http://www.ashrae.org)) for the current guidelines on preparing features for ASHRAE Handbook Online+. Tools and features should be submitted by TCs to their Handbook Committee Liaison, who will forward them to Handbook staff to edit and prepare as necessary for online publication.

## APPENDIX A

# Chapter Revision Process Timeline for TC Handbook Subcommittees

*(for use in setting up a project schedule)*

**DATE:** *(insert date and time)*

**SESSION:** *(insert chapter name)*  
Chapter ## (TC-##/TG/TRG)

**PREPARED BY:** *(insert name)*, Handbook Subcommittee Chair

**DISTRIBUTION:** *(insert TC/TG/TRG ### chair name)*  
*(insert chapter reviser names)*  
*(insert TC/TG/TRG reviewer names)*  
*(insert Handbook liaison name)*

Example for 2015 HVAC Applications volume:

### Year 1 (volume published):

#### July 2011–January 2012

- Appoint TC subcommittee chair July 1
- Appoint chapter reviser(s) July 1
- Set semiannual reviser meeting dates and time July 1
- Review just-published chapter January 31
- Issue June meeting minutes August 15

#### February–June 2012

- Complete “just published” review comments checklist (Attachment C) February 1
- Lead reviser starts chapter recommendations (using official base Word file of just-published chapter) February–June 2012
- Issue January meeting minutes March 15

### Year 2

#### July 2012–January 2013

- Lead reviser provides chapter revision status July 1
- Lead reviser starts chapter recommendations July 1
- TC subcommittee completes brainstorm session (Topics to consider: latest technology, ASHRAE Research, library books, etc.) July 1
- Lead reviser continues chapter revisions July 2012–January 2013
- Issue June meeting minutes August 15

#### February–June 2013

- Lead reviser provides chapter revision status February 1
- Lead reviser submits proposed chapter to subcommittee February 1
- TC subcommittee reviews and comments on revisions February–June 2013
- Lead reviser continues with cross references February–June 2013
- Issue January meeting minutes March 15

## Year 3

### July 2013–January 2014

- Lead reviser provides chapter revision status July 1
- TC subcommittee submits chapter comments July 1
- Lead reviser continues chapter revisions July 2013–January 2014
- TC votes on proposed chapter revisions  
(if due date is March–June) January 31
- Issue June meeting minutes August 15

### February–June 2014

- Lead reviser provides chapter revision status February 1
- TC subcommittee submits chapter comments February 1
- Subcommittee reviews and comments on revisions February 1
- Lead reviser completes Chapter Approval Checklist  
(Attachment D) (if due date is March–June) February 1
- Lead reviser sends Word file of revised chapter  
to Handbook Liaison (if due date is March–June) March–June 2014
- ASHRAE staff edits/lays out chapter  
(if due date is March–June) March–June 2014
- Issue January meeting minutes March 15

## Year 4

### July 2014–January 2015

- TC votes on proposed chapter revisions  
(if due date is July) January–June 2014
- Lead reviser completes Chapter Approval Checklist  
(Attachment D) (if due date is July) July 2014
- Chapter revision document sent to Handbook Liaison  
(if due date is July) July 2014
- ASHRAE staff edits/lays out chapter  
(if due date is July) July–January 2015
- ASHRAE staff sends PDF proof of chapter to lead reviser  
for final review and comments July–January 2015
- Lead reviser approves/comments on proof to ASHRAE July–January 2015
- ALL Handbook chapters are due for submission to  
ASHRAE HQ July 31, 2014
- Issue June meeting minutes (if due date is July) August 15

### February–June 2015

- ASHRAE staff edits/lays out chapter February–March 2015
- ASHRAE staff sends PDF proof of chapter to lead reviser  
for final review and comments February–March 2015
- Lead reviser approves/comments on proof to ASHRAE February–March 2015
- ALL Handbook chapters sent to printer April 1, 2015
- Revised Handbook chapter published June 1, 2015

## 2015 Handbook Revision Schedule

		2011			2012			2013			2014			2015		
		Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	
Review	Current HB received (June 1)		June 1													
	TC selects HB subcom, chair															
	Review current HB for changes															
Revise	Outline revisions															
	Revise chapter(s)															
Approve	Revised chap. to TC for review															
	TC approves chapter															
	Chapter to HB Com liaison															
Edit & Produce	HQ sends proof to TC contact															
	HB sent to printer (April 15)															
	HB mailed (May 15)															

## APPENDIX B

### Handbook Chapter Revision Agenda and Meeting Minutes Template (to be completed semiannually)

#### TC Handbook Subcommittee Chapter Revision Process

**DATE:** (insert date and time)

**SESSION:** (insert chapter name)  
Chapter ## (TC/TG/TRG ##)

**PREPARED BY:** (insert name), Handbook Subcommittee Chair

**DISTRIBUTION:** (insert TC/TG/TRG ## chair name)  
(insert chapter reviser names)  
(insert TC/TG/TRG reviewer names)  
(insert Handbook liaison name)

#### AGENDA and POINTS of DISCUSSION:

- **Approval of Past Meeting Minutes**  
Comments:
- **Selection of Reviewers/Reviser(s) for Chapter(s) Revision**
  - **Reviewer/Reviser Selections:** *It is suggested that reviewers/revisers be selected based on the following experience and/or background:*
    - Design Engineer: (insert chapter reviewer/reviser name)
    - Operating Engineer: (insert chapter reviewer/reviser name)
    - Trade Contractor: (insert chapter reviewer/reviser name)
    - Other: (insert chapter reviewer/reviser name)
- **Review the 4-Year Chapter Revision Timeline**  
Comments:
- **Lead Reviser Chapter Revision Status**
  - Chapter reviewer checklist status  
Comments:
  - Outline of chapter addressed per Authors and Revisers Guide  
Comments:
- **Chapter Reviewer Checklist Discussed and Updated**  
Comments:
- **New Business:**  
Comment:
- **Milestones To Reach Before Next meeting:**  
Comment:
- **Other Comments and Questions:**

## APPENDIX C

### CHAPTER REVIEW CHECKLIST

**DATE:** *(insert date and time)*

**SESSION:** *(insert chapter name)*  
Chapter ## (TC-##/TG/TRG)

**PREPARED BY:** *(insert name)*, Handbook Subcommittee Chair

**DISTRIBUTION:** *(insert TC/TG/TRG ### chair name)*  
*(insert chapter reviser names)*  
*(insert TC/TG/TRG reviewer names)*  
*(insert Handbook liaison name)*

#### Review items:

1. Check for errors that should be noted in the errata published with the next volume and on the ASHRAE web site ([www.ashrae.org](http://www.ashrae.org)), and corrected in the next edition. Completed [ ]
2. Recommend whether the chapter should be discontinued, what revisions should be made, or if no changes are necessary. Completed [ ]
3. Does the chapter meet the needs of the design engineer new to the field? Completed [ ]
4. Is the chapter written so that a person who is technically competent but not an expert in this particular area can understand it? Completed [ ]
5. Is the title brief, accurate, and informative? Completed [ ]
6. Is there any important, relevant information that has not been included? Completed [ ]
7. Is there information in the chapter that should not be there? Completed [ ]
8. Is there information in the chapter that is already in the Handbook somewhere else? Where? Is the content coordinated with that presented by others? Completed [ ]
9. What recently completed research should be included in the upcoming chapter revision? Completed [ ]
10. Is anybody else doing research that should be monitored? Completed [ ]
11. Are there data that should be deleted? Completed [ ]
12. If data are deleted, should they be available for use other than via old volumes? If so, how? Completed [ ]
13. Is all information properly referenced? Should other important references and bibliography material be included? What are they? Completed [ ]
14. Are there derivations that should be deleted or simplified? Completed [ ]
15. Are there examples that should be deleted, simplified, or clarified? Completed [ ]
16. Has all commercialism and bias been removed? All relevant technologies presented accurately? Completed [ ]
17. What is the best part of the chapter? Completed [ ]
18. What is the worst part of the chapter? Completed [ ]
19. Do references to other chapters or volumes need to be added? Completed [ ]
20. Is there related information in other ASHRAE publications that should be referenced (search in ASHRAE Bookstore)? Completed [ ]
21. What is changing in the industry that could affect this chapter? Completed [ ]
22. Are technologies emerging that should be mentioned or described? Completed [ ]
23. What are new topics, issues, etc. that should be considered? Completed [ ]
24. Does the chapter focus first on the designer followed by operations and then construction? Completed [ ]
25. Are the following topics covered (as applicable)?:
  - a. Benchmarking Completed [ ]
  - b. Budgeting Completed [ ]
  - c. Commissioning Completed [ ]

d. Constructability	Completed [ ]
e. Operation and maintenance	Completed [ ]
f. Renovations	Completed [ ]
g. Replacement	Completed [ ]
h. Retrocommissioning	Completed [ ]
i. Rules-of-thumb	Completed [ ]
j. Security	Completed [ ]
k. Sustainability	Completed [ ]
l. Value engineering	Completed [ ]

## APPENDIX D

[Note: interactive electronic version of this form is available in [Handbook Central](#) on the ASHRAE web-site.]

# ASHRAE<sup>®</sup> HANDBOOK CHAPTER APPROVAL CHECKLIST

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Handbook Volume \_\_\_\_\_ Intended Year \_\_\_\_\_  
Chapter Title \_\_\_\_\_  
Responsible TC \_\_\_\_\_ TC Chair \_\_\_\_\_  
TC Handbook Subcommittee Chair \_\_\_\_\_  
Lead Author/Reviser for chapter \_\_\_\_\_  
Handbook Liaison \_\_\_\_\_

1. **Obtain TC approval.** Date: \_\_\_\_\_  
# of voting members \_\_\_\_\_ # Approving \_\_\_\_\_ Rejecting \_\_\_\_\_ Abstaining \_\_\_\_\_  
Vote taken:  At meeting  By letter ballot

2. **Reviser or author who will review the proof pages:**  
Name \_\_\_\_\_  
Affil. \_\_\_\_\_  
Addr. \_\_\_\_\_  
Phone \_\_\_\_\_ Fax \_\_\_\_\_ e-mail \_\_\_\_\_

3. **Editing.** Do not retype the chapter unless changes are extensive. See Section 7.0 of the *Authors and Revisers Guide* for instructions on preparing manuscripts.

4. **References.** Submit copies/permissions for any references that are not available in the literature as required in Section 6.6 of the *Authors and Revisers Guide*. Check that references are correctly cited and updated as needed.

5. **Index.** Mark or list the words or topics that should be included in the Index.  
\_\_\_\_\_

6. **Search terms.** Mark or list the words or topics that should be included in search terms (e.g., bookstore searches, Google).  
\_\_\_\_\_

7. **Summary.** Submit a brief summary of changes made and new material added to chapter.  
\_\_\_\_\_

8. **Contributors.** Attach list of names, affiliations, and mailing addresses of others who contributed *significantly* to this revision of the chapter. List names and affiliations as they should appear on the Contributors page of the printed book, and notify Handbook staff of any changes so that personalized Handbooks can be delivered correctly. We prefer to credit no more than three revisers per chapter. Do not include names of those who only reviewed the chapter or made minor edits.

Contributor #1 \_\_\_\_\_  
Affil. \_\_\_\_\_  
Address \_\_\_\_\_

Contributor # 2 \_\_\_\_\_  
Affil. \_\_\_\_\_  
Address \_\_\_\_\_

Contributor #3 \_\_\_\_\_  
Affil. \_\_\_\_\_  
Address \_\_\_\_\_

- 9. **Figures.** New and redrawn figures should be original artwork, in an acceptable electronic graphics format (see the *Authors and Revisers Guide*, Section 7.3).
- 10. **Permissions.** Include copies of written permission to use material from publishers other than ASHRAE. Permission must be obtained in each publication cycle for both new and reused copyrighted material. Please contact Handbook staff if you need guidance with this step.
- 11. **ASHRAE Research.** Relevant ASHRAE research results have been incorporated as appropriate in the submitted chapter.
- 12. **Units.** New material must be provided in both I-P and SI units, either in the same file (parenthetical dual-units format) or in separate files.
- 13. **Comments.** Confirm that all comments on a specific Handbook chapter have been addressed by the TC responsible for the chapter.
- 14. **Submittal.** Submit this completed checklist, items 4 through 9, and electronic files (.doc or .docx) of the TC-approved manuscript to the Handbook Committee liaison listed on the TC roster [with copies to the Handbook Editor \(mowen@ashrae.org\) and Managing Editor \(hkennedy@ashrae.org\)](#).

***Thank you for your help in improving our Handbook!***

**ASHRAE HANDBOOK - INTERNATIONAL CONTENT****Att. D****INTERNATIONAL SUBCOMMITTEE**Sunday 28<sup>th</sup> June 2015**1 What does international membership want/need ?**

ASHRAE has been responding to a growing demand from international members across the world for technology transfer. There is a clear demand for ASHRAE technology. For many that means what North America uses for everyday engineering.

Developing countries are particularly in need of guidance as they start to build out from a standing start (compared to developed countries).

For others it means joining an organisation that has a proven track record in delivering useful data to assist with design and construction of engineering systems in buildings in the belief that ASHRAE can be a vehicle for developing information (publications) which can be used across the world.

There is no one else doing this at the moment – and probably no other organisation capable of doing this.

ASHRAE are now recognised as the leading authority on HVAC and R technology and this supports other areas such as sustainability , energy in buildings, environmental design and related topics. At the moment ASHRAE publications have a distinct North American flavour. However much of the content is relevant at a technical level anywhere in the world.

**2 How does ASHRAE respond to this demand**

This has already started by sharing – to ASHRAE members worldwide - what are ASHRAE's current series of technical documents - possibly written for North America use , but not necessarily, to increasingly documents written with other climates and countries in mind.

**3 What does ASHRAE need to do next ?**

This growing interest in having ASHRAE technology across the world has resulted in ASHRAE starting to ask what is this demand and how big is it or could it be, and more to the point, what is actually needed.

**4 ASHRAE technology already satisfies some of this demand**

One point which favours ASHRAE is the wide range of climate regions in the handbooks, guides, standards and special pubs. A new climate region Zero is being introduced for very hot and dry middle east countries, using Riyadh.

It appears that climate regions can be used to cover most places around the world. This is very helpful to countries that have little climate data available.

ASHRAE weather data files are already used in many simulation programmes such as IES.

ASHRAE also covers basic science and engineering calculations extremely well and better than most others, for example load calcs and psychometrics etc etc. This is used across the world by all engineers.

5 What else is needed and where should ASHRAE prioritise ?

There are moves within ASHRAE to clarify these matters....

### **RAL – Region at large.**

Currently organising a survey of all international members in RAL. This will include questions about use of ASHRAE Publications. RAL meets Monday at 2.15pm and I will attend to find out what results they have from this work.

Issues such as

- Do you use publications
- Which ones
- Do you need any others
- Would translations be useful

### **PLC – Planning Committee**

In the process of undertaking research and surveys into the potential for growing international membership. Questions will include use of ASHRAE publications, what publications are needed, how much they use, or could use ASHRAE publications.

This initiative follows the new strategic plan.

This is a major initiative and is being directed by the Board.

### **Developing Economies Presidential Ad Hoc Committee**

ASHRAE is creating a new program devoted to the Developing Economies (DE) aimed at:

- Contributing to the clean and sustainable holistic development of the integrated buildings construction/HVAC industry, preserving natural resources including water, richness of the diversity of the territories, protecting the environment and suppressing pollution, and helping to raise the level of health and well-being, worldwide. The Handbooks can help achieve these objectives.

### **AASA – ASHRAE Associate Society Alliance**

The AASA are keen to see ASHRAE lead initiatives world wide. At the AASA meeting on 26 January 2015, ASHRAE and UNEP agreed to join forces to help develop technical guidance for phase out of HCFCs and to help the UNEP Ozone programme. This will be carried out in conjunction with AASA member countries.

## **Cold Climate Design Guide**

Working with REHVA and SCANVAC, ASHRAE have produced a new design guide for cold climates. This will be available at Atlanta and also at the next Cold Climate conference in China in October 2015.

A similar initiative with a new Hot Climate Design guide is under way and will involve ASHRAE chapters across the Middle East and elsewhere.

### 6 Other methods and initiatives

ASHRAE are now running conferences and courses across the world in selected places. These are proving successful at generating data for publications which can be used elsewhere.

### 7 Conclusions

Handbook Committee needs to engage with and be aware of the research and other initiatives mentioned above. Handbook should consider ways of assisting authors to produce suitable material for inclusion in the Handbooks to help this process develop effectively.

Handbook should monitor and be willing to reference any other new publications which are produced as part of the above initiatives. The Handbooks should always be the central source of ASHRAE material and at the very least direct members to other ASHRAE Publications wherever relevant.

#### **Report by International sub committee**

**Frank Mills, Chair**

**Aguilo**

**Enck**

**Hernandez**

**Paranjpey**

28<sup>th</sup> June 2015

**Handbook Committee**  
MBOs for Society Year: 2014-2015  
Chair: Dan Dettmers                      Date: 30 June 2015

Objective	SP Init.	Compl. Date	Fiscal Impact	Responsible Party	Status	Comment
1. Improve process control of Handbook chapter review and revision by providing enhanced guidelines for authors and revisers.	2A	6/15	None	Functional Subcom	COMPLETE	Develop additional tools and incorporate in ARG. <i>Measure:</i> compliance with procedures; reported by liaisons, staff.
2. Review TC workload distribution with TAC. Verify TCs have sufficient membership to update cognizant chapters in timely manner.	2A, 2B	6/15	None	Chair	In progress; staff provided revision history	Verify current TC chapter assignments are still valid; <i>Measure:</i> TCs regularly updating content; reported by liaisons, staff.
3. Establish subcommittee or other formal tracking system to identify chapters delinquent for updates.	2A, 2B	6/15	None	Functional Subcom; Chair; staff	COMPLETE	Action to support identifying chapters and TCs needing help. <i>Measure:</i> subcommittee or system established by chair.
4. Review relevance of Handbook Committee subcommittee structure.	2A	6/15	None	Functional Subcom; Chair	COMPLETE	Evaluate applicability and streamline structure to make better use of volunteer time. <i>Measure:</i> member reports.
5. Create and distribute list of resources for TCs needing help to review, update chapters.	2A	6/15	None	ExCom; Functional Subcom	In progress	Action to support TCs needing help. <i>Measure:</i> resources provided to TCs.
6. Review methods for TCs' use in managing revision process.	2A	6/15	None	Elec. Media Subcom	COMPLETE	For example, evaluate using GoogleDocs or other software/resources. <i>Measure:</i> recommendation made by subcom.
<b>Additional Recommendations for Strategic Planning:</b> None at this time						

**SP Init.** = Strategic Plan 2014 Initiative addressed by objective

DJD: mso 30 June 2015

## **Proposal for a New ASHRAE Handbook Chapter on Natatoriums: Indoor Swimming Pool Facilities**

**Submitted by: Frank Mills, Handbook committee Chair TC 9.8 and Liaison for Applications Handbook**

Lead author - Ralph Kittler, Reviser for Chapter 4 Applications (T.C. 9.8) and Handbook Subcommittee Chair, TC 8.10

**Chapter Title:** Natatoriums: Indoor Swimming Pool Facilities

**Handbook Volume:** Applications

**Cognizant TC:** TC 9.8, Large buildings

**Co sponsoring TC :** TC 8.10, Mechanical Dehumidification Equipment and Heat Pipes

**Potential Author(s):** Ralph Kittler, Harry Milliken, Reinhold Kittler, Keith Coursin, Tim Sechrist.

**Potential Reviewers:**, Reinhold Kittler, Titu Doctor, Ken Cooper. Frank Mills,

### **Justification for New Chapter.**

Much like Ice Rinks, Indoor Pools (aka Natatoriums) are a unique application and should have their own chapter. Currently a designer needs to know to read Chapter 4 of Applications, Chapter 24 of Systems and Equipment and also Chapters 4 & 27 of the Humidity Control Design Guide to get a decent picture of what is required to properly design an indoor pool's HVAC system and understand what could happen to the building envelope if proper measures are not taken.

Currently there is a small section within Chapter 4, "Places of Assembly" in the Applications Handbook. This is not an appropriate location for pool design information. This chapter has been used to accommodate a range of building types which do not fit elsewhere.

Most swimming pools and related facilities such as Spas, splash pools, hydrotherapy pools and the like are in hotels, fitness clubs, residential, YMCAs and institutional pools without spectator areas. These pools pose significant problems to the buildings which host them and must receive special attention in design, construction and operation. There are also special swimming hall buildings which host large pools with spectator areas and a range of pool types including diving pools, racing pools, training pools and even semi-deep pools for synchronized swimming complete with underwater music speakers.

Pools use a lot of energy. They must have ventilation systems which operate 24/7 to protect the building structure and fabric.

The fabric construction must be carefully designed to function in a humid environment. Indoor Pools are often built without a proper vapor retarder system because the Enclosure Designer is under the misconception that the Mechanical System Designer will take care of any and all condensation and moisture issues.

Some international pools installations have had headline grabbing catastrophic enclosure roof failures in the past few years. This is a strong argument for a single comprehensive Indoor Pool Design Guide. Many public pools are being closed because the local Council cannot afford the high energy and other running costs. This is a sad loss of amenity for the public.

ASHRAE would be much better served if all this was consolidated in a single chapter in the Handbooks.

The comprehensive guideline should spell out the obligations and limitations of the designer of:

- Pool enclosures.
- Mechanical Systems, including IAQ, air distribution and Dehumidification Equipment Performance requirements.
- Energy efficient design and energy recycling
- Safe and efficient operational HVAC routines

# Proposed Outline

## A. POOL ENCLOSURE.

- 1) Design Intent.
- 2) Thermal Requirements.
- 3) Definition of a vapor retarder system.
- 4) Function of wall and roof venting features.
- 5) Where to use thermal breaks.
- 6) Importance of dew point temperature with respect to vapor retarder location in walls and roof.
- 7) How to deal with building elements which have a low R-value.
- 8) Vapor Migration.
  - a. Effect of air pressure.

## B. ENERGY CONSIDERATIONS

- 1) Operating conditions
- 2) Winter RH levels
- 3) Heat Recovery from exhaust air.
- 4) Compressor heat.
- 5) Pool covers
- 6) CHP
- 7) Heat recovery from water systems – eg pool water make up, backwash etc

## C. MECHANICAL SYSTEM DESIGN.

- 1) Load Calculation:
  - Determine evaporation rate based on the design intent.
  - Determine make-up air code requirement and its impact on the load.
  - Determine load from Occupants versus Spectators.
  - Water features.
- 2) Effect of heat recovery on make-up air pre-treatment.
- 3) Use of DOAS for large spectator areas in pools.
- 4) Mechanical System Functions.
  - Impact of supply air temperature on RH levels in the space.
  - Dehumidification (zero reheat)
  - Air cooling
  - Air heating
  - Pool water heating
  - Make –up air treatment.
- 5) Control strategies
  - Humidity Control priority
  - Air heating priority
  - Pool water heating priority
  - Baseline pool water heating
  - Interface with BMS (pros and cons).

- 6) Air distribution and IAQ
  - Minimum air changes in pool area and spectator area
  - Use of discharge air to prevent condensation
  - Strategic exhaust air. How to deal with hot tubs and whirlpools
  - Duct design does and don'ts.
    - i. How duct design affects the dehumidifier performance
    - ii. Duct materials.
    - iii. When to use insulation and how.
- 7) Pool water plumbing.
  - How to hook up the dehumidifier water heater.
  - Why an open circuit is different than a closed circuit.
- 8) Corrosion.
- 9) Commissioning Requirements.
- 10) Legionella and pool ventilation
- 11) Health and safety issues in pool operation and maintenance

## **Proposal for a New ASHRAE Handbook Chapter on Atriums**

**Submitted by: Frank Mills, Handbook committee Chair TC 9.8 and Liaison for Applications Handbook**

**Lead author – Frank Mills**

**Chapter Title:** Atriums

**Handbook Volume:** Applications

**Cognizant TC:** TC 9.8, Large buildings

**Potential Author(s):** Frank Mills,

**Potential Reviewers:**, Ralph Kittler, Tyler Lewis, Cecily Gryzwack, John Harrod

### **Justification for New Chapter.**

Atrium buildings are a unique application and should have their own chapter. Currently a designer needs to know to read Chapter 4 of Applications where there is a small amount of design information.

This is not an appropriate location for design information on atriums because they occur within all sorts of buildings , not just Places of Assembly. This chapter has been used to accommodate a range of building types which do not fit elsewhere.

Atriums can use a lot of energy. In fact, if badly designed an atrium can use more energy than the rest of the host building. However an atrium can also be an energy saving feature if designed as a ‘passive solar atrium’.

ASHRAE has published many papers on atriums over the past 20 years and has a great deal of material on the design , construction and operation of modern atriums as well as historic atrium use and refurbishments. ASHRAE sponsored research in the 1980’s into energy use in atriums and studied a number in some detail. TC 9.8 has this research and needs to use it in a new chapter along with the other published papers.

ASHRAE would be much better served if all this was consolidated in a single chapter in the Handbooks.

The comprehensive guideline should spell out the obligations and limitations of the designer of:

- Atrium enclosure within a host building – sealed off or open.
- Mechanical Systems, including IAQ, air distribution and Dehumidification Equipment Performance requirements.
- Energy efficient design and energy recovery
- Safe and efficient operational HVAC routines
- Environment for people and for plants
- Water features and other such issues
- Atriums and catering – kitchen smells, dining areas

# Proposed Outline - first draft

Historical background

The modern atrium building

Atrium building types

Passive solar atrium design

Hybrid passive and Air con

Air conditioned

Energy

Environment for people

- Thermal comfort
- Air quality

Environment for plants

Acoustics