

A Passive Building Design Standard - ASHRAE 227P

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Learning Objectives

- Why make an ASHRAE passive building standard?
- How enforcement differs from proprietary standards.
- Organization - Design vs. Construction, Envelope vs. Mechanical, Heating & Cooling vs. Total Energy.
- Compliance paths in the draft standard - “prescriptive” vs. “performance”.

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Acknowledgements

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Outline/Agenda

- Background on Consensus development process
- Motivation, and Opportunities in a change of framework
- Standard Organization Conundrum, and Result
- Stringency with Flexibility !
- Status of some important issues

What is a building standard?

- Building codes or standards provide a common language and (typically minimum) requirements for the design, construction, and operations of buildings.¹
- Codes are developed with the intent of being adopted by a jurisdiction (i.e. municipality, county, or state) as criteria for design, construction, or operation of buildings.
- Standards may or may not be developed with the intent to serve as regulatory requirements. However, they may be adopted as such by a jurisdiction—at which point they become the code for that jurisdiction.

1. <https://www.wbdg.org/resources/codes-and-standards-development>

How are building standards developed?

- Several organizations now develop "model codes & standards" that are intended to provide consistency across the country, facilitate the incorporation of the latest knowledge, and reduce the costs of development.
- The development process includes a balance of all relevant stakeholders including government, citizens/public interests, and building industry representatives – without undue influence from any one particular stakeholder;
- A rigorous process is followed to make sure that recommendations for revision to existing or criteria for new model codes and standards receive proper consideration and resolution; and **the process is transparent, to facilitate trust and diverse engagement.**

Common Code and Standard Development Processes

PROCESS NAME	DEFINING CHARACTERISTICS
ANSI Consensus	<ul style="list-style-type: none">• Consensus must be reached by representatives from materially affected and interested parties• Standards are required to undergo public reviews when any member of the public may submit comments• Comments from the consensus body and public review commenters must be responded to in good faith• An appeals process is required• Standards developed by ANSI accredited organizations that follow this process are considered American National Standards
Government Consensus	<ul style="list-style-type: none">• Participation in the development of the codes, including code hearings, is open to all at no cost.• Anyone can submit a code change proposal or make a public comment• Code committees must consider all views before voting• Final decisions are made in an open hearing by government officials

Why an ASHRAE building standard?

- ASHRAE is the American Society of Heating, Refrigerating, and Air-Conditioning Engineers.
- ASHRAE writes standards and guidelines in its fields of expertise to guide industry in the delivery of goods and services to the public. Currently, ASHRAE has over 90 active standards and guidelines.
- Over 30 ASHRAE standards are referenced in current building codes.
- ASHRAE Standards cover broad areas such as indoor air quality, thermal comfort, energy conservation in buildings, & design of high performance green buildings.

<https://www.ashrae.org/communities/committees/standards-committees>

Why an ASHRAE building standard?

- In 1975, ASHRAE published the first national energy code (ASHRAE 90-75: Energy Conservation in New Building Design).
- 38 states have adopted ASHRAE Standard 90.1 & 33 states have adopted the International Code Council's International Energy Conservation Code (IECC)
- ASHRAE is a ANSI accredited organization. So **ASHRAE** can “self-stamp” their standards as ANSI Standards because they agreed to follow ANSI's requirements for consensus process.

Consensus Process

- All meetings are open.
- Only one voting member from each employer.
- Typically 3 rounds of public review.
- Effort must be made to resolve each comment - supermajority required to reject.
- Follows ASHRAE's Standards Committee Manual of Procedures

Approval SEQUENCE of Standards related actions

Action	Initiator	Recommending Entity	Affirmative Vote Required	Approving Entity	Affirmative Vote Required	Other Approval
Initiate Development of a New Standard, guideline or portion thereof						
Submit to PPIS proposed title, purpose and scope (TPS) and recommendation for a chair (ASHRAE member) & roster (min 4 + chair)	TC/TG/TRG (or a responsible entity or person)	PPIS	*Majority	StdC	*Majority	BOD
Select Project Committee Chair and Members						
Recommend PC Membership	SPLS Liaison & PC Chair	SPLS	*Majority			
Recommend Policy Level PC Chair	PC Chair	PC Chair	SPLS	StdC	*Majority	
Advisory Public Review (APR)						
Recommend advisory public review	PC	PC	*Majority	SPLS Liaison & SPLS Chair	None	
Publication Public Review (PPR)						
Recommend Fast Track Processing	PC or SRS #	PC or SRS	+Standards Action	SPLS Liaison	Approval	
Recommend Normal Track Processing	PC or SRS #	PC	+Standards Action	SPLS	*Majority	

Approval SEQUENCE of Standards related actions

Respond to Comments						
Respond to comments submitted via online database	PC or SRS #	PC or SRS #	*Majority	PC or SRS #	*Majority	
Publication/Withdrawal						
Recommend publication or withdrawal following PPR (unresolved objector/commenter/negative PC vote with reason)	PC or SRS #	PC or SRS #	+Standards Action	StdC	*Majority	BOD
Recommend publication or withdrawal following PPR (no unresolved objectors and no threat of legal action)	PC or SRS #	PC or SRS #	+Standards Action	PC or SRS #	+Standards Action	
Appeal						
Uphold or deny an Objector's appeal	Appeals Panel			Appeals Panel	*Majority	
Initiate Revision of an Existing Standard, Guideline or portion thereof (when no PC exists for R/RA/W)						
Recommend revision within 5-year cycle	TC/TG/TRG or SRS	SRS	*Majority	StdC	*Majority	
Recommend revision within 5-year cycle	SSPC/SGPC or subcommittee	SSPC/SGPC	*Majority	SSPC/SGPC	*Majority	
Initiate Revision or Reaffirmation of an Existing Standard, Guideline or portion thereof (when a PC exists)						
Recommend revision within 5-year cycle	SSPC/SGPC or subcommittee	SSPC/SGPC	*Majority	SSPC/SGPC	*Majority	
Recommend reaffirmation and review updated references	PC	PC	*Majority	StdC	*Majority	

Enforcement must work differently

- To be code-adoptable, it must be an open standard, not proprietary as “above code” programs typically are:

Proprietary standard	Open standard
Use of proprietary software required.	Software capabilities can be required, any specific calculation methods need to be spelled out so that anyone could write compliance software.
Use of specifically credential professionals required.	Authority having Jurisdiction must be able to determine compliance, and has discretion about the qualifications of anyone to whom they delegate any part of that determination.

Opportunities

Change of structure from ‘one-model, one-path’ to ‘two-model, two-path’ - works more like other energy codes:

- Choice of a more straightforward but restrictive “prescriptive” path and a more flexible “performance” path requiring energy modeling.
- Performance-path requirement is to beat the performance of the “baseline” prescriptive configuration.
 - Relative performance target allows more software independence than absolute targets.
- Relative performance generalizes better to all kinds of commercial buildings
 - Make usage patterns same in baseline and proposed.
 - Baseline is loaded up with all the good envelope & equipment properties.

Opportunities

- Transcending the current proprietary programs
 - With input from Phius people, PHI people, and a cast of several others familiar with e.g., ASHRAE 90.1, California Title 24, etc.

It is not a great mystery what causes energy use in buildings. A design standard can regulate the energy use with rules about the properties of the envelope and all the energy-using equipment including their controls.

It is not a great mystery what the main improvement opportunities are for codes to match passive building performance:

- Air-tightness

- Thermal bridge reduction and windows

- Duct leakage

- Ventilation heat recovery

Finer points of compliance framework

- Other codes have resorted to offering “trade-off” options of limited scope within their prescriptive paths, e.g. envelope UA, that allow some flexibility without requiring full energy modeling of the performance path.
 - On 227P we are using this ploy a lot and calling it “subsystem performance” requirements; there’s not actually a fully prescriptive path in the usual sense.
 - Some calculation support is needed even on the subsystem path.
- There are some requirements that apply regardless of whether the Subsystem or Overall Performance is used. These are tagged “Mandatory” requirements (as in the IECC).

Standard Organization Conundrum

The highest-level organization of the Phius standard is by phase - design certification and then final certification, post construction.

In contrast the high-level organization of other codes is by discipline - envelope and then systems/equipment.

Both Phius and PHI have separate criteria to limit heating and cooling loads, and then also to limit overall energy use.

The committee formed 4 working groups:

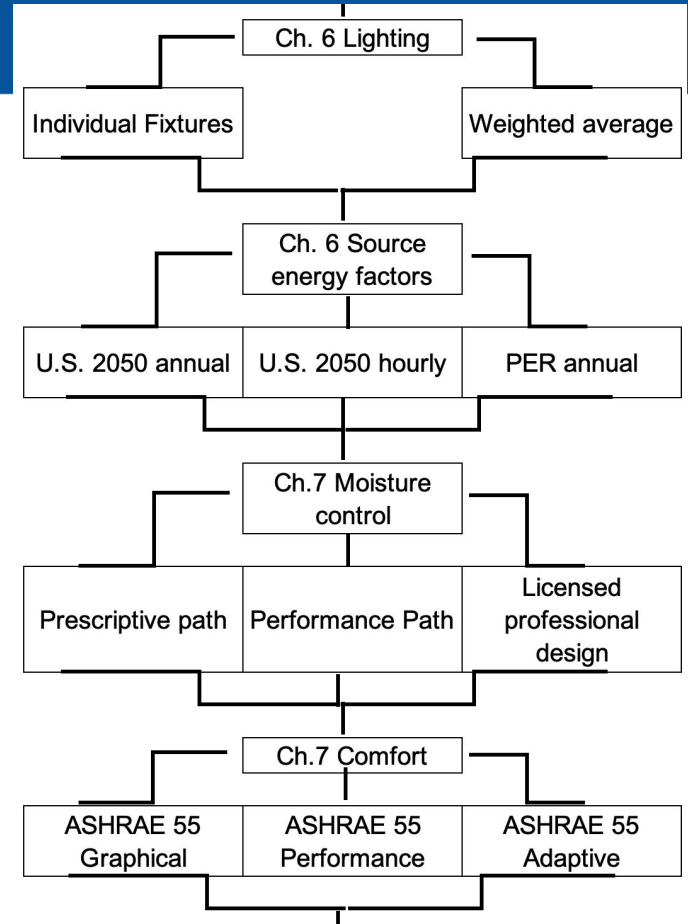
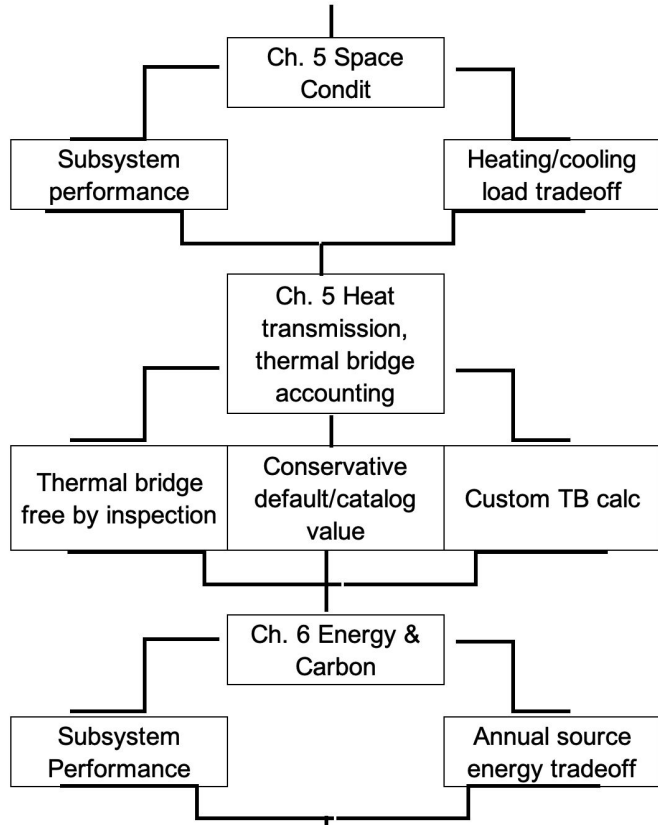
- Passive measures / space conditioning loads
- Energy and carbon
- Supplementary Requirements
- Administration & Compliance

Standard Organization Result

There's a chapter for every one of these things! :)

- 1 - Purpose, 2 - Scope, 3 - Definitions
- 4 - Administration / Enforcement
- 5 - Passive measures to limit heating/cooling loads
- 6 - Whole building energy / carbon limits
- 7 - Building enclosure - mandatory
- 8 - HVAC systems - mandatory
- 9 - Lighting - nonresidential
- 10 - Durability and Resilience
- 11 - Construction phase Cx, FPT, M&V
- 12 - Documentation of compliance - maybe
 - 12.1 - For Permit, 12.2 - for Certificate of Occupancy

Stringent yet flexible - multiple compliance options in various places



Passive Building Design Standard

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

SCOPE:

2.1 This standard is applicable to all new and existing buildings intended for human occupancy.

2.2 This standard provides requirements for the **design, construction and plans for operation of the:**

- building envelope,
- heating and cooling equipment and systems,
- ventilation systems,
- service hot water systems,
- interior and exterior lighting systems, and
- plug and appliance loads.

2.3 This standard does not provide requirements for the use of buildings.

2.4 This standard does not apply to process related systems or equipment.

2.5 This standard shall not be used to circumvent any safety, health, or environmental requirements.

Status of some important technical issues

- Reduced thermal bridging - mostly resolved
- Moisture risk limitation - mostly resolved
- Air-tightness testing of tall buildings - contentious
- U.S. Federal preemption on equipment efficiency - mostly resolved
- Load calcs and equipment sizing - partly resolved
- Cooling season solar protection - innovative/untested
- Where the documentation requirements go - under discussion

Timeline

Advisory Public Review (APR)α						
Recommend advisory public reviewα	PCα	PCα	*Majorityα	SPLS Liaison & SPLS Chairα	Noneα	α
Publication Public Review (PPR)α						
Recommend Fast Track Processingα	PC or SRS #α	PC or SRSα	+Standards Action ^β	SPLS Liaisonα	Approvalα	α
Recommend Normal Track Processingα	PC or SRS #α	PCα	+Standards Actionα	SPLSα	*Majorityα	α

1. Advisory Public Review (APR) November 2022

2. Publication Public Review (PPR) #1: March 2023

Timeline

Respond to Comments						
Respond to comments submitted via online database	PC or SRS #	PC or SRS #	*Majority	PC or SRS #	*Majority	
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Recommend publication or withdrawal following PPR (no unresolved objectors and no threat of legal action)	PC or SRS #	PC or SRS #	+Standards Action	PC or SRS #	+Standards Action	

1. Respond to comments August 2023
2. Proceed or withdrawal - September 2023
3. Appeal if necessary
4. Repeat PPR as needed up to 3 times.

Questions?

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