

Energy Efficiency and Auditing in Existing Buildings by ASHRAE Std

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1. Purpose

- provides criteria that will result in energy efficiency in existing buildings.
- provides procedures and programs essential to energy efficient operation, maintenance, management, and monitoring; increasing the energy efficiency of the energy-using systems and components and upgrading the thermal performance of the building envelope.

2. Scope

- Applies to : existing buildings, portions of buildings and building complexes, including the envelope and all systems in the building.
- Excludes : industrial and agricultural processes in buildings for which the energy targets do not include those processes.

3. Definitions

- **BM** : Building Manager
- **EM**: Energy Manager
- **EMP**: Energy Management Plan
- **EUI** : Energy-Use Intensity
- **EEM**: Energy Efficiency Measures

4. Compliance Requirements

4.1 Building Type Requirements

- Nonresidential Building
- Residential Building
- Combined Activities

4.2 Energy Management Plan and Operations and Maintenance Program

- Operations and Maintenance.
Building manager shall comply with the operations and maintenance requirements on Form A
- Energy Management Plan.
Building manager shall comply with the energy management requirements on Form A

4.3 Building Energy Use

- Calculate the building's measured energy-use intensity (EUI) by completing Form C
 - Electricity
 - Gas
 - District Energy: Steam, Hot Water, Cold Water
 - Bulk Fuels (Coal etc)
 - Waste (Cold Water, Hot Water)

Buildings WITH Energy Targets

- If the building's measured EUI is less than or equal to its energy target then the building complies
- If NOT then ENERGY AUDITING is required according to Section 8 to reduce energy use to meet the energy target shall be implemented according to Section 9.

Buildings WITHOUT Energy Targets

- ENERGY AUDITING is required according to Sec. 8
- Identify Energy Efficiency Measures (EEM) to meet energy targets according to Sec. 9
- Implement EEMs
- Building owner must submit verification that measured postimplementation energy savings meet or exceed 75% of the energy savings projected in the energy audit report to the AHJ.

5. ENERGY MANAGEMENT PLAN

- **5.1 Establish the Energy Management Plan**

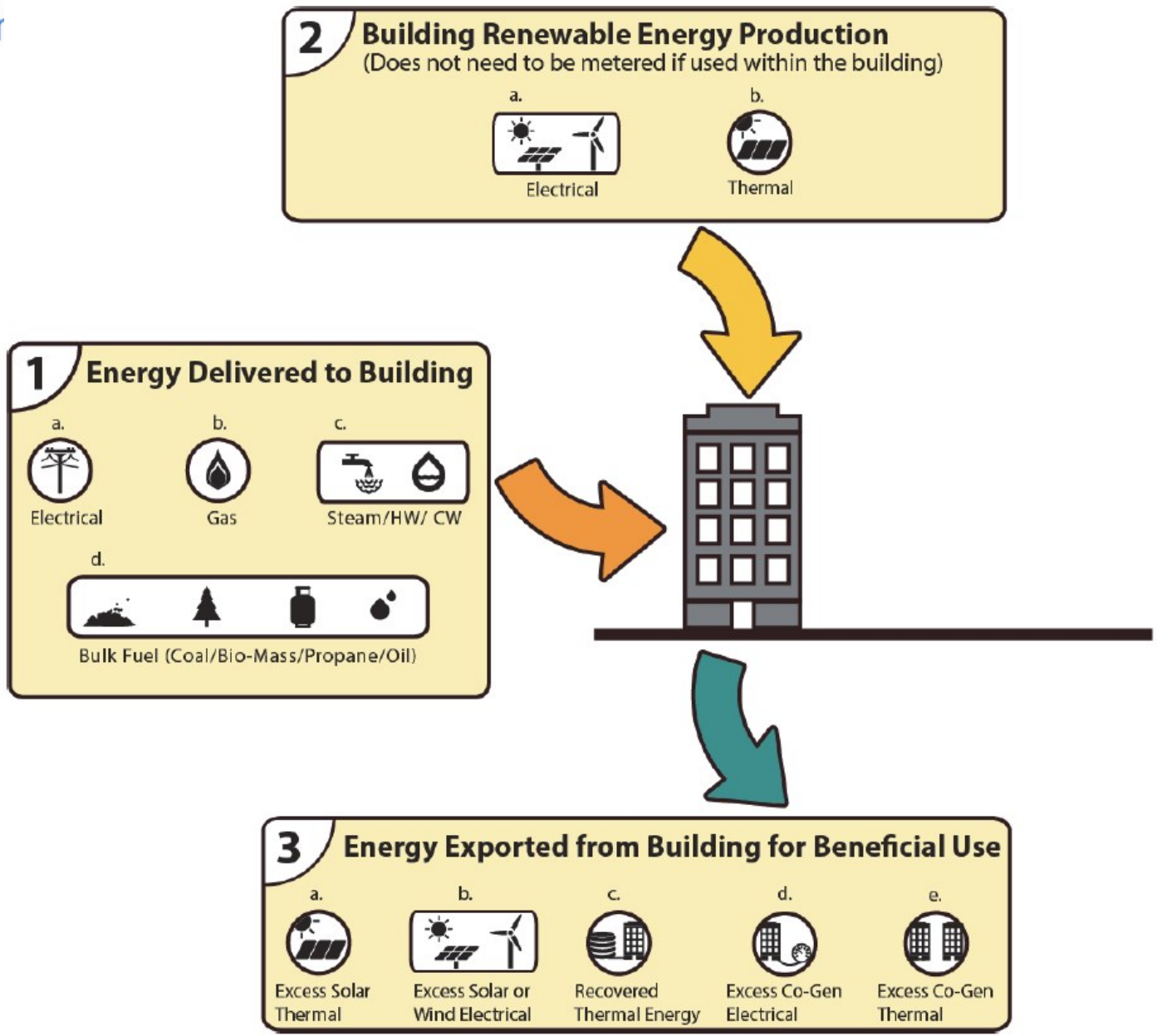
An Energy Manager (EM) must be appointed by the owner to develop and maintain an energy management plan for the building.

- **5.2 Building Energy Monitoring.**

Building net energy use shall be monitored and recorded.

Net energy use = $(1a + 1b + 1c + 1d) - (3a + 3b + 3c + 3d + 3e)$

Net Energy Concept



Annual Energy Use = $A + B - C$

- *A = measured inventory of the energy type at the beginning of the 12-month period, converted to energy equivalent (Refer to table 5.2.)*
- *B = the amount of the energy type delivered to the building during the 12-month period, converted to energy equivalent (Refer to table 5.2.)*
- *C = measured inventory of the energy type at the end of the 12-month period, converted to energy equivalent (Refer to table 5.2.)*

6. OPERATION AND MAINTENANCE REQUIREMENTS

- **Operations and Maintenance Program.**

(O&M) program shall be established and implemented in order to achieve their intended energy efficiency that will include:

 - a) Inventory of Items to be Inspected and Maintained.
 - b) Maintenance Plan Development.
 - c) Performance Objectives.
 - d) Condition Indicators.
 - e) Inspection and Maintenance Tasks.
 - f) Inspection and Maintenance Tasks Frequencies

Operations and Maintenance Tasks

- Building envelope
- Domestic hot water
- Heating, ventilation and air conditioning
- Refrigeration
- Lighting
- Controls
- Electric power distribution and on-site power generation

Equipment and Component Replacement

- HVAC, domestic hot-water heating, or refrigeration equipment or appliances if replaced, must meet energy efficiency requirements ASHRAE 90.1 or 90.2

7.2 Determining Energy Target (EUI_t)

- $(EUI_t) = S \times (EUI_{t1})$
- *(EUI_{t1}) is the building activity energy target value in Table 7-2 for the appropriate building activities/types and climate*
- *S : is the building operating shifts normalization factor in Table 7-3.*

8. ENERGY AUDIT REQUIREMENTS

- Qualified energy auditor must complete Forms D and or E
- Compliance with this Standard will be achieved by adopting energy efficiency measures (EEMs) that collectively will reduce annual building energy use.

9. IMPLEMENTATION AND VERIFICATION REQUIREMENTS

- For buildings having energy targets, EEMs identified from the energy audit shall be implemented in order to meet the building's energy target. Develop a written plan for maintaining the building's EUI at or below the energy target.
- Buildings that do not have an energy target shall implement the EEMs identified from the energy audit within four years from the application of compliance

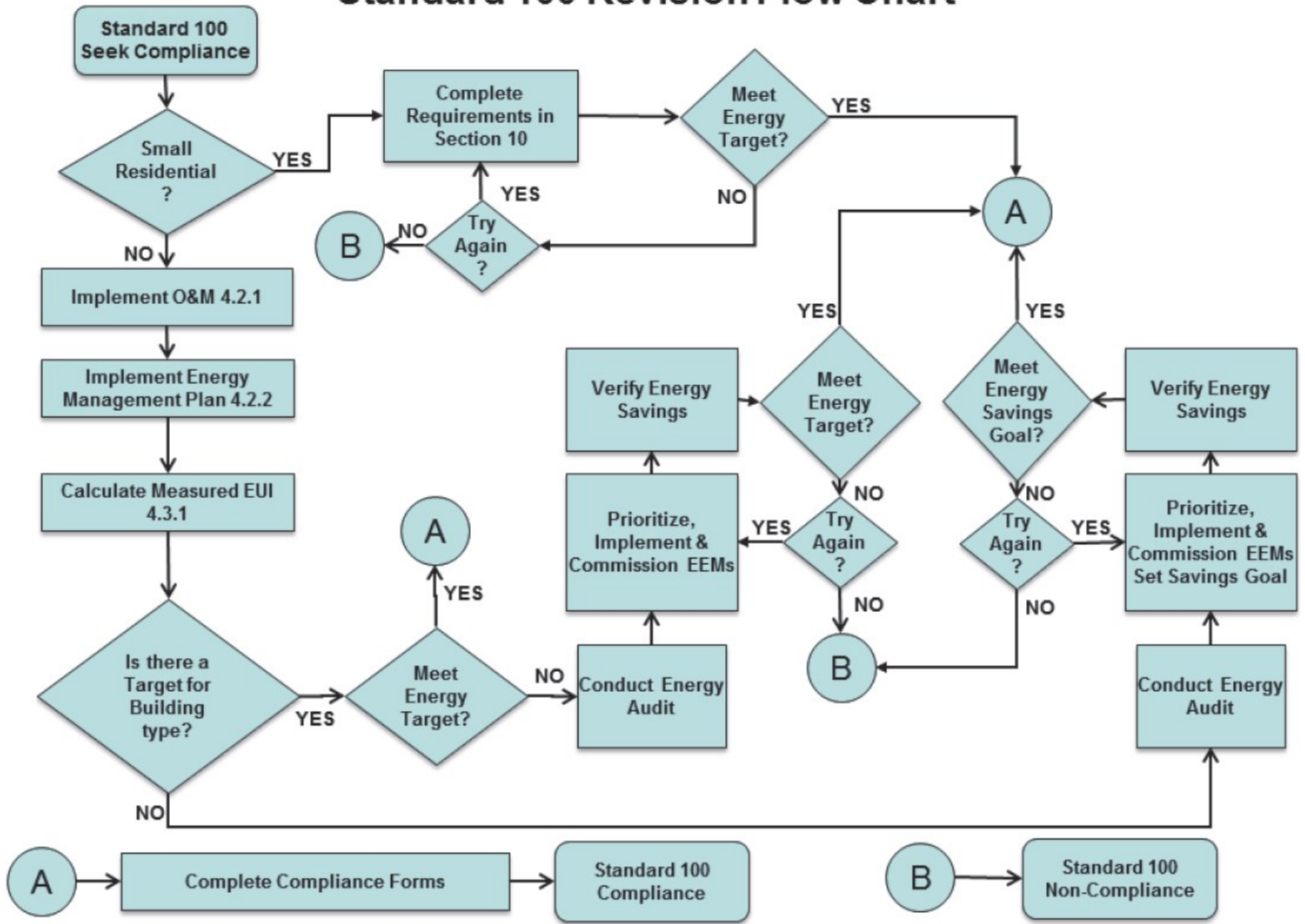
9.1 Implementing the Energy Management Plan.

- **Training of Building Staff**
- **Energy Efficiency Priorities** considering life cycle of building systems and to minimize the disruption of building occupants
- **Implementation and Commissioning** based on commissioning protocols, ASHRAE Guideline 0, *The Commissioning Process*, and *ASHRAE Guideline 1.1, HVAC&R Technical Requirements for the Commissioning Process*

9.2 Verification of Implemented EEMs

- **Buildings with Energy Targets** : building's EUI shall be monitored until one full year's data demonstrate that energy targets have been met.
- **Buildings without Energy Targets**: the affected end-use systems shall be monitored for one year to verify EEM energy savings.

Standard 100 Revision Flow Chart



Q&A

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