2016 Energy Standards
Water Heating Requirements

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Location
Date

Goals of this Training

Review the Energy Standards requirements for low-rise residential water heating systems

- All Occupancies
  - Mandatory requirements, features, and devices
- Newly Constructed Buildings
  - Mandatory
  - Prescriptive
- Existing Buildings - Additions and alterations
  - Prescriptive

Questions…

Please feel free to ask at anytime!

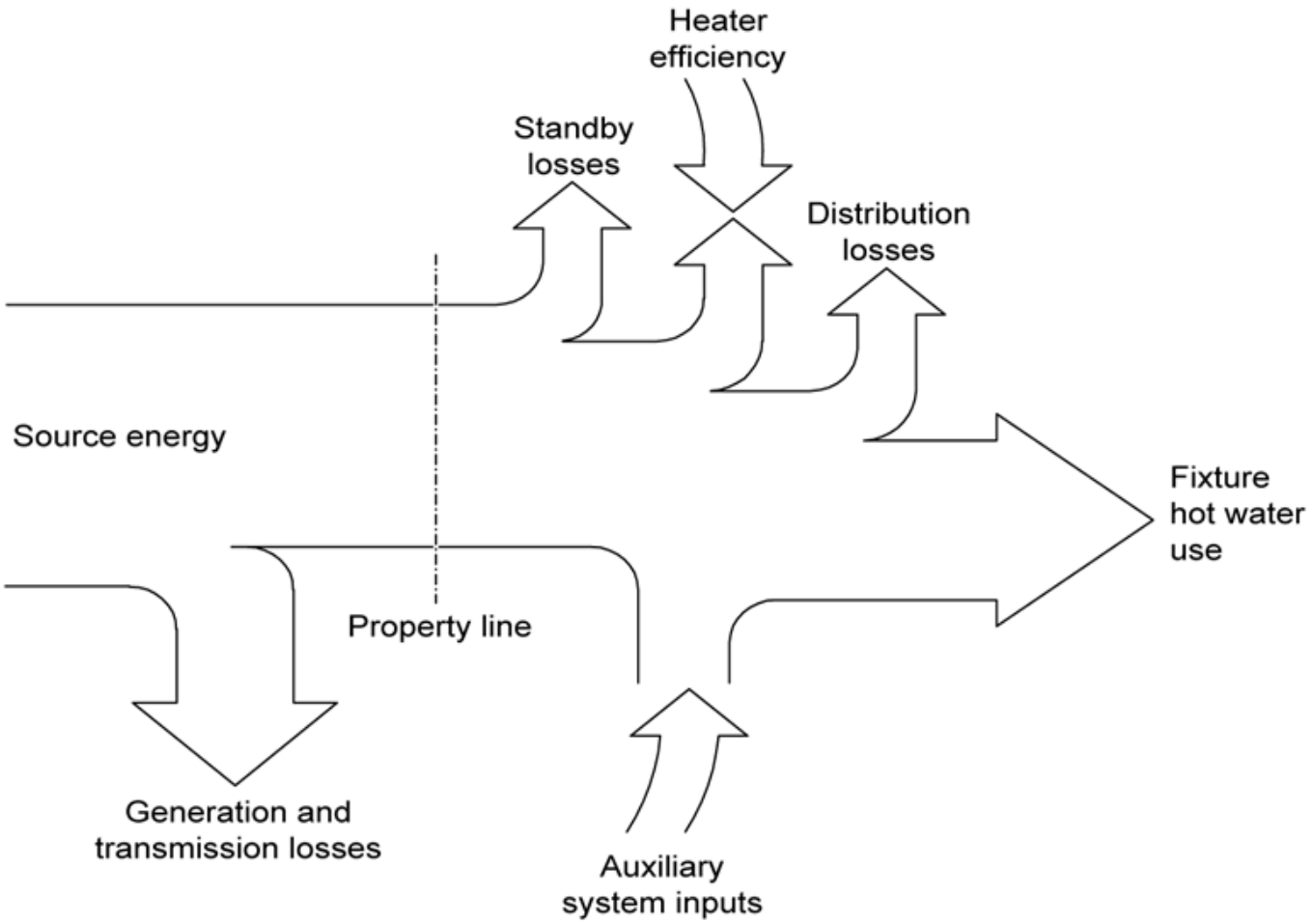
- During training
- At break
- Afterwards

- **Your questions enhance the class**

A Little Energy Commission History

- Warren Alquist Act created the Energy Commission in 1974 and gave it authority to develop and maintain Building Energy Efficiency Standards
- Requires the Energy Standards to be cost effective over the economic life of the structure
- Requires the Energy Commission to update the Energy Standards periodically (about every 3 years)

Why Do We Have Energy Standards for Water Heating?



Approaches

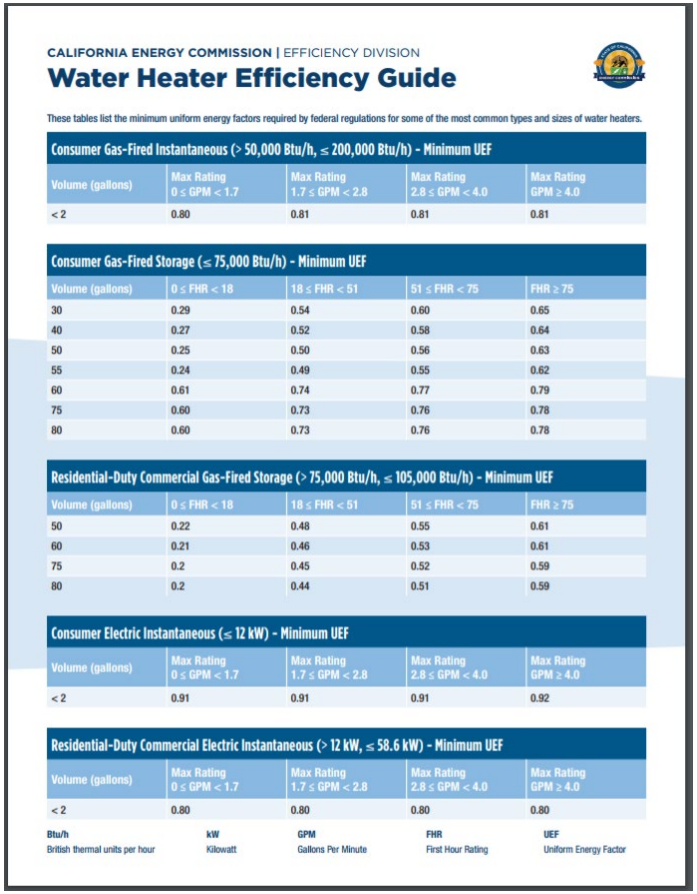
- **Mandatory** - measures that must be met regardless of which compliance approach is used
- **Prescriptive Compliance Approach** - direct pathway to compliance, is the standard design building
- **Performance Compliance Approach** - most detailed and flexible approach, more efficient features may be used to make up for less efficient features (tradeoffs), modeling software is used to show the proposed design uses no more energy than the standard design building

ALL OCCUPANCIES - MANDATORY REQUIREMENTS FOR THE MANUFACTURE, CONSTRUCTION AND INSTALLATION OF SYSTEMS, EQUIPMENT AND BUILDING COMPONENTS

§ 110

§ 110.1 - Mandatory Requirements for Appliances

a) Regulated appliances may only be installed if the minimum efficiencies of Title 20 are met.



CALIFORNIA ENERGY COMMISSION | EFFICIENCY DIVISION

Water Heater Efficiency Guide

These tables list the minimum uniform energy factors required by federal regulations for some of the most common types and sizes of water heaters.

Consumer Gas-Fired Instantaneous (> 50,000 Btu/h, ≤ 200,000 Btu/h) - Minimum UEF

Volume (gallons)	Max Rating 0 ≤ GPM < 1.7	Max Rating 1.7 ≤ GPM < 2.8	Max Rating 2.8 ≤ GPM < 4.0	Max Rating GPM ≥ 4.0
< 2	0.80	0.81	0.81	0.81

Consumer Gas-Fired Storage (≤ 75,000 Btu/h) - Minimum UEF

Volume (gallons)	0 ≤ FHR < 18	18 ≤ FHR < 51	51 ≤ FHR < 75	FHR ≥ 75
30	0.29	0.54	0.60	0.65
40	0.27	0.52	0.58	0.64
50	0.25	0.50	0.56	0.63
55	0.24	0.49	0.55	0.62
60	0.61	0.74	0.77	0.79
75	0.60	0.73	0.76	0.78
80	0.60	0.73	0.76	0.78

Residential-Duty Commercial Gas-Fired Storage (> 75,000 Btu/h, ≤ 105,000 Btu/h) - Minimum UEF

Volume (gallons)	0 ≤ FHR < 18	18 ≤ FHR < 51	51 ≤ FHR < 75	FHR ≥ 75
50	0.22	0.48	0.55	0.61
60	0.21	0.46	0.53	0.61
75	0.2	0.45	0.52	0.59
80	0.2	0.44	0.51	0.59

Consumer Electric Instantaneous (≤ 12 kW) - Minimum UEF

Volume (gallons)	Max Rating 0 ≤ GPM < 1.7	Max Rating 1.7 ≤ GPM < 2.8	Max Rating 2.8 ≤ GPM < 4.0	Max Rating GPM ≥ 4.0
< 2	0.91	0.91	0.91	0.92

Residential-Duty Commercial Electric Instantaneous (> 12 kW, ≤ 58.6 kW) - Minimum UEF

Volume (gallons)	Max Rating 0 ≤ GPM < 1.7	Max Rating 1.7 ≤ GPM < 2.8	Max Rating 2.8 ≤ GPM < 4.0	Max Rating GPM ≥ 4.0
< 2	0.80	0.80	0.80	0.80

Btu/h British thermal units per hour
kW Kilowatt
GPM Gallons Per Minute
FHR First Hour Rating
UEF Uniform Energy Factor

§ 110.1 - Mandatory Requirements for Appliances

b) Verify required efficiency using the:

- Appliance database
- Equivalent federal directory
- Approved trade association directory

https://cacertappliances.energy.ca.gov/Login.aspx

§ 110.3 - Mandatory Requirements for Service Water-Heating Systems and Equipment

a) Certification - Only manufacturer certified systems and equipment can be installed.

1. Water heating systems must have automatic temperature controls

- Exception: Residential occupancies

§ 110.3 - Mandatory Requirements for Service Water-Heating Systems and Equipment

c) Water Heater Installation

1. Outlet temp controls - On systems that have a total capacity greater than 167,000 Btu/hr, outlets that require higher than service water temperatures as listed in the ASHRAE Handbook, Applications Volume, must have one of the following:
   - Separate remote heaters
   - Heat exchangers
   - Boosters to supply the outlet with the higher temperature

§110.3 - Mandatory Requirements for Service Water-Heating Systems and Equipment

c) Water Heater Installation *(continued)*

2. Service hot water systems with circulating pumps or with electrical heat trace systems must be capable of automatically turning off the system when hot water is not required.
3. Public lavatories must have controls to limit the outlet temperature to 110°F.

§ 110.3 - Mandatory Requirements for Service Water-Heating Systems and Equipment

c) Water Heater Installation *(continued)*

4. Insulation for unfired hot water storage tanks and back up tanks for solar heating systems must have one of the following:

   A. R-12 external

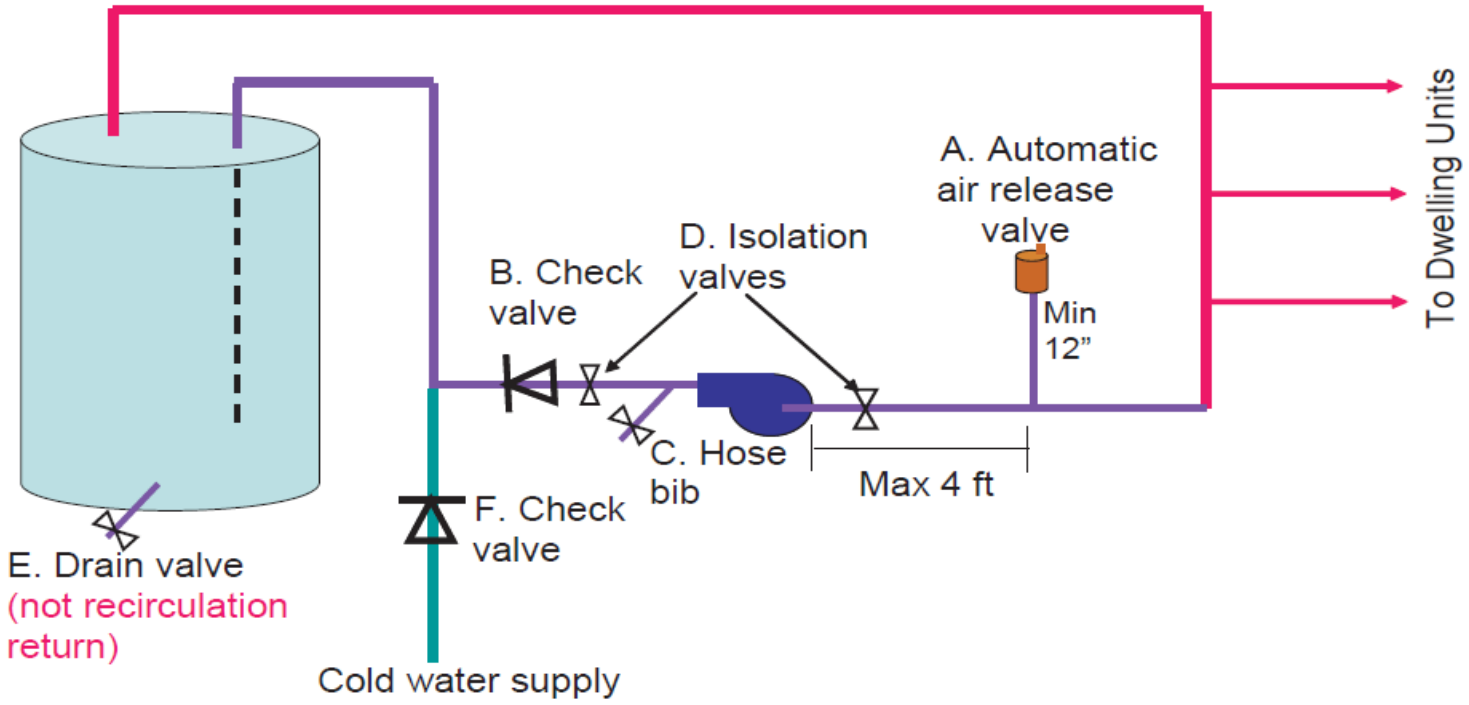
   B. R-16 combined internal and external

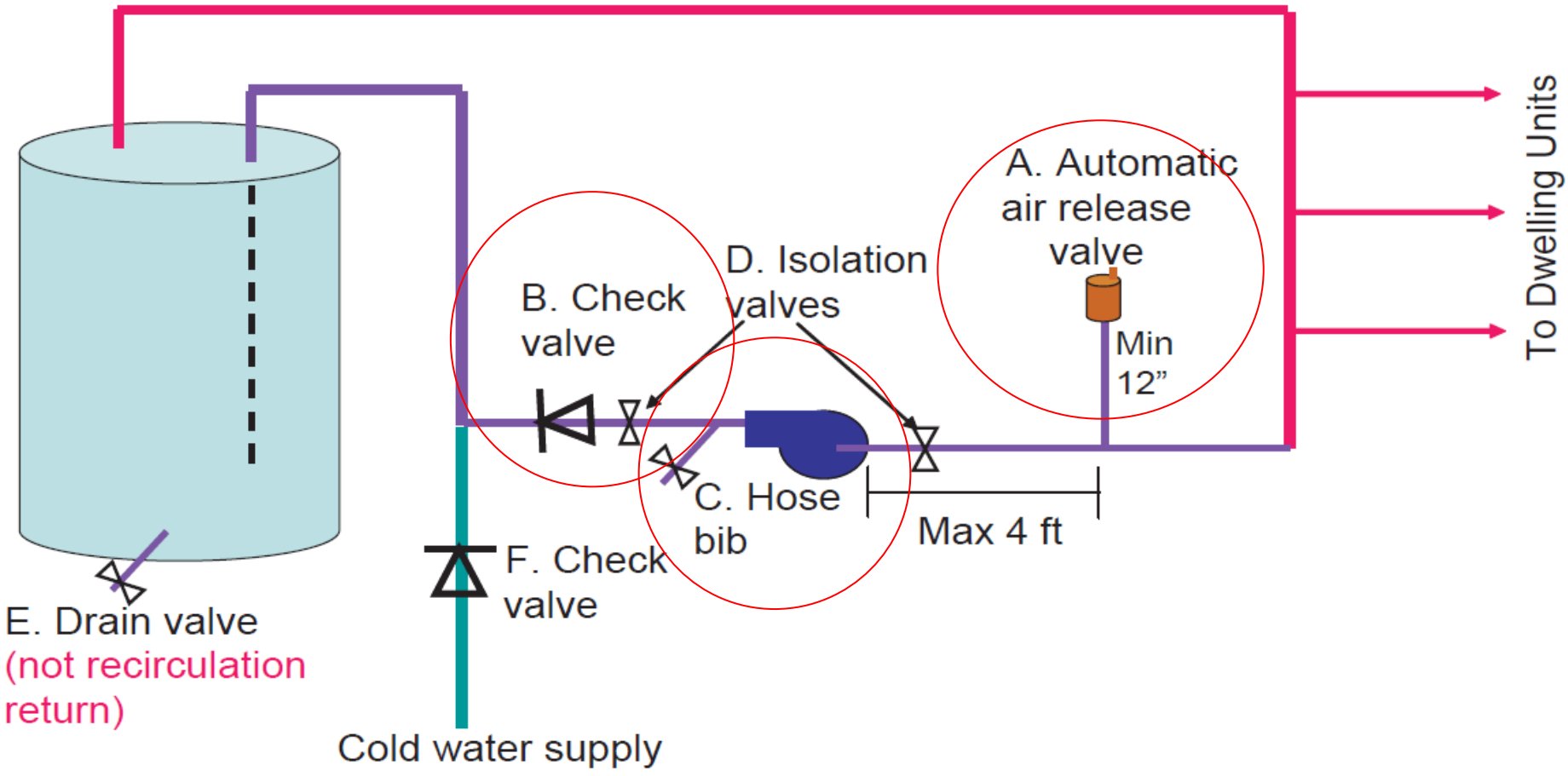
   C. Heat loss of less than 6.5 Btu per hour per square foot at tank surface

§ 110.3 - Mandatory Requirements for Service Water-Heating Systems and Equipment

c) Water Heater Installation *(continued)*

5. Recirculation loops




A. Automatic air release valve
Min 12”
D. Isolation valves
B. Check valve
C. Hose bib
Max 4 ft
To Dwelling Units
F. Check valve
E. Drain valve (not recirculation return)
Cold water supply

§ 110.3 - Mandatory Requirements for Service Water-Heating Systems and Equipment

c) Water Heater Installation *(continued)*

5. Recirculation loops serving multiple dwelling units, high-rise residential, hotel/motel, and nonresidential occupancies must meet all of the following requirements:

   A. Air release valve or vertical pump installation

   B. Recirculation loop backflow prevention

   C. Equipment for pump priming

§ 110.3 - Mandatory Requirements for Service Water-Heating Systems and Equipment

c) Water Heater Installation *(continued)*

5. Recirculation loops serving multiple dwelling units, high-rise residential, hotel/motel, and nonresidential occupancies must meet all of the following requirements:

   D. Pump isolation valves

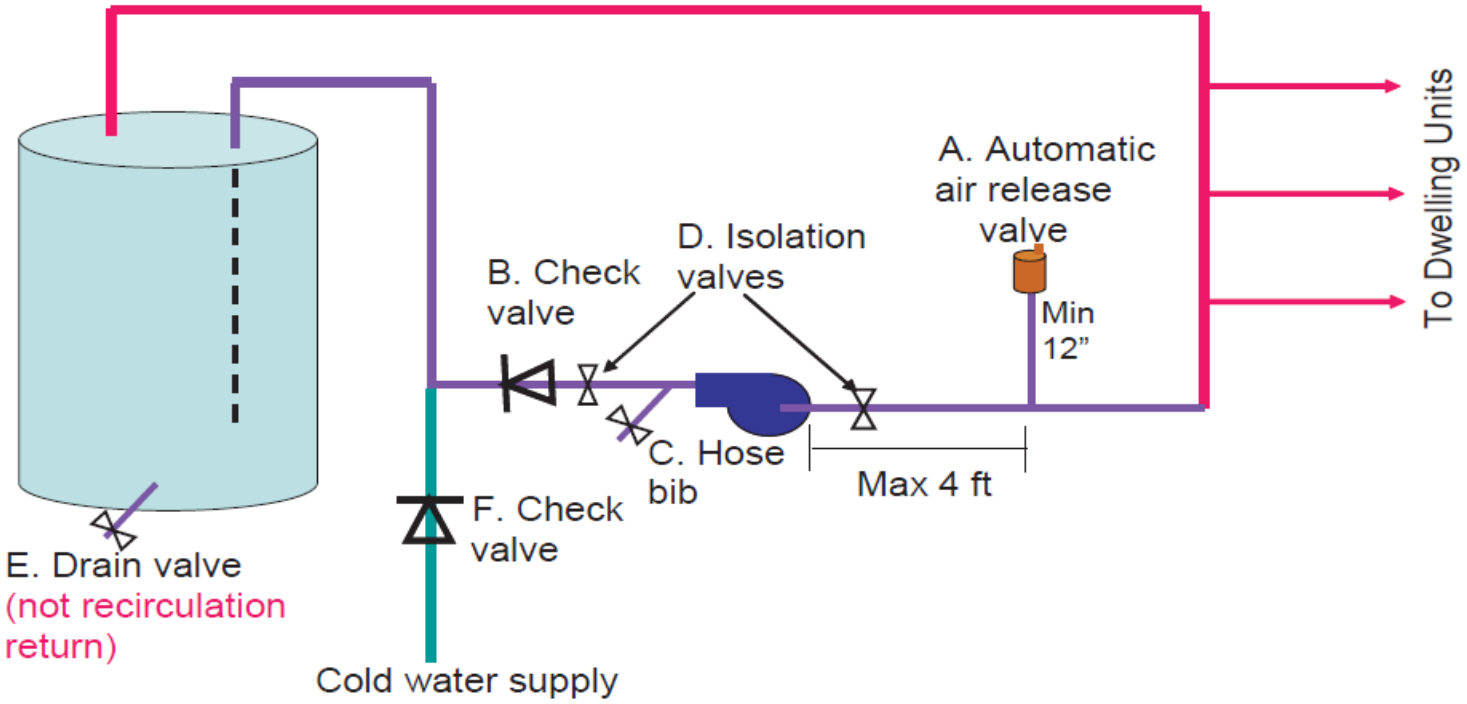
   E. Cold water supply and recirculation loop piping must not be connected to the hot water storage tank drain port

   F. Cold water supply backflow prevention

§ 110.3 - Mandatory Requirements for Service Water-Heating Systems and Equipment

c) Water Heater Installation *(continued)*

5. Recirculation loops



§ 110.3 - Mandatory Requirements for Service Water-Heating Systems and Equipment

c) Water Heater Installation *(continued)*

6. New state built buildings must get at least 60 percent of the energy needed for water heating from site solar or recovered energy.
   - EXCEPTION: Buildings the state architect determines that this requirement is economically or physically infeasible.

§ 110.3 - Mandatory Requirements for Service Water-Heating Systems and Equipment

c) Water Heater Installation *(continued)*

7. Isolation valves

- Isolation valves and fittings required for instantaneous water heaters > 6.8 kBtu/hr (2 kW)
- Must be installed on cold line in, and hot water line out
- Allows for maintenance


Rheem
120

§ 110 - SUMMARY

- Installed appliances must meet Appliance Efficiency Regulations
- Verify efficiency using the appliance database
- Manufacturers must certify and test appliances as required
- Remote heaters/boosters for higher than service temperature outlets (systems > 167,000 Btu/hr)
- Automatic controls for water heating systems
- Limit temperature of public lavatories to 110°F

§ 110 - SUMMARY

- Insulate storage and back up tanks as required
- If applicable, make sure recirculation systems have:
  - Air release valve or vertical pump installation
  - Recirculation loop backflow prevention
  - Equipment for pump priming
  - Pump isolation valves
  - No connections to the hot water storage tank drain port
  - Cold water supply backflow prevention
- Solar/recovered energy required for water heating in state built newly constructed buildings
- Isolation valves and fittings for instantaneous water heaters > 6.8 kBTU/hr (2kW)

Enforcement of § 110.1 and § 110.3

Plan Review

Verify efficiencies on CF1R or NRCC-PLB-01

- Can ask for mandatory measures summary
- Can require note block

Inspection

Visually verify equipment efficiencies

- Can ask for database print out, or manufacturer cut sheet
- Confirm on CF2R-PLB (01, 02, 03, 21, 22) (use the PSR)
- Confirm on CF3R-PLB (21, 22) (use the PSR)
- Confirm on NRCI-PLB (01, 02, 03, 21, 22)

NONRESIDENTIAL, HIGH-RISE RESIDENTIAL, HOTEL/MOTEL OCCUPANCIES, AND COVERED PROCESSES - MANDATORY REQUIREMENTS

§ 120

§ 120.3(a) – General Requirements for Pipe Insulation

Insulate the following according to TABLE 120.3-A

3. Service water-heating systems.
   - A. Recirculating system piping, including the supply and return piping of the water heater.
   - B. The first 8 feet of hot and cold outlet piping for a nonrecirculating storage system.
   - C. The inlet pipe between the storage tank and a heat trap in a nonrecirculating storage system.
   - D. Pipes that are externally heated.

§ 120.3(b) - Insulation Protection

Protect insulation from:

- Sunlight 
- Moisture 
- Equipment maintenance 
- Wind 

§ 120.3(b) - Insulation Protection

1. Insulation exposed to weather:
   - Must be installed with a cover suitable for outdoor service.
     - The cover must provide shielding from solar radiation and be water retardant.


HOT WATER RETURN
HOT WATER RETURN

§ 120.3 - Requirements for Pipe Insulation

c) Insulation Thickness

1. Insulate pipes according to TABLE 120.3-A.

TABLE 120.3-A PIPE INSULATION THICKNESS

FLUID TEMPERATURE RANGE (°F)	CONDUCTIVITY RANGE (in Btu-inch per hour per square foot per °F)	INSULATION MEAN RATING TEMPERATURE (°F)	NOMINAL PIPE DIAMETER (in inches)				
			< 1	1 to <1.5	1.5 to < 4	4 to < 8	8 and larger
			INSULATION THICKNESS REQUIRED (in inches)				
Space heating, Hot Water systems (steam, steam condensate and hot water) and Service Water Heating Systems (recirculating sections, all piping in electric trace tape systems, and the first 8 feet of piping from the storage tank for nonrecirculating systems)							
Above 350	0.32-0.34	250	4.5	5.0	5.0	5.0	5.0
251-350	0.29-0.32	200	3.0	4.0	4.5	4.5	4.5
201-250	0.27-0.30	150	2.5	2.5	2.5	3.0	3.0
141-200	0.25-0.29	125	1.5	1.5	2.0	2.0	2.0
105-140	0.22-0.28	100	1.0	1.5	1.5	1.5	1.5

§ 120.3 - Requirements for Pipe Insulation

c) Insulation Thickness

2. If TABLE 120.3 doesn't include the needed insulation conductivity range, use the equation:

$$T = PR\left[\left(1+\frac{t}{PR}\right)^{\frac{K}{k}}-1\right]$$

WHERE:

T	=	Minimum insulation thickness for material with conductivity *K*, inches.
PR	=	Pipe actual outside radius, inches.
t	=	Insulation thickness from TABLE 120.3-A, inches.
K	=	Conductivity of alternate material at the mean rating temperature indicated in TABLE 120.3-A for the applicable fluid temperature range, in Btu-inch per hour per square foot per °F.
k	=	The lower value of the conductivity range listed in TABLE 120.3-A for the applicable fluid temperature range, Btu-inch per hour per square foot per °F.

§ 120 - SUMMARY

- Protect outdoor insulation
- Use the correct insulation (e.g. rated for outdoor use)
- Use insulation with the correct thickness (TABLE 120.3-A)
- If you can't use TABLE 120.3-A, use the equation

Enforcement of § 120.3

Plan Review

Verify efficiencies on NRCC-PLB-01-E

- Can require note block

Inspection

Visually verify equipment efficiencies

- Can ask for database print out, or manufacturer cut sheet
- Confirm on NRCI-PLB (01, 03, 22)
- Confirm on NRCI-STH-01

NONRESIDENTIAL, HIGH-RISE RESIDENTIAL, AND HOTEL/MOTEL OCCUPANCIES - PERFORMANCE AND PRESCRIPTIVE COMPLIANCE APPROACHES FOR ACHIEVING ENERGY EFFICIENCY

§ 140

§ 140.5 - Prescriptive Requirements for Service Water Heating Systems

a) Nonresidential occupancies - Must comply with § 110.1, § 110.3, and § 120.3. *(previous)*

b) High-rise residential and hotel/motel occupancies - Must comply with § 150.1(c)8 *(coming up)*

NONRESIDENTIAL, HIGH-RISE RESIDENTIAL, AND HOTEL/MOTEL OCCUPANCIES - ADDITIONS, ALTERATIONS, AND REPAIRS

§ 141

§ 141.0 - Additions, Alterations, and Repairs to Existing Buildings That Will be Nonresidential, High-Rise Residential, and Hotel/Motel Occupancies

a) Additions must meet 1 or 2

1. Prescriptive - Meet applicable requirements of §110.1, §110.3, and § 140.5. *(previous)*

§ 141.0 - Additions, Alterations, and Repairs to Existing Buildings That Will be Nonresidential, High-Rise Residential, and Hotel/Motel Occupancies

a) Additions must meet 1 or 2 *(continued)*

2. Performance

A. Newly installed water-heating system serving the addition must meet the applicable requirements of § 110.1, and § 110.3; and

B. Either

i. The addition alone must meet § 140.1; or

ii. E+A+A

§ 141.0 - Additions, Alterations, and Repairs to Existing Buildings That Will be Nonresidential, High-Rise Residential, and Hotel/Motel Occupancies

a) Additions

- EXCEPTION 1: When service water heating to an addition is provided by expanding existing systems, the existing systems and equipment need not comply with § 110.1, § 110.3, § 120.3, or § 140.5.

§ 141.0 - Additions, Alterations, and Repairs to Existing Buildings That Will be Nonresidential, High-Rise Residential, and Hotel/Motel Occupancies

b) Alterations

2. Prescriptive approach - The altered components must meet applicable requirements of § 110.1, § 110.3, § 120.3, and

   N. Meet § 140.5 - except for the solar water heating requirements.

§ 141.0 - Additions, Alterations, and Repairs to Existing Buildings That Will be Nonresidential, High-Rise Residential, and Hotel/Motel Occupancies

b) Alterations

3. Performance approach

   A. Must meet applicable requirements of § 110.1; § 110.3; § 120.3; and

   B. § 140.5 - except for the solar water heating requirements.

§ 141 - SUMMARY

- **Additions**
  - Use prescriptive or performance paths of compliance
  - If expanding a system, existing system and equipment do not need to comply
- **Alterations**
  - Use prescriptive or performance paths of compliance

LOW-RISE RESIDENTIAL BUILDINGS - MANDATORY FEATURES AND DEVICES

§ 150.0

§ 150.0(j)1 - Insulation for Tanks

Unfired hot water storage tanks and backup solar storage tanks must be insulated with one of the following:

- R-12 external
- R-16 internal (must be labeled)

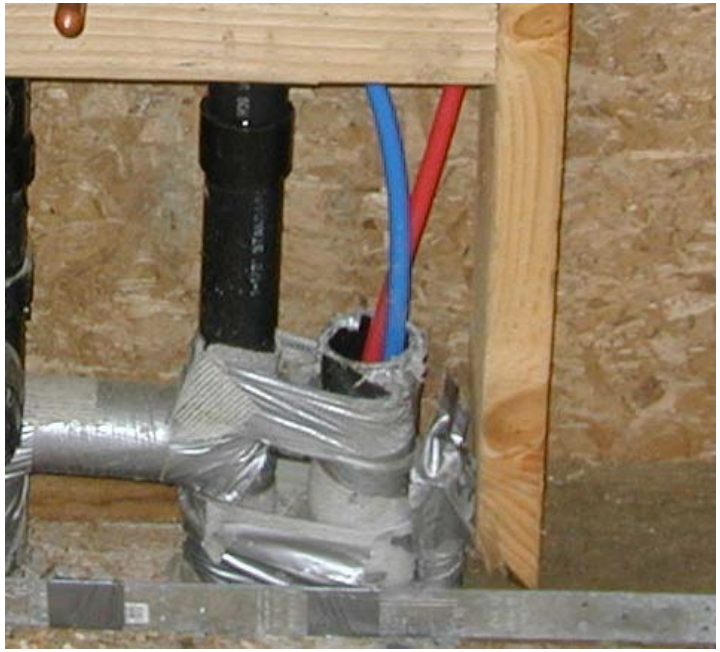
§ 150.0(j) - Insulation for Piping

2. Water piping insulation thickness and conductivity.
   A. Insulate the following water piping according to TABLE 120.3-A:
      i. First 5 feet of hot and cold pipes from storage tank
      ii. All hot water piping ¾" or larger
      iii. All piping for recirculation systems
      iv. Piping from heating source to storage tank or between tanks
      v. Hot water piping buried below grade (kitchen island)
      vi. Piping between the heating source and kitchen fixtures

§ 150.0(j) - Insulation for Piping

2. Water piping insulation thickness and conductivity. *(continued)*

   B. Buried hot water piping must be installed in waterproof, non-crushable casing or sleeve



§ 150.0(j) - Insulation for Piping

2. Water piping insulation thickness and conductivity. *(continued)*
   C. Distribution piping for steam and hydronic heating systems must insulated according to TABLE 120.3-A.

Exception 2: Piping that serves process loads, gas piping, cold domestic water piping, condensate drains, roof drains, vents, or waste piping.

§ 150.0(j) - Insulation for Piping

2. Water piping insulation thickness and conductivity. *(continued)*

Exception 3:

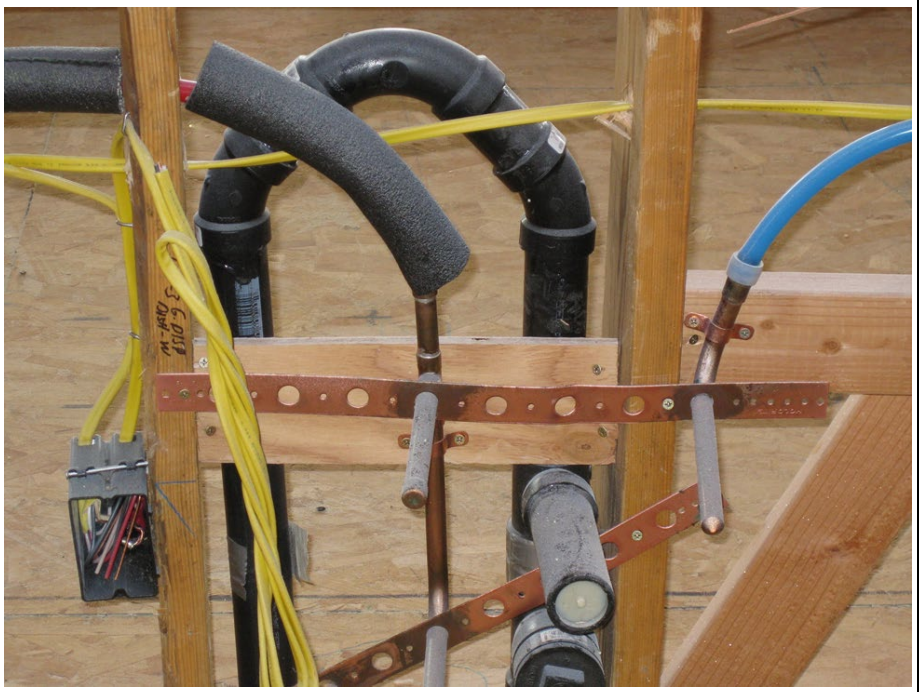
- Portions of piping that penetrate framing members.
- Metal piping penetrating metal framing must use grommets, plugs, wrapping or other insulating material to eliminate metal to metal contact*.

§ 150.0(j) - Insulation for Piping

2. Water piping insulation thickness and conductivity.

Exception 3 *(continued)*:

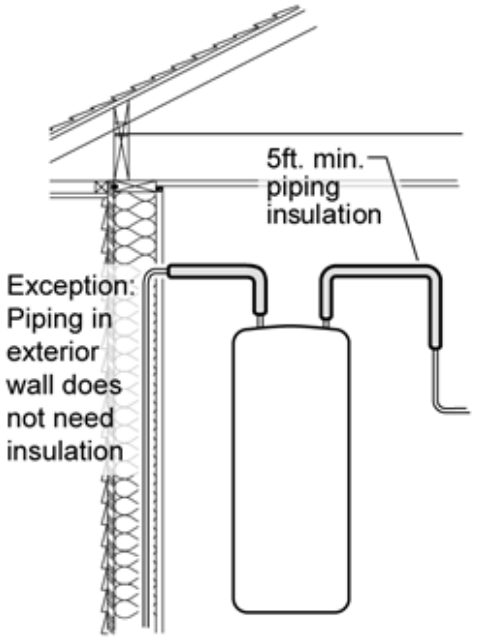
- Insulation must abut securely against all framing members.



§ 150.0(j) - Insulation for Piping

2. Water piping and cooling line insulation thickness and conductivity. *(continued)*

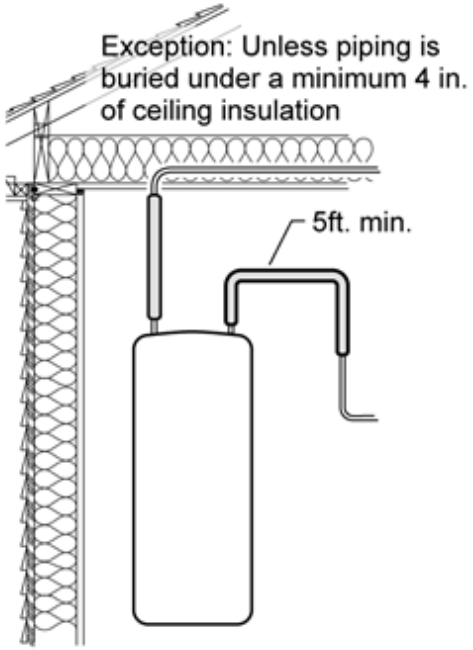
Exception 4: Piping installed in interior or exterior walls which meet QII requirements.



§ 150.0(j) - Insulation for Piping

2. Water piping and cooling line insulation thickness and conductivity. *(continued)*

Exception 5: Piping installed in attics with a minimum of 4” of attic insulation on top of the piping.



§ 150.0(j)3 - Insulation for Piping and Tanks

Insulation outside of conditioned space must be protected from:

- Sunlight 
- Moisture 
- Equipment maintenance 
- Wind 

§ 150.0(j)3 - Insulation Protection

A. Insulation exposed to weather:
   - Must be installed with a cover suitable for outdoor service.
     - The cover must provide shielding from solar radiation and be water retardant.


HOT WATER RETURN
HOT WATER RETURN

§ 150.0(n) - Water Heating System

1. Systems using gas or propane water heaters to serve individual dwelling units must include all of the following components:
   A. A 120V electrical receptacle that is within 3 feet from the water heater and accessible to the water heater with no obstructions
   B. Category III or IV vent, or a Type B vent with straight pipe between the outside termination and the space where the water heater is installed


60§150.0(n)

§ 150.0(n) - Water Heating System

1. Systems using gas or propane water heaters to serve individual dwelling units must include the following components: *(continued)*
   C. A condensate drain that is no more than 2 inches higher than the base of the installed water heater, and allows natural draining without pump assistance
   D. A gas supply line with a capacity of at least 200,000 Btu/hr

§ 150.0(n) - Water Heating System

2. Water heating recirculation loops serving multiple dwelling units must meet the requirements of § 110.3(c)5.
3. Solar water-heating systems and collectors must be certified and rated by the Solar Rating and Certification Corporation (SRCC) or by a testing agency approved by the Executive Director.

§ 150.0 - SUMMARY

- Insulate unfired hot water storage tanks as required
- Insulate hot water pipes according to TABLE 120.3-A
- Insulate:
  - First 5 feet of hot and cold pipes from storage tank
  - All hot water piping ¾" or larger
  - All piping for recirculation systems
  - Piping from heating source to storage tank or between tanks
  - Buried hot water piping
  - Piping between the heating source and kitchen fixtures
- Insulate and protect buried hot water pipes

§ 150.0 - SUMMARY

- Insulate distribution piping for steam and hydronic heating systems according to TABLE 120.3-A.
- Protect insulation
- Use the correct insulation
- If installing gas or propane water heaters, install
  - A 120V electrical receptacle
  - Category III or IV vent, or a Type B vent with straight pipe
  - A condensate drain
  - A gas supply line with a capacity of at least 200,000 Btu/hr.

Enforcement of § 150.0

Plan Review

Verify efficiencies on CF1R

- Can ask for mandatory measures summary
- Can require note block

Inspection

Visually verify equipment efficiencies

- Can ask for database print out, or manufacturer cut sheet
- Confirm on CF2R-PLB (01, 02, 22), (*use the PSR*)
- Confirm on CF2R-STH-01, (use the PSR)
- Confirm on CF3R-PLB-22

LOW-RISE RESIDENTIAL BUILDINGS - PERFORMANCE AND PRESCRIPTIVE COMPLIANCE APPROACHES FOR NEWLY CONSTRUCTED RESIDENTIAL BUILDINGS

§ 150.1

§ 150.1(a) - Performance and Prescriptive Compliance Approaches for Newly Constructed Residential Buildings

Basic Requirements - Newly constructed low-rise residential buildings must meet:

1. § 110.1 and § 110.3
2. § 150.0
3. Performance or prescriptive standards

§ 150.1(b) - Performance Compliance for Newly Constructed Residential Buildings

Compliance with Energy Budget (EB)

- Energy Budget Rule
- Trade offs allowed

$$EB_{\text{Proposed Design Building}} \leq EB_{\text{Standard Design Building}}$$

§ 150.1(b)2 § 150.1(b)1

§ 150.1(c) - Prescriptive Compliance Newly Constructed Residential Buildings

8. Domestic water-heating systems – Can install manually controlled demand circulation systems.

   Must meet one of the following (A or B):

   A. Systems serving individual dwelling units (3 options):

      i. A single gas or propane instantaneous water heater with an input of 200,000 Btu/hr or less

§ 150.1(c) - Prescriptive Compliance for Newly Constructed Residential Buildings

8. Domestic water-heating systems - Must meet A or B *(continued)*:

   A. Systems serving individual dwelling units:

      ii.

All of the Below	Plus One of the Below (Must be HERS Verified)
• 1 gas or propane storage water heater • ≤ 55 gallons • ≤ 105,000 Btu/hr • Quality Insulation Installation (QII)	• Compact distribution • All hot water pipes insulated

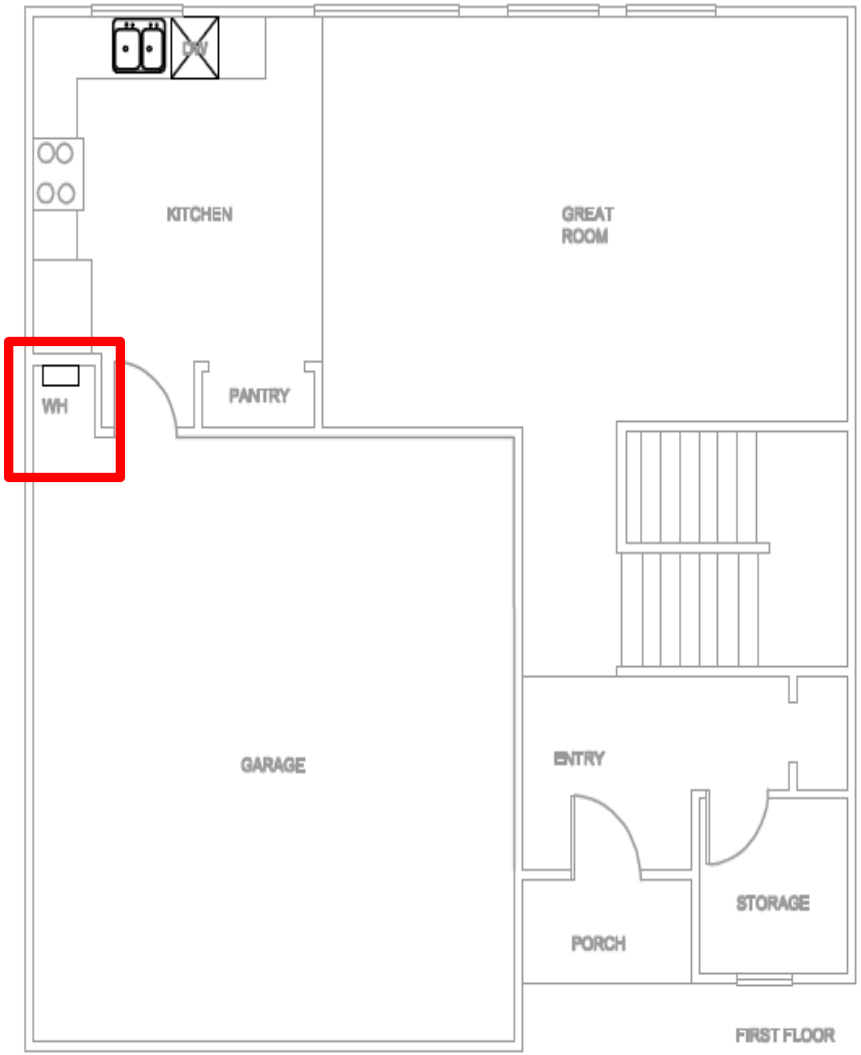
§ 150.1(c) - Prescriptive Compliance for Newly Constructed Residential Buildings

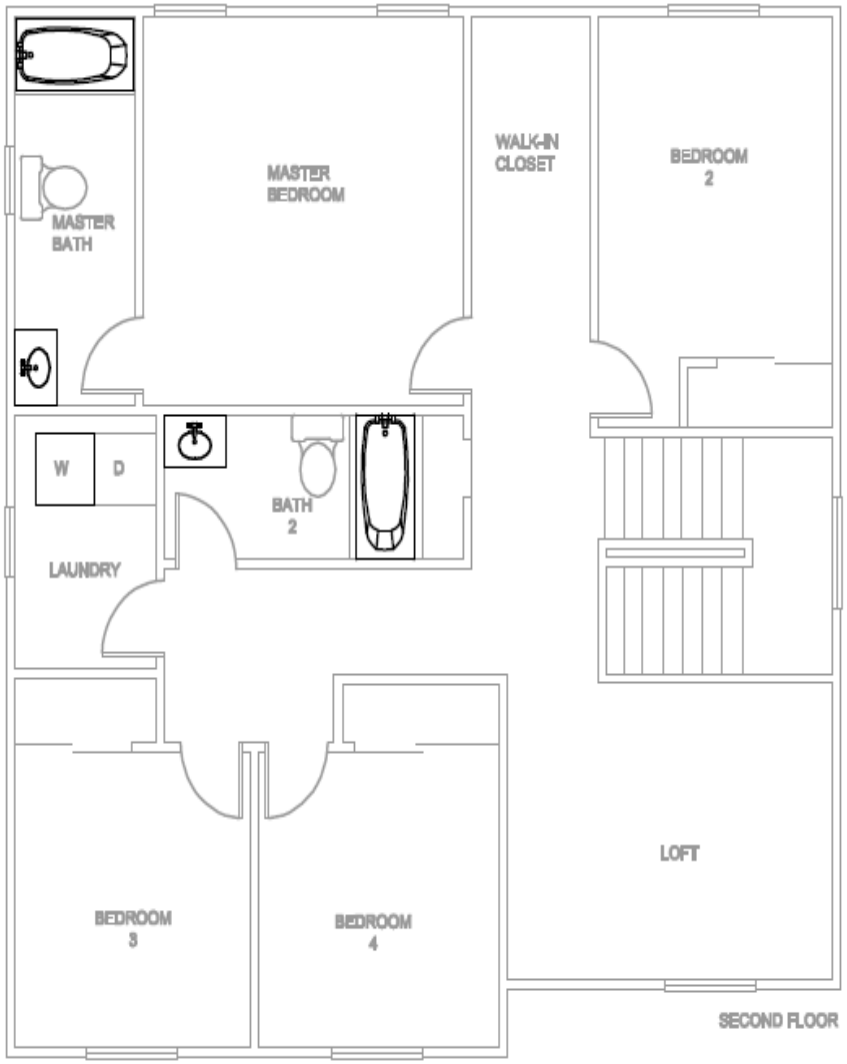
8. Domestic water-heating systems - Must meet A or B *(continued)*:

   A. Systems serving individual dwelling units:

      iii.

All of the Below	Plus One of the Below (Must be HERS Verified)
• 1 gas or propane storage water heater • > 55 gallons • ≤ 105,000 Btu/hr	• Compact distribution • All hot water pipes insulated


KITCHEN
GREAT ROOM
WH
PANTRY
GARAGE
ENTRY
STORAGE
PORCH
FIRST FLOOR


MASTER BATH
MASTER BEDROOM
WALK-IN CLOSET
BEDROOM 2
W
D
LAUNDRY
BATH 2
BEDROOM 3
BEDROOM 4
LOFT
SECOND FLOOR

§ 150.1(c) - Prescriptive Compliance for Newly Constructed Residential Buildings

8. Domestic water-heating systems - Must meet A or B *(continued):*

   B. For systems serving multiple dwelling units, a central system that includes all of the following:

      i. Gas or propane water heaters, boilers or other water heating equipment that meet the minimum efficiency requirements of § 110.1 and § 110.3

§ 150.1(c) - Prescriptive Compliance for Newly Constructed Residential Buildings

8. Domestic water-heating systems - Must meet A or B *(continued)*:
   B. Systems serving multiple dwelling units, a central water-heating system that includes the following components must be installed *(continued):*
      ii. A water heating recirculation loop that:
         - Meets the requirements of § 110.3(c)2 and § 110.3(c)5
         - Equipped with automatic controls
         - Has two recirculation loops, each serving half of the building

§ 150.1(c) - Prescriptive Compliance for Newly Constructed Residential Buildings

8. Domestic water-heating systems - Must meet A or B *(continued)*:

   B. Systems serving multiple dwelling units, a central water-heating system that includes the following components must be installed: *(continued)*

      iii. A solar water-heating system that:

      - Meets the installation criteria in RA4;
      - Has a minimum solar savings fraction of 0.20 in CZ 1 - 9, or 0.35 in CZ 10 - 16;
      - The solar savings fraction is determined using Commission approved method.

What do we see?

What is done well?

Concerns?

§ 150.1 - SUMMARY

- Use performance or prescriptive paths of compliance
- Prescriptive
  - Individual dwelling units
    - Install a natural gas or propane water heater
      - If installing a recirculation system, it must be a demand recirculation system with manual control pumps.

§ 150.1 - SUMMARY

- Prescriptive *(continued)*
  - Multiple dwelling units
    - Natural gas or propane heating equipment;
    - Recirculation loop; and
    - Solar water heating system.

Enforcement of § 150.1

Plan Review

Verify efficiencies on CF1R

- Can ask for mandatory measures summary
- Can require note block

Inspection

Visually verify equipment efficiencies

- Can ask for database print out, or manufacturer cut sheet
- Confirm on CF2R-PLB (01, 02, 21, 22), (use the PSR)
- Confirm on CF2R-STH-01, (use the PSR)
- Confirm on CF3R-PLB (21, 22)

LOW-RISE RESIDENTIAL BUILDINGS - ADDITIONS AND ALTERATIONS IN EXISTING LOW-RISE RESIDENTIAL BUILDINGS

§ 150.2

§ 150.2(a) - Additions

Additions to existing residential buildings must meet the requirements of § 110.0 - § 110.9 and § 150.0(a) - (q), and either prescriptive or performance requirements.

- EXCEPTION 3: Existing inaccessible piping does not require insulation as defined under § 150.0(j)2Aiii.

§ 150.2(a) - Additions

1. Prescriptive Approach
   D. When a second water heater is installed as part of the addition, install one of the following types of water heaters:
      i. Natural gas or propane water-heating system (§ 150.1(c)8);
      ii. Electric water heater (if no natural gas is connected to the building). If adding recirculation pump, on demand with manual control;

§ 150.2(a) - Additions

1. Prescriptive Approach

   D. When a second water heater is installed as part of the addition, install one of the following types of water heaters: *(continued)*

      iii. A water-heating system determined by the executive director to use no more energy than item i above; or item ii (if no natural gas is connected to the building) above;

      iv. Use the compliance software (§ 150.2(b)2) to show that the proposed water heating system uses no more energy than the system defined in item i above.

§ 150.2(a) - Additions

2. Performance Approach - Performance calculations must meet the requirements of § 150.1(a) through (c), pursuant to the applicable requirements in Items A, and B below.

   A. For additions alone. The addition complies if the addition alone meets the energy budgets as specified in § 150.1(b).

§150.2(a) - Additions

2. Performance Approach - Performance calculations must meet the requirements of § 150.1(a) through (c), pursuant to the applicable requirements in Items A, and B below. *(continued)*

   B. E+A+A. The proposed design energy use is the combination of the existing building's unaltered components to remain and the altered components' energy features, plus the proposed energy features of the addition.

§ 150.2(b) - Alterations

Alterations - to existing residential buildings or alterations in conjunction with a change in building occupancy type to a low-rise residential occupancy must meet either prescriptive of performance requirements

1. Prescriptive Approach – The altered component and any newly installed equipment serving the alteration must meet the applicable requirements of § 110.0 - § 110.9 and all applicable requirements of § 150.0(a) - (m), § 150.0(o) - (q) and

§ 150.2 - Alterations

1. Prescriptive Approach
   G. Water Heating System
      i. Insulate new and existing accessible pipes according to § 150.0(j)2
      ii. Water heating system that
         a. A natural gas or propane water-heating system that:
            - Meets the requirements of § 110.1 and § 110.3;
         - No recirculation systems; or

§ 150.2(b) - Alterations

1. Prescriptive Approach
   G. Replacement service water-heating systems or components must meet the requirements of § 150.0(j)2 and *(continued)*:
      ii. If no natural gas is connected to the building:
         - Electric water heater that has an energy factor equal to or greater than required by the Appliance Efficiency Regulations.
         - Storage type water heaters must not exceed 60 gallons.
         - No recirculation systems; or

§ 150.2(b) - Alterations

1. Prescriptive Approach
   G. Replacement service water-heating systems or components must meet the requirements of § 150.0(j)2 and *(continued)*:
      iii. A water-heating system determined by the executive director to use no more energy than item i above; or item ii (if no natural gas is connected to the building) above; or
      iv. Use the compliance software (§ 150.2(b)2) to demonstrate that the proposed water heating system uses no more energy than the system defined in item i above.

Heat pump water heaters that meet the UEFs listed in the Water Heater Replacements table may be used to replace existing water heaters. This applies only to prescriptive alterations to single dwelling units. The UEF depends on the climate zone where the water heater will be installed. The water heater being replaced can be of any fuel type – natural gas, propane, or electric.

Northwest Energy Efficiency Alliance (NEEA) Tier 3 or higher heat pump water heaters may be installed as described above in climate zones 1-15. If these water heaters are installed in climate zone 16, the solar water heating requirements described in the table must be met.

Per **Section 150.2(b)1Giid**, the California Energy Commission used the performance compliance approach to determine the minimum UEF needed to be able to prescriptively replace an existing water heater with a heat pump water heater. These heat pump water heaters have been precalculated to comply with the prescriptive water heating alteration requirements when serving a single dwelling unit, with or without natural gas connection. These are only a few of many possible combinations that will comply using the performance compliance approach.

Water Heater Replacements (New Heat Pump Water Heater)

Climate Zone	Minimum UEF
1	2.82
2	2.82
3	2.82
4	2.87
5	2.82
6	2.47
7	2.61
8	2.47
9	2.47
10	2.47
11	2.61
12	2.87
13	2.61
14	2.61
15	2.47
16	≥ 3, plus a solar water heating system with solar saving fraction ≥ 0.4

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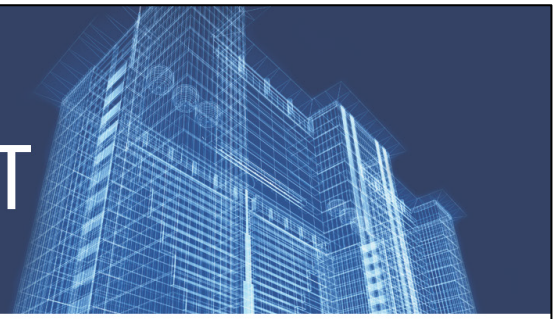
California Energy Commission
Efficiency Division



In This Issue

New Mechanical Acceptance Test Technician Certification Provider

On January 13, 2016, the California Energy Commission (Energy Commission) approved the National Environmental Balancing Bureau (NEBB), as a mechanical Acceptance Test Technician Certification Provider (ATTCP). This gives NEBB the authority to train, certify, and oversee acceptance test technicians (ATTs) and their employers. NEBB will train and certify ATTs to perform all 17 mechanical acceptance tests required in the *2013 Building Energy Efficiency Standards* (Energy Standards).

The Conditions of Approval are available for review in the **Executive Director's recommendation**.

For more information, please visit: **http://energy.ca.gov/title24/attcp/**.

Small Duct High Velocity Space Conditioning Systems

Small duct high velocity (SDHV) systems may be used to comply with the Energy Standards. The following is a list of requirements with direction on how SDHV systems can comply with the low-rise residential requirements of the Energy Standards.

Mandatory Requirements

United States Department of Energy Standards:

SDHV systems manufactured on or after January 23, 2006, and before January 1, 2015, must have a minimum Seasonal Energy Efficiency Ratio (SEER) of 11, and a minimum Heating Seasonal Performance Factor (HSPF) of 6.8.

SDHV systems manufactured on or after January 1, 2015, must have a minimum SEER of 12, and a minimum HSPF of 7.2.

Energy Standards:

Section 150.0(m)13B - Single zone systems that use forced air ducts to supply cooled air to an occupiable space must either meet minimum airflow and fan efficacy requirements, or meet the return duct and grille sizing requirements of **TABLES 150.0-C or 150.0-D**.

NOTE: The return duct and grille sizing alternative will likely be the method chosen for compliance when installing a SDHV system.

Section 150.0(m)15 - Specific to systems with multiple thermostatically controlled zones, this section requires the same mandatory airflow and fan efficacy requirements as **Section 150.0(m)13B**. However, it does not have the same duct and grille sizing alternative. If such systems cannot satisfy the airflow and fan efficacy requirements of this section, compliance must be demonstrated via the performance approach.

The duct leakage and insulation requirements apply as with any other system.

Prescriptive Requirements

The refrigerant charge and duct insulation requirements apply as with any other system.

§ 150.2 - SUMMARY

- **Additions**
  - Prescriptive
    - Install a natural gas or propane water heating system (§ 150.1(c)8)
    - If natural gas is not connected:
      - Install an electric water heater.
      - Do not install recirculation pumps.
    - Executive decision
    - Compliance software

§ 150.2 - SUMMARY

- **Additions** *(continued)*
  - Performance
    - Addition alone
    - E+A+A

§ 150.2 - SUMMARY

- **Alterations**
  - Prescriptive
    - Install a natural gas or propane water heating system (§ 150.1(c)8)
      - No recirculation system.
    - If natural gas is not connected:
      - Install an electric water heater.
      - Storage water heaters cannot exceed 60 gallons.
      - Do not install recirculation pumps.
    - Executive decision
    - Compliance software

Enforcement of § 150.2

Plan Review (may not be necessary)

Verify efficiencies on CF1R

- Can ask for mandatory measures summary

Inspection

Visually verify equipment efficiencies

- Can ask for database print out, or manufacturer cut sheet
- Confirm on CF2R-ADD-05 or CF2R-ALT-02
- Confirm on CF2R-STH-01


DAIKIN

Resources

Online Resource Center (ORC)

Online Resource Center

The Online Resource Center is provided to assist the building community and enforcement agencies with Building Energy Efficiency Standards (Energy Standards) compliance. Energy Standards apply to newly constructed buildings, as well as additions and alterations for existing buildings. Presently, the Energy Standards are updated every three years.

To assist in the compliance process, we provide compliance documents and free Public Domain Compliance Software programs for commercial and residential buildings. Training and links to the Energy Standards and compliance software are available on the Energy Commission website and at utility training centers throughout the state. To help direct you to an appropriate resource, Energy Commission and external resource information are provided on this page.

Building Energy Efficiency Standards

2016 Energy Standards

2013 Energy Standards

Past Energy Standards

Energy Standards Information and Training Materials

Overview

Commissioning

Covered Processes

Follow

Energy Standards Questions?

- Energy Standards Hotline

Energy Standards Booth Handouts

- Handouts - 02212017 (zip file, 507 mb)
- Help with the zip file

Forms

- 2016 Residential Compliance Forms
- 2016 Nonresidential Compliance Forms

Trainings & Events

- Energy Standards Outreach & Education Schedule
- Utility Sponsored Training Schedules

Subscribe

Building Standards List Serve

Automated Email Notifications

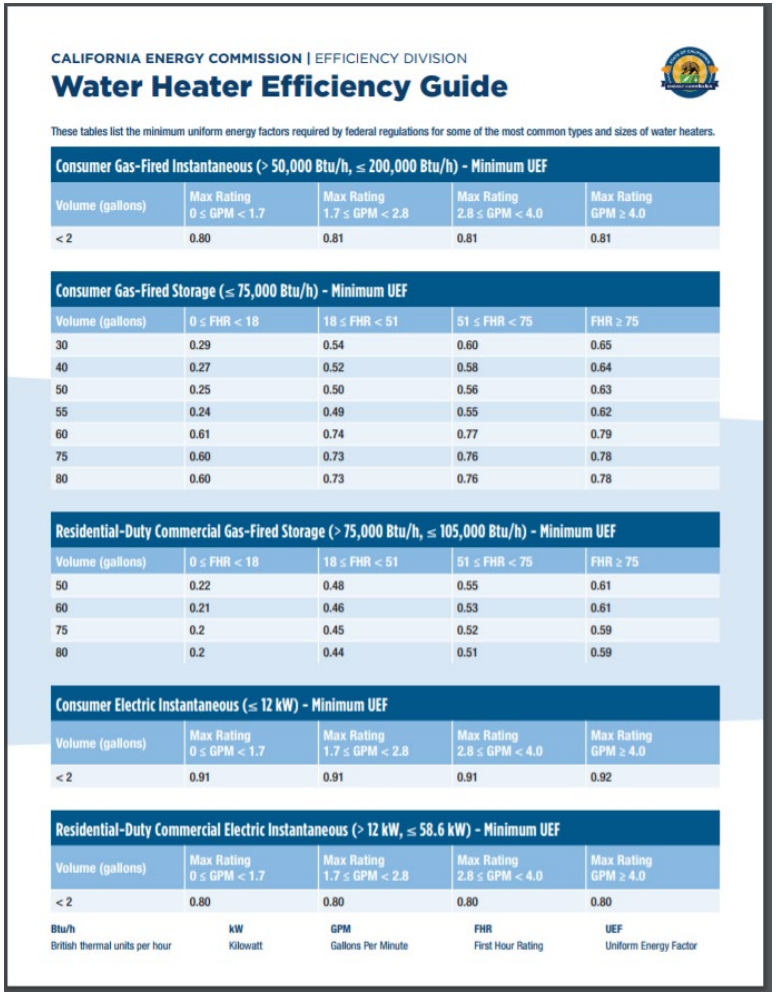
First name:

Last name:

Email address:

http://www.energy.ca.gov/title24/orc/

Water Heater Efficiency Guide



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Water Heater Efficiency Guide

These tables list the minimum uniform energy factors required by federal regulations for some of the most common types and sizes of water heaters.

Consumer Gas-Fired Instantaneous (> 50,000 Btu/h, ≤ 200,000 Btu/h) - Minimum UEF

Volume (gallons)	Max Rating 0 ≤ GPM < 1.7	Max Rating 1.7 ≤ GPM < 2.8	Max Rating 2.8 ≤ GPM < 4.0	Max Rating GPM ≥ 4.0
< 2	0.80	0.81	0.81	0.81

Consumer Gas-Fired Storage (≤ 75,000 Btu/h) - Minimum UEF

Volume (gallons)	0 ≤ FHR < 18	18 ≤ FHR < 51	51 ≤ FHR < 75	FHR ≥ 75
30	0.29	0.54	0.60	0.65
40	0.27	0.52	0.58	0.64
50	0.25	0.50	0.56	0.63
55	0.24	0.49	0.55	0.62
60	0.61	0.74	0.77	0.79
75	0.60	0.73	0.76	0.78
80	0.60	0.73	0.76	0.78

Residential-Duty Commercial Gas-Fired Storage (> 75,000 Btu/h, ≤ 105,000 Btu/h) - Minimum UEF

Volume (gallons)	0 ≤ FHR < 18	18 ≤ FHR < 51	51 ≤ FHR < 75	FHR ≥ 75
50	0.22	0.48	0.55	0.61
60	0.21	0.46	0.53	0.61
75	0.2	0.45	0.52	0.59
80	0.2	0.44	0.51	0.59

Consumer Electric Instantaneous (≤ 12 kW) - Minimum UEF

Volume (gallons)	Max Rating 0 ≤ GPM < 1.7	Max Rating 1.7 ≤ GPM < 2.8	Max Rating 2.8 ≤ GPM < 4.0	Max Rating GPM ≥ 4.0
< 2	0.91	0.91	0.91	0.92

Residential-Duty Commercial Electric Instantaneous (> 12 kW, ≤ 58.6 kW) - Minimum UEF

Volume (gallons)	Max Rating 0 ≤ GPM < 1.7	Max Rating 1.7 ≤ GPM < 2.8	Max Rating 2.8 ≤ GPM < 4.0	Max Rating GPM ≥ 4.0
< 2	0.80	0.80	0.80	0.80

Btu/h British thermal units per hour
kW Kilowatt
GPM Gallons Per Minute
FHR First Hour Rating
UEF Uniform Energy Factor

Blueprint

- Quarterly newsletter
- Clarifications on frequently asked questions

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BLUEPRINT

California Energy Commission
Efficiency Division

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Prescriptive Requirements

The refrigerant charge and duct insulation requirements apply as with any other system.

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www.energy.ca.gov/efficiency/blueprint/

Email Lists

Receive updates on the Energy Standards

Subscribe to the following Efficiency emails:

- Building Standards – www.energy.ca.gov/title24/orc
- Blueprint – www.energy.ca.gov/efficiency/blueprint

Respond to confirmation email within 24 hours

Approved Compliance Software

Used to show compliance with the Energy Standards when using the performance approach

Residential

- CBECC-Res
- Energy Pro
- Wrightsoft Right-Energy

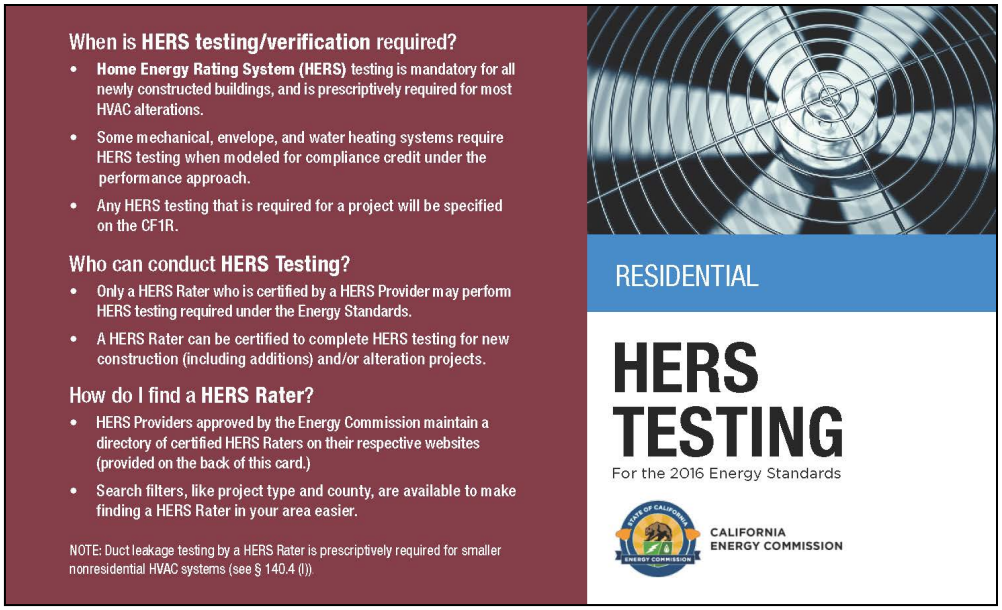
Nonresidential

- CBECC-Com
- Energy Pro
- IES Virtual Environment

www.energy.ca.gov/title24/2016standards/2016_computer_prog_list.html

HERS Counter Card

- Available online
- Intended to assist counter staff
- Inform applicants about HERS testing and verification



When is **HERS testing/verification** required?

- **Home Energy Rating System (HERS)** testing is mandatory for all newly constructed buildings, and is prescriptively required for most HVAC alterations.
- Some mechanical, envelope, and water heating systems require HERS testing when modeled for compliance credit under the performance approach.
- Any HERS testing that is required for a project will be specified on the CF1R.

Who can conduct **HERS Testing?**

- Only a HERS Rater who is certified by a HERS Provider may perform HERS testing required under the Energy Standards.
- A HERS Rater can be certified to complete HERS testing for new construction (including additions) and/or alteration projects.

How do I find a **HERS Rater?**

- HERS Providers approved by the Energy Commission maintain a directory of certified HERS Raters on their respective websites (provided on the back of this card.)
- Search filters, like project type and county, are available to make finding a HERS Rater in your area easier.

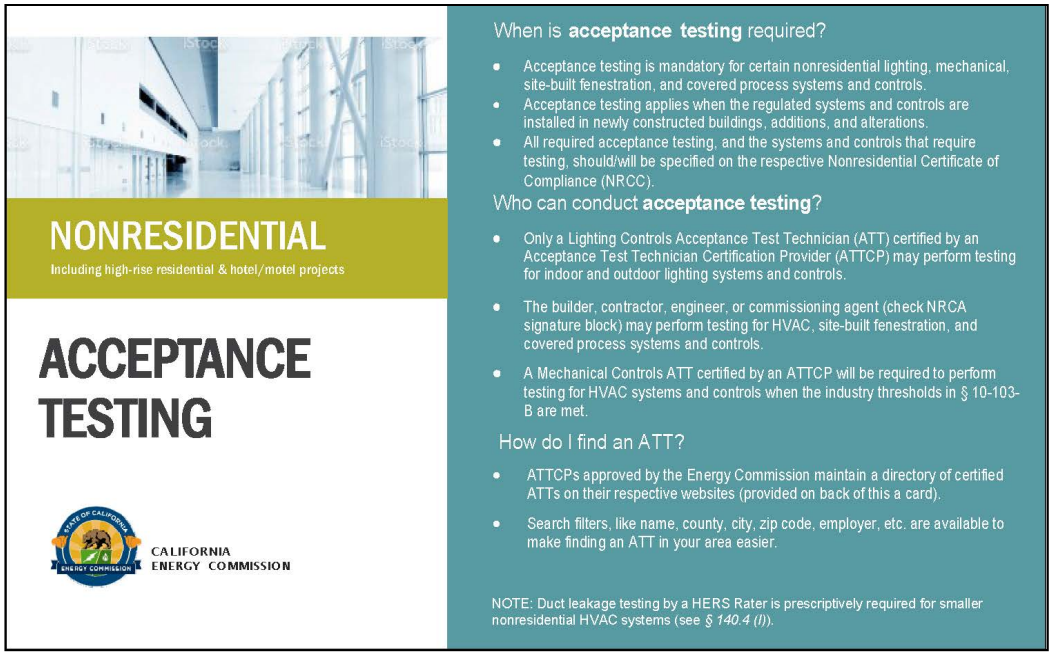
NOTE: Duct leakage testing by a HERS Rater is prescriptively required for smaller nonresidential HVAC systems (see § 140.4 (l)).

Approved HERS Providers

- CalCERTS - New construction, HVAC alterations, and whole house ratings
- CHEERS - New construction and HVAC alterations

www.energy.ca.gov/HERS/providers_2016standards.html

ATTCP Counter Card



- Available online
- Intended to assist counter staff
- Inform applicants about acceptance testing

Approved ATTCPs

Lighting ATTCPs

- CALCTP
- NLCAA

Mechanical ATTCPs

- NEMIC (also referred to as TABB)
- NEBB
- CSPTC

www.energy.ca.gov/title24/attcp/

ENERGY STANDARDS HOTLINE

Available to help with Energy Standards (Title 24, Part 6) questions.

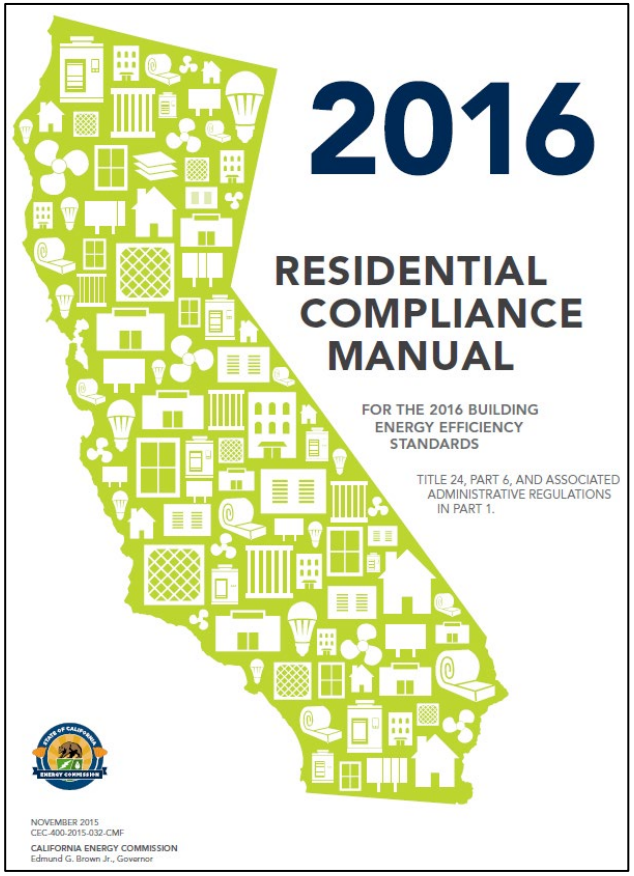
title24@energy.ca.gov

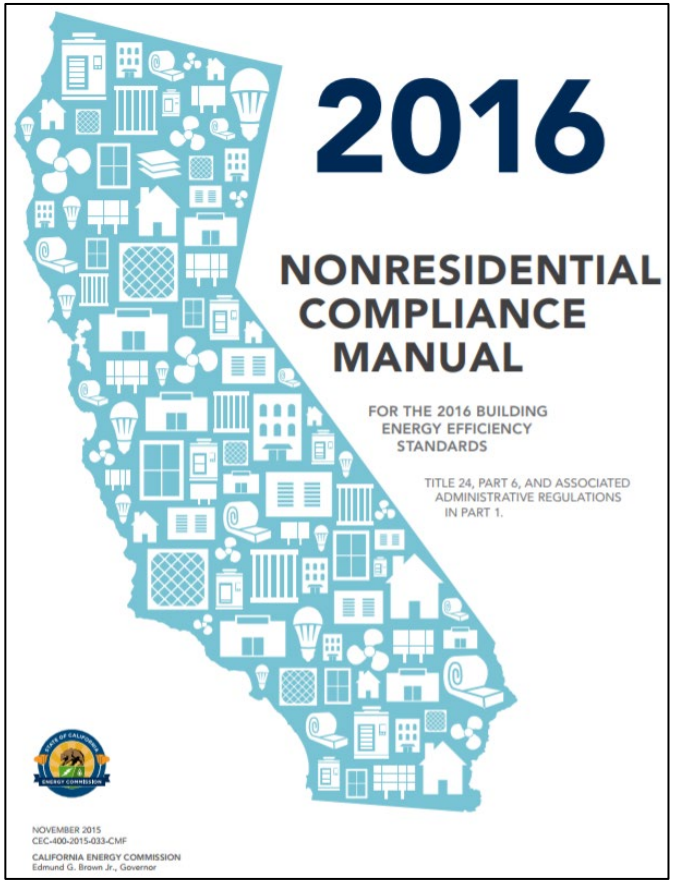
800-772-3300 Toll free in CA

916-654-5106 Outside CA

HOURS 8 a.m.–12 p.m. **and** 1 p.m.–4:30 p.m.

Compliance Manuals





Energy Code Ace

Don't gamble on Title 24, Part 6 and Title 20 compliance.
Ace it with:

- Forms and resources
- Free training (in person and online)
- Checklists and trigger sheets

www.energycodeace.com

Questions