

# **ASHRAE Standard 100 – 2015 Energy Efficiency in Existing Buildings**

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# ASHRAE Std. 100 – 2015

## Energy Efficiency in Existing Buildings

1. The need for ASHRAE Std. 100
2. What is ASHRAE Std. 100
3. Compliance



# ASHRAE Std. 100 – The Need

- **Existing Buildings**
  - In the US – Approx. 5.6 Million commercial buildings (CBECS 2012)
  - In Canada – Approx. 0.5 Million commercial/institutional buildings (SCIEU 2009)
- **Building Energy Use**
  - Buildings Consume
    - 40% of All Energy
    - 69% of all Electricity
  - Buildings Produce 39% of all CO<sub>2</sub> Emissions

# ASHRAE Std. 100 – The Need

**75% to 80% of All Buildings  
That will exist in 2030  
Exist Today**

**Our Greatest Opportunity to  
Reduce Energy consumption &  
provide for a Sustainable Future  
is in:**

**Existing Buildings**



# ASHRAE Std. 100 – The Need

- International Energy Conservation Code (IECC)
- ASHRAE Std. 90.1
- ASHRAE Std. 90.2

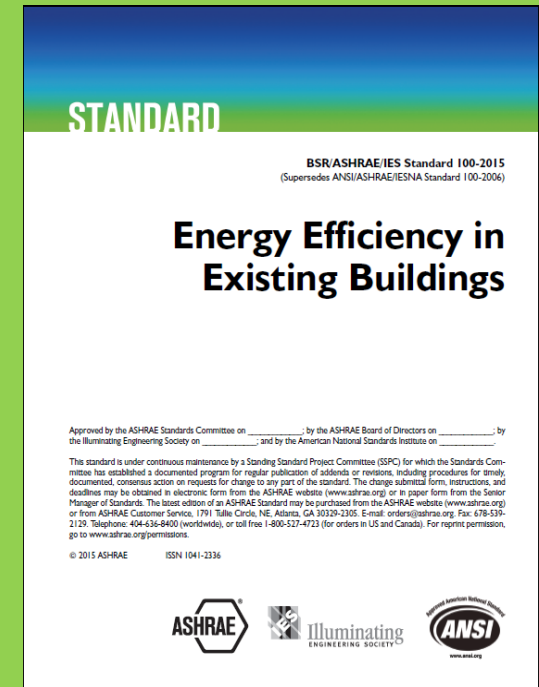
Are energy codes and standards for the design and construction of **NEW** buildings

# ASHRAE Std. 100 – What is it?

## ASHRAE Standard 100 – 2015

## Energy Efficiency in Existing Buildings

Provides the **minimum** requirements for energy efficient **design** and **operation** of **existing** residential, commercial, institutional and industrial buildings



# ASHRAE Std. 100 – What is it?

- Provides Guidance to building owners and operators on processes and procedures needed to reduce the energy consumption of their buildings
- Provides a code ready standard that can be used by state and local jurisdictions to write directly into building codes
- Provides a verifiable process that federal & state authorities and utility companies can use to support tax incentive, rebate and other programs

# ASHRAE Std. 100 – What is it?

## Basic Index

1. Purpose
2. Scope
3. Definitions
4. Compliance Requirements
5. Energy Management Plan
6. Operation and Maintenance Requirements
7. Energy Use Analysis & Target Requirements
8. Energy Audits Requirements
9. Implementation & Verification
10. Residential Buildings & Dwelling Units



# ASHRAE Std. 100 – What is it?

## References

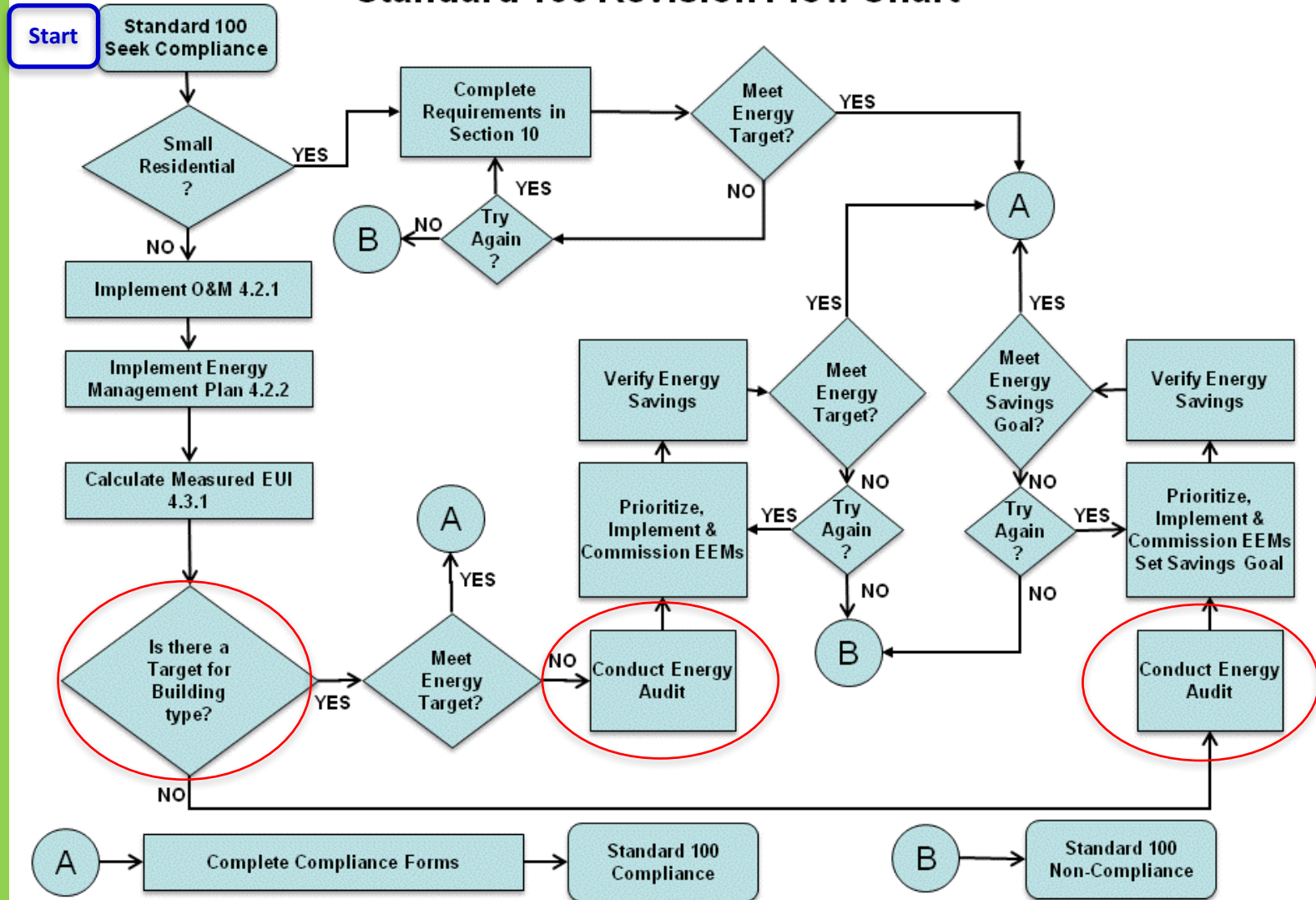
1. Normative Annex A: Alternate Energy Intensity Targets
2. Informative Annex B: Timeline
3. Normative Annex C: Forms
4. Informative Annex D: Operation and Maintenance Requirements for Building Systems and Elements
5. Informative Annex E: Energy Efficiency Measures
6. Informative Annex F: Standard 100 Compliance Flow Chart
7. Informative Annex G: Climate Zones
8. Informative Annex H: Simple Payback and Life-Cycle Cost Analysis
9. Informative Annex I: Building Energy Modeling
10. Informative Annex J: Derivation of Building Energy-Use Intensity Targets
11. Informative Annex K: Alternative Methods for Energy Targets and Fuel Heat Conversion Values – Other Fuels
12. Normative Annex L: Operation and Maintenance Implementation

# ASHRAE Std. 100 – Compliance

## Section 4 *Compliance Requirements*

# ASHRAE Std. 100 – Compliance

## Standard 100 Revision Flow Chart



# ASHRAE Std. 100 – Compliance

## Section 4 – Compliance Requirements

### 1. Compliance Process

- Building Types
- Timeline
- Forms

### 2. Energy Management Plan

### 3. Operation and Maintenance Requirements

### 4. Building Energy Use

- Buildings *with* Energy Targets
- Buildings *without* Energy Targets

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## Section 5 *Energy Management Plan*

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## Section 5 – Energy Management Plan

- Annual building net energy use shall be monitored and recorded as an Energy Use Intensity (EUI)
- Equipment replacement minimum standards are equal to
  - ASHRAE Std. 90.1, *Energy Standard for Buildings, Except Low-Rise Residential Buildings*, and
  - ASHRAE Std. 90.2, *Energy Standard for Residential Buildings*

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## Section 6

### *Operation and Maintenance*

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## Section 6 – Operation and Maintenance

- For compliance – Establishing an O & M Program is mandatory
- **Annex L** defines the minimum O&M requirements
- Requirements are targeted to be
  - Feasible for buildings of all sizes and occupancies
  - Practical for the average owner
  - Achieve energy efficiency



# ASHRAE Std. 100 – Compliance

## Section 7

### *Energy Use Analysis and Targets*

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## Energy-Use Intensity (EUI) Targets

- 53 Building Types
- 16 Climate Zones
- Annex J

		EUIs by Building Type by Climate Zone (kBtu/sf-yr)															
		ASHRAE Climate Zone															
No.	Commercial Building Type	1A	2A	2B	3A	3B	3B	3C	4A	4B	4C	5A	5B	6A	6B	7	8
1	Admin/professional office	39	40	39	42	33	39	33	46	40	40	48	42	54	47	58	81
2	Bank/other financial	55	57	56	59	46	55	47	65	56	57	68	59	76	67	82	115
3	Government office	49	50	49	52	41	48	42	57	49	50	60	52	67	59	72	101
4	Medical office (non-diaq)	33	34	33	35	28	33	28	39	34	34	41	36	46	40	49	69
5	Mixed-use office	45	46	45	48	38	45	39	53	46	47	56	48	62	55	67	94
6	Other office	38	39	38	40	32	37	32	44	38	39	47	40	52	46	56	78
7	Laboratory	178	176	171	175	147	165	159	194	173	179	209	187	232	211	249	331
8	Distribution/ship center	12	16	16	20	11	18	14	27	23	22	36	30	49	40	60	113
9	Non-refrig warehouse	6	8	8	10	5	9	7	13	11	11	17	14	24	19	29	54
10	Convenience store	135	146	135	152	127	139	141	166	150	157	178	162	193	179	208	263
11	Convenience store+gas	108	118	109	122	102	112	114	133	121	126	144	130	156	144	168	212
12	Grocery/food market	112	122	113	127	106	116	118	138	125	131	149	135	161	149	174	219
13	Other food sales	34	37	34	38	32	35	36	42	38	40	45	41	49	45	53	66
14	Fire/police station	66	65	63	64	54	61	59	71	64	66	77	69	85	78	92	122
15	Other public order/safety	60	59	57	59	49	55	53	65	58	60	70	63	78	71	84	111
16	Medical office (diagnostic)	33	32	32	32	30	32	27	32	30	28	30	30	31	30	31	35
17	Clinic/other outpatient health	50	48	49	48	45	48	40	48	46	42	46	45	47	45	46	52
18	Refrigerated warehouse	69	68	66	68	57	64	62	75	67	69	81	72	90	82	96	128
19	Religious worship	23	23	22	23	19	22	21	25	23	23	27	25	30	28	33	43
20	Entertainment/culture	23	23	22	23	19	21	21	25	23	23	27	24	30	28	32	43
21	Library	61	61	59	60	50	57	55	67	60	61	72	64	80	73	86	114
22	Recreation	26	26	25	26	22	24	24	29	26	26	31	28	34	31	37	49
23	Social/meeting	28	27	26	27	23	26	25	30	27	28	32	29	36	33	39	51
24	Other public assembly	28	28	27	28	23	26	25	31	27	28	33	30	37	33	39	52
25	College/university	62	61	60	62	45	58	50	72	60	65	78	65	90	78	99	147
26	Elementary/middle school	38	37	36	37	30	35	32	41	36	36	42	37	46	41	49	72
27	High school	45	45	44	46	33	42	37	52	44	47	57	48	66	57	72	107
28	Preschool/daycare	49	48	46	48	39	45	41	52	46	47	54	47	60	53	63	93
29	Other classroom education	25	25	25	25	18	24	21	29	25	26	32	27	37	32	40	60
30	Fast food	261	268	263	277	237	266	253	305	280	284	332	301	364	333	393	497
31	Restaurant/cafeteria	141	145	141	150	126	143	137	166	151	156	179	163	195	181	213	268
32	Other food service	77	79	77	82	69	78	75	91	83	85	98	89	107	99	116	146
33	Hospital/inpatient health	142	143	140	141	134	138	130	143	129	135	139	126	142	130	144	166
34	Nursing home/assisted living	84	83	81	83	69	78	75	91	82	84	99	88	109	100	118	156
35	Dormitory/fraternity/sorority	40	43	42	47	31	43	40	58	48	54	65	55	75	66	85	119
36	Hotel	50	51	48	52	47	49	48	55	52	52	57	55	61	59	65	75
37	Motel or inn	55	53	52	51	48	50	46	52	50	48	53	50	56	52	57	69
38	Other lodging	53	50	50	49	46	48	44	49	48	46	50	48	53	50	55	66
39	Vehicle dealership/showroom	49	50	49	53	38	48	42	60	52	52	68	58	78	69	87	124
40	Retail store	28	29	28	30	21	27	24	34	30	30	39	33	45	40	50	71
41	Other retail	49	50	49	52	37	48	42	59	52	52	67	58	78	69	86	124
42	Post office/postal center	43	42	41	42	35	39	38	46	41	43	50	45	56	51	60	79
43	Repair shop	28	28	27	28	23	26	25	31	28	28	33	30	37	34	40	53
44	Vehicle service/repair shop	33	33	32	32	27	31	29	36	32	33	39	35	43	39	46	61
45	Vehicle storage/maintenance	14	14	14	14	12	13	13	16	14	14	17	15	19	17	20	27
46	Other service	60	60	58	59	50	56	54	65	59	60	71	63	78	71	84	112
47	Strip shopping mall	59	59	58	62	46	57	51	71	62	63	82	70	94	84	106	151
48	Enclosed mall	56	56	55	59	44	54	49	68	59	60	78	67	90	80	101	144
		ASHRAE Climate Zone															
	Residential Building Type	1A	2A	2B	3A	3B	3B	3C	4A	4B	4C	5A	5B	6A	6B	7	8
49	Mobile home	38	40	40	45	30	41	38	54	45	51	62	52	71	62	80	112
50	SF-detached	28	30	30	33	22	30	28	40	34	38	46	38	52	46	60	83
51	SF-attached	32	34	34	38	25	35	32	46	39	43	53	44	60	53	69	96
52	Apartment building (2-4 units)	47	50	50	56	37	51	47	68	57	64	77	65	89	78	101	140
53	Apartment building (5+ units)	32	34	34	38	25	35	32	46	39	43	53	44	60	53	68	96

# ASHRAE Std. 100 – Compliance

## Sect 7 – Energy Use Analysis and Targets

- Authority Having Jurisdiction may pick level of compliance in reference to Benchmark for Target and may be set on both a Site or Source basis
- Owner to conduct energy use analysis from utility bills to get Baseline EUI, Energy Use Intensity, (kBTU/ft<sup>2</sup>-yr) or (MJ/m<sup>2</sup>-yr)

# ASHRAE Std. 100 – Compliance

## Sect 7 – Energy Use Analysis and Targets

- If building type is listed in Target List, compare Baseline to Target
  - If Baseline  $\leq$  Target, Sec. 7 requirement is met
  - If Baseline  $>$  Target, Sec. 7 requirement is not met and must complete Sec 8 & 9
- If building type is not listed in Target list, Sec 8 & 9 must be completed

# ASHRAE Std. 100 – Compliance

## Section 8

### *Energy Audit Requirements*

# ASHRAE Std. 100 – Compliance

## Section 8 – Energy Audit Requirements

- **Buildings that Don't Meet Targets**
  - Audit Level to be sufficient to identify EEMs that would result in the building meeting its energy target
- **Buildings w/o Targets**
  - Audit Level 2

# ASHRAE Std. 100 – Compliance

## Section 9

### *Implementation and Verification Requirements*

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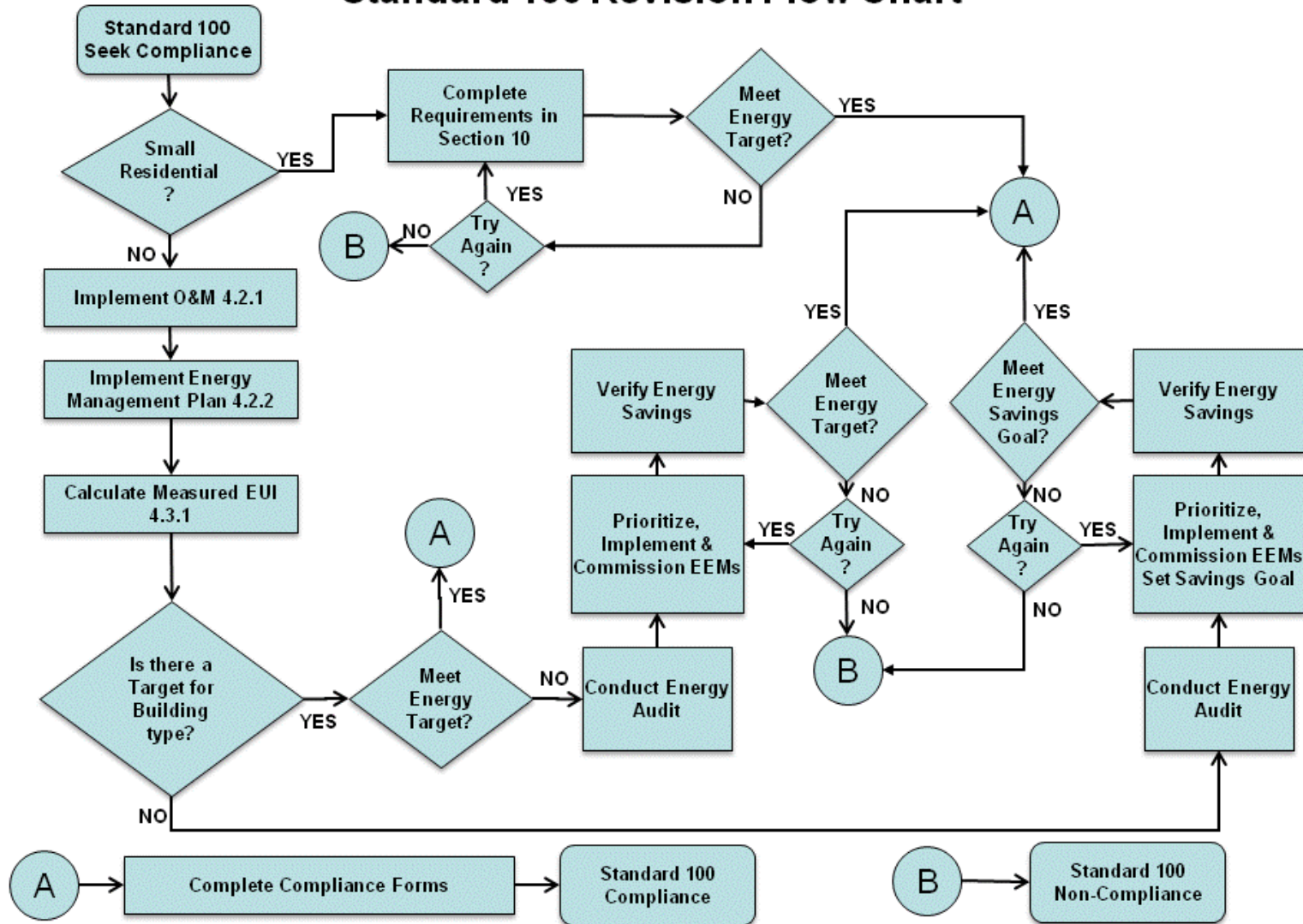
## Section 9 – Implementation & Verification

- **Developing/Implementing an Energy Efficiency Plan**
  - **Implements EEMs**
    - **Buildings with Targets - As required to meet EUI target**
    - **Buildings w/o Targets - Optimized Bundle of EEMs with simple payback less than or equal to 5 years**
  - **Training of Building staff**
  - **Multiple Buildings**



# ASHRAE Std. 100 – Compliance

## Standard 100 Revision Flow Chart



# Thank You!

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