MATERIAL AND WARRANTY INFORMATION

Specifications and Warranties

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8.2.1(d) Response to failure signal (how to request replacement of the alarm or battery should failure occur within the warranty period)

8.2.2 Both verbal and written educational information shall be provided about:

8.2.2(a) CO and its effects on the human body

8.2.2(b) The symptoms associated with CO poisoning

8.2.3 Tamper-resistant CO alarm installations

8.2.3(a) The landlord or property owner will be provided a wrench for removal of tamper-resistant screws.

8.3. Clean-Up and Disposal Requirements

8.3.1 Packaging materials that include manufacturer's instructions or warranty information will be given to the customer.

8.3.2 All other installation and packaging materials shall be removed from the premises and disposed of properly.

8.3.3 Recycle CO alarms and batteries according to local requirements.

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life

9.1.1 LIHEAP: 4 years

9.1.2 DOE: Not applicable to this measure

9.2 Battery-powered CO alarms shall:

9.2.1 Be Underwriters Laboratories (UL)-tested and UL-listed to the latest American National Standards Institute/UL 2034 standard and on the state fire marshal's list of approved products

9.2.2 Be single-purpose alarms (CO only)

9.2.3 Be equipped with a non-rechargeable, non-removable, lithium-type (minimum 10-year life) battery

9.2.4 Have an electrochemical sensor and a digital readout that displays the current CO level as low as 10 parts per million

9.2.5 Provide audible and visual warning signals when an internal malfunction occurs (e.g., electrical short or failure), the sensor's life has expired, or the battery is at the end of its useful life

9.3 Hardwired CO alarms shall also:

9.3.1 Have factory-installed lithium battery back-up

9.3.2 Be interconnected when required by the local jurisdiction

10. WARRANTY

10.1 Manufacturer—10 years

10.2 Contractor—1 year

7.2.2 Single-Family

7.2.2(a) If required by local code, the excerpt from the local code must be included in the client file or provided to CSD upon request.

7.2.3 Mobile Home

7.2.3(a) Requirements for mobile homes are the same as those for single-family homes.

8. POST-INSTALLATION GUIDELINES

8.1. Quality Check

8.1.1 Each installed alarm shall be tested.

8.2. Client Education

8.2.1 All Alarm Installations

8.2.1(a) Both verbal and written instructions shall be provided regarding:

8.2.1(a1) Maintenance of the alarm (e.g., periodic cleaning, protection from being painted, battery replacement, etc.)

8.2.1(a2) Testing of the alarm

8.2.1(a3) Response to an activated alarm

8.2.1(a4) Response to failure signal (how to request replacement of the alarm should failure occur during the warranty period)

8.2.2 Tamper-Resistant Alarm Installations

8.2.2(a) The landlord or property owner will be provided a wrench for removal of tamper-resistant screws.

8.3. Clean-Up and Disposal Requirements

8.3.1 Packaging materials that include manufacturer's instructions or warranty information will be given to the customer.

8.3.2 All other installation and packaging materials shall be removed from the premises and disposed of properly.

8.3.3 Recycle smoke alarms and batteries according to local requirements.

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life

9.1.1 LIHEAP: 4 years

9.1.2 DOE: Not applicable to this measure

9.2 All alarms shall be:

9.2.1 Listed to Underwriters Laboratories (UL) 217

9.2.2 Single-purpose alarm (smoke only)

9.2.3 NFPA-approved photoelectric or ionization-type

9.2.4 On the state fire marshal's list of approved smoke alarms and have these features:

9.2.4(a) Date of manufacture on the alarm label

9.2.4(b) Test and hush buttons to check alarm electronics and temporarily silence unwanted nuisance alarms

9.2.4(c) End-of-life feature that indicates the alarm must be replaced

9.3 Battery-powered alarms shall have non-replaceable, non-removable batteries capable of powering the alarm for a minimum of 10 years.

9.4 Hardwired alarms:

9.4.1 Shall be 120-volt AC

9.4.2 Must have factory-installed lithium battery backup

9.4.3 Will be interconnectable when required, as described in Interconnected Alarms

9.4.3(a) When a hardwired, interconnected alarm is replaced, the replacement alarm shall be compatible with the existing system.

10. WARRANTY

10.1 Manufacturer—10 years

10.2 Contractor—1 year

8.2.1(e5) Icing of the evaporator coil during cooling mode

8.2.1(e6) Outside unit never defrosts

8.2.1(e7) Unusual noises or odors

8.2.1(e8) Warranty information

8.2.1(f) Issues regarding multiple systems running will be discussed with occupant

8.2.1(g) Equipment manuals and warranties

8.3. Clean-Up and Disposal Requirements

8.3.1 Replaced parts, filters, and debris shall be removed from the property and disposed of properly.

8.3.2 All hazardous waste materials shall be disposed of in accordance with federal, state, and local code.

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life

9.1.1 Air Conditioner, Furnace, or Heat Pump

9.1.1(a) LIHEAP: 19 years

9.1.1(b) DOE: 15 years (Furnace: 20 years)

9.1.2 Evaporative Cooler or Wall Heater

9.1.2(a) LIHEAP: 15 years

9.1.2(b) DOE: 15 years

9.1.3 Window/Wall Air Conditioner

9.1.3(a) LIHEAP: 14 years

9.1.3(b) DOE: 14 years

9.2 All Heating and Cooling Units

9.2.1 Appliance Sizing and Selection

9.2.1(a) Building heating and cooling loads, used for equipment sizing and selection, shall be determined based on any one of the following:

9.2.1(a1) ACCA Manual J, or

9.2.1(a2) Sheet Metal and Air Conditioning Contractors National Association (SMACNA) Residential Comfort System Installation Standards Manual, or

9.2.1(a3) American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) Handbook (Equipment, Applications and Fundamentals Volumes)

9.2.1(a4) Equipment selection will be performed in accordance with ANSI/ACCA Manual S and manufacturer specifications

9.2.1(b) The unit shall be sized to meet the minimum requirements, but not larger than necessary and in accordance with Title 24 and local code.

9.2.2 Air Filter

9.2.2(a) Filters shall be selected in accordance with those prescribed in Section 10 Air Filters.

9.2.3 Ducts and Sealants

9.2.3(a) Materials shall conform with those prescribed in Section 8 Ducting Repair, Sealing, and Insulation.

9.2.4 Thermostats

9.2.4(a) Programmable, smart, and manual wall thermostats shall be selected in accordance with Section 7 Thermostats—Smart, Programmable, and Manual.

9.2.5 Gas Pipes and Valves

9.2.5(a) Gas valves must be UL-listed and American Gas Association (AGA)- or Canadian Standards Association (CSA)-certified.

9.2.5(b) Gas flexible connectors must be International Association of Plumbing and Mechanical Officials (IAPMO)–listed epoxy-coated or stainless-steel units.

9.2.5(c) Pilot tubing shall be aluminum. Copper is not allowed.

9.2.5(d) Fuel-gas piping shall be selected, sized, and installed per CMC, Chapter 13. Copper gas lines are not allowed.

9.2.6 Vent Pipes

9.2.6(a) Metal vent pipes

9.2.6(a1) All metal vent pipes, vent connectors and components shall be UL-listed.

9.2.6(a2) Gas vent pipe shall be Type B or B-W.

9.2.6(b) Non-metallic combustion air and vent pipes

9.2.6(b1) Pipes and fittings shall be labeled to conform to American Society of Testing and Materials (ASTM) D 1785 and D 2665.

9.2.6(b2) Pipe cement and primer shall be labeled to conform to ASTM D 2564.

9.2.7 Refrigerant Theft Protection

9.2.7(a) Locking caps shall be brass with integral O-ring and a covering that is color-coded or labeled for the refrigerant type.

9.3 Central Cooling

9.3.1 The AC shall have a minimum seasonal energy efficiency ratio 2 (SEER2) and energy efficiency ratio 2 (EER2) depending on AC type:

9.3.1(a) Package units

9.3.1(a1) Minimum SEER2 of 13.4 and EER2 of 10.6

9.3.1(b) Split systems

9.3.1(b1) Less than 45 kBtuh: minimum SEER2 of 14.3 and EER2 of 11.7

9.3.1(b2) Greater than or equal to 45 kBtuh: minimum SEER2 of 13.8 and EER2 of 11.2

9.3.1(b3) If the split system is rated SEET of 16.0 or greater, the unit must have a minimum EER2 rating of 9.8.

9.3.2 SEER shall be determined by the coil and condenser combination as listed in the current AHRI directory.

9.4 Central Heat Pumps

9.4.1 Package units

9.4.1(a) Minimum heating season performance factor 2 (HSPF2) of 6.7

9.4.1(b) Minimum SEER2 of 13.4

9.4.2 Split systems

9.4.2(a) Minimum HSPF2 of 7.5

9.4.2(b) Minimum SEER2 of 14.3

9.4.3 The SEER2 and HSPF2 shall be determined by the coil and condenser combination as listed in the current AHRI Directory.

9.4.4 Dual fuel heat pumps: The furnace shall conform with Central Furnace.

9.5 Mini-Split Heat Pumps

9.5.1 All ductless mini split heat pumps shall:

9.5.1(a) Be ENERGY STAR®–certified

9.5.1(b) Have a minimum 15 SEER, 12.5 energy efficiency ratio (EER), and 8.5 HSPF

9.5.1(c) Be a wall-mount, floor-mount, or ceiling cassette type

9.5.1(d) Include a programmable thermostat

9.5.2 Indoor and outdoor units performance shall be verified by AHRI listing.

9.5.3 In colder climates with >3,600 heating degree days (HDD), units must comply with National Energy Efficiency Guidelines (NEEP) guidelines.

9.6 Wall/Window AC

9.6.1 All replacement window/wall-mounted ACs and heat pumps shall be:

9.6.1(a) UL-listed and ENERGY STAR®–certified

9.6.1(b) Equipped with:

9.6.1(b1) Minimum two-speed fan

9.6.1(b2) Adjustable thermostat with a minimum of six positions

9.6.1(b3) Removable filter

9.6.1(b4) Minimum four-way air directional control

9.6.1(c) Rated with a minimum combined EER compliant with Table 4-3

TABLE 4-3: MINIMUM COMBINED EER

Appliance	Cooling Capacity (Btuh) with Louvered Sides	Minimum Combined EER	Cooling Capacity (Btuh) without Louvered Sides*	Minimum Combined EER
Window/Wall AC	<6,000	11.0	<6,000	10.0
	≥6,000–7,999	11.0	≥6,000–7,999	10.0
	≥8,000–13,999	10.9	≥8,000–10,999	9.6
	≥14,000–19,999	10.7	≥11,000–13,999	9.5
	≥20,000–27,999	9.4	≥14,000–19,999	9.3
	≥28,000	9.0	≥20,000	9.4
Room AC Heat Pump	<20,000	9.8	<14,000	9.3
	≥20,000	9.3	≥14,000	8.7
Casement-Only Room AC	Any	9.5	Any	9.5
Casement-Slider Room AC	Any	10.4	Any	10.4
*Without louvered sides = Through-the-wall units				

9.6.1(d) Wall units must be equipped with a through-the-wall chassis (sleeve).

9.6.1(e) Unit sizing: The new unit shall comply with manufacturer's recommendations and the sizing guidelines outlined in Table 4-4

TABLE 4-4: REPLACEMENT UNIT CAPACITY BASED ON SQUARE FOOTAGE OF AREA TO BE COOLED

Area to Be Cooled (Sq. Ft.)	Capacity (Btuh)*
100–150	5,000
151–250	6,000
251–300	7,000
301–350	8,000
351–400	9,000
401–450	10,000
451–500	12,000
501–700	14,000
701–1,000	18,000

*Adjustments:
If the room is heavily shaded, reduce capacity by 10%.
If the room is very sunny, increase capacity by 10%.
If more than two people regularly occupy the room, add 600 Btuh for each additional person.
If the unit is installed in a kitchen, increase capacity by 4,000 Btuh.

9.7 Cooling—Evaporative

9.7.1 All Units

9.7.1(a) UL-listed (or equivalent) and compliant with UL 507.

9.7.1(b) Surface burning characteristics shall be per UL 723 and ASTM E-84.

9.7.1(c) Air movement shall have been factory-tested per ANSI/Air Movement and Control Association Standard 210.

9.7.1(d) Equipped with a code-compliant automatic cleaning device, such as an automatic flushing system (e.g., timed purging).

9.7.1(d1) A bleed-off system may be used only when allowed by the local jurisdiction.

9.7.1(e) Installed unit sizing requirements per Table 4-5:

TABLE 4-5: COOLER SIZING GUIDELINES

Cooler Capacity (Airflow in CFM)	Maximum Sq. Ft. Area	
	At 3.0 CFM per sq. ft. (22 air changes/hour [ACH]) (Average Climate)	At 4.0 CFM per sq. ft. (30 ACH) (Hot, Dry Climate)
3000	1000	750
3500	1165	875
4000	1330	1000
4500	1500	1125
5000	1665	1250
5500	1830	1375
6000	2000	1500
6500	2165	1625

9.7.2 Media—Standard Pads (Fig. 4-34)

9.7.2(a) Pads shall be:

9.7.2(a1) Aspen excelsior bound in netting or

9.7.2(a2) Honeycomb cellulose fiber pad or

9.7.2(a3) The type specified by the cooler manufacturer

9.7.2(b) All pads shall have minimum 1" thickness. (Two thinner pads may be used to achieve 1" thickness.)

9.7.2(c) The size shall be as specified by the cooler manufacturer.

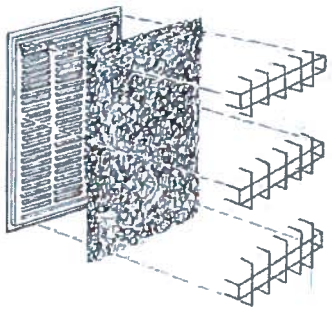

FIG. 4-34: STANDARD EXCELSIOR COOLER PAD

9.7.3 Media—High-Efficiency (Fig. 4-35)

9.7.3(a) Only rigid media shall be used.

9.7.3(b) The size shall be as specified by the cooler manufacturer.

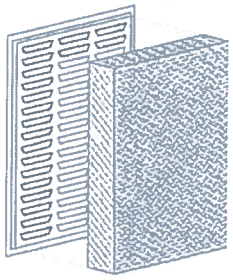

FIG. 4-35: HIGH-EFFICIENCY COOLER PAD

9.7.4 Replacement Blower Motor

9.7.4(a) The replacement motor shall be:

9.7.4(a1) UL-listed or a UL-recognized component designed for moist conditions

9.7.4(a2) Equipped with thermal overload protection

9.7.4(a3) Wired for at least two speeds

- Exception: If the existing motor is single-speed, the replacement may be single-speed.

9.7.4(a4) Rated at 115/120 volts, 60 Hz, single phase

9.7.5 Replacement belts shall be general purpose "A" or "4L" section utility belts.

9.7.6 Pump Requirements

9.7.6(a) The pump shall be:

9.7.6(a1) A UL-listed or a UL-recognized component

9.7.6(a2) A grounded UL-recognized motor with thermal overload protection

9.7.6(a3) Protected from water damage to the motor winding (e.g., by shaft sleeve, skirting, etc.)

9.7.6(b) The pump shall have a molded screen or other factory-supplied screening device to keep debris out of the impeller.

9.7.7 Water Supply Shut-Off Valve and Fittings

9.7.7(a) Valves and fittings shall be brass only.

9.7.7(b) A self-tapping needle valve is not allowed.

9.7.8 Drain Line

9.7.8(a) Acceptable drain line materials include copper, PVC, and galvanized pipe.

9.7.9 Supports

9.7.9(a) Window-/wall-mount cooler supports:

9.7.9(a1) All metal brace support material shall be minimum ¾" x ¾" angle iron or equivalent.

9.7.9(a2) All metal shall be primed, anodized, painted, galvanized, or corrosion-resistant (e.g., aluminum).

9.7.9(b) Metal frame components

9.7.9(b1) Use minimum ¾" x ¾" 16-gauge angle iron or equivalent for the support stand.

9.7.9(b2) All metal shall be primed, anodized, painted, galvanized, or corrosion-resistant (e.g., aluminum).

9.7.9(c) Materials for wooden platforms shall be:

9.7.9(c1) Exterior-grade

9.7.9(c2) Sealed with exterior primer and paint

9.7.9(d) Window/wall cooler attachments shall comply with the manufacturer's minimum specifications; however:

9.7.9(d1) Non-corrosive screws or lag bolts shall be used

9.7.9(d2) Nails and molly bolts are not allowed

9.7.9(e) Framing

9.7.9(e1) Use minimum 2x4 pressure-treated lumber or redwood.

9.7.9(f) Plywood for bracing and sheathing

9.7.9(f1) Use exterior-grade materials.

9.7.10 Supply Lines

9.7.10(a) Replacement supply lines shall be minimum ¼" OD copper tubing.

9.8 Central Furnace

9.8.1 Conventional Home Furnaces

9.8.1(a) Units shall conform with the requirements of the current California Building Code (CBC), CMC, DOE, Title 24 Residential Compliance Manual, and Title 20 Appliance Efficiency Regulations.

9.8.1(b) Unit efficiency shall be verified by inclusion in the California Energy Commission (CEC) database of certified appliances.

9.8.1(c) All units and components shall be UL-listed and/or certified by CSA, AGA, or AHRI.

9.8.1(d) Split systems

9.8.1(d1) Minimum annual fuel utilization efficiency (AFUE) rating: 80%

9.8.2 Package Units (Dual Packs)

9.8.2(d1) Minimum AFUE rating: 81%

9.8.2(d2) If replaced in conjunction with the furnace, the AC shall have a minimum SEER2 of 13.4.

9.8.3 Oil-Fired Furnaces

9.8.3(a) Split system minimum AFUE rating: 83%

9.8.3(b) Package unit minimum AFUE rating: 78%

9.8.3(c) Mobile home minimum AFUE rating: 75%

9.8.4 Mobile Home Furnaces

9.8.4(a) Units installed in a mobile home shall be listed for use in a mobile home.

9.8.4(b) Units shall be sealed combustion when inside the living space.

9.8.5 Mobile Home Gas Furnaces

9.8.5(a) Minimum AFUE rating: 80%

9.8.5(b) Materials installed inside a mobile home shall comply with HCD regulations.

9.8.5(c) Materials installed outside a mobile home shall comply with HCD regulations or, as applicable, the requirements of the local building department.

9.9 Floor/Wall and Freestanding Furnace

9.9.1

Units shall conform with the requirements of the current CBC, CMC, DOE, Title 24 Residential Compliance Manual, and Title 20 Appliance Efficiency Regulations.

9.9.2

Installed appliances shall be:

9.9.2(a) UL-listed and/or certified by CSA or AGA

9.9.2(b) Closed combustion and listed for use in a mobile home when installed in a mobile home

9 9 2(c) The most efficient model feasible to install, but no lower in efficiency than specified in Table 4-6

TABLE 4-6: MINIMUM HEATING EFFICIENCY FOR NON-DUCTED, NON-CENTRAL, GAS-FIRED HEATING EQUIPMENT

Furnace Type	Btuh Output Capacity	Minimum AFUE (%)
Wall Furnace with Fan	≤42,000	75%
	>42,000	76%
Wall Furnace without Fan	≤27,000	65%
	≥27,001–≤46,000	66%
	>46,000	67%
Floor Furnace	≤37,000	57%
	>37,000	58%
Freestanding Room Heater	≤20,000	61%
	>20,000–≤27,000	66%
	>27,000–≤46,000	67%
	>46,000	68%
Source: Title 24 2022 Residential Compliance Manual, Section 4.2		

9.10 Wood Stove/Fireplace Insert

9.10.1 Wood Stove/Insert

9 10 1(a) Only new wood stove/insert manufacturer–approved, factory-built, and laboratory-listed equipment and other hardware shall be installed.

9 10 1(b) All wood stoves/inserts shall bear a permanently-affixed label stating "For use with solid fuel only."

9 10 1(c) Where applicable, any installed wood stove/insert shall comply with the EPA Phase II emission limits and shall bear temporary label(s) certifying it conforms to EPA emission standards.

9.10.2 Units Installed in Mobile Homes

9 10 2(a) Units installed in mobile homes shall:

9 10 2(a1) Draw CVA from outdoors and

9 10 2(a2) Bear a permanent manufacturer's label stating the wood stove/insert is approved for use in mobile homes

9.10.3 Chimneys, Connectors, and Components

9 10 3(a) Chimneys and connectors must be factory-built, laboratory-listed, Class A–types specified by the manufacturer, including:

9 10 3(a1) A ceiling support package when a vent connector is used

9 10 3(a2) An insulation shield when penetrating an attic

9 10 3(a3) A chimney cap and spark arrestor

10. WARRANTY

Appliance	Manufacturer	Contractor
Central AC/Heat Pump		
Repair	90 days	1 year
Install	5 years (compressor) 1 year (other)	1 year
Central Heat Pump		
Repair	90 days	1 year
Install	5 years (compressor) 1 year (other)	1 year
Mini-Split Heat Pump		
Install	5 years	1 year
Evaporative Cooler		
Repair	90 days	1 year
Install	5 years (reservoir pan) 1 year (other)	1 year
Wall/Window AC		
Repair	90 days	1 year
Install	5 years (compressor) 1 year (other)	1 year
Central Furnace/Heat Pump		
Repair	90 days	1 year
Install	1 year	1 year
Floor/Wall and Freestanding Furnace		
Repair	90 days	1 year
Install	1 year	1 year
Wood Stove/Fireplace Insert		
Install	3 years (stove) 1 year (other)	1 year

8.3.2 All packaging materials and debris shall be cleaned up and removed from the premises.

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life:

9.1.1 LIHEAP: 10 years

9.1.2 DOE: Not applicable to this measure.

9.2 The motor component shall be:

9.2.1 Underwriters Laboratories (UL)– or Canadian Standards Association (CSA)–listed

9.2.2 A variable-speed ECM with a horsepower and torque rating that closely matches that of the existing motor and produces the required static pressure

9.3 Accessories (when required by the blower motor manufacturer or local code):

9.3.1 A digital programmer compatible with the motors it will program

9.3.2 Commercially available replacement motor mounting hardware compatible with the ECM being installed

10. WARRANTY

10.1 Manufacturer—2 years minimum

10.2 Contractor—1 year

4.2.2 Verify proper operation of the HVAC system in heating and/or cooling mode and proper thermostat voltage (24-volt AC) before attempting installation.

4.2.3 Best practice: Photograph or label the existing wiring connections for reference before commencing the installation.

4.2.4 Install the EFC as an additional control component (not to replace any existing component).

4.2.5 Operate the furnace (when it is cold outside) or the air conditioner (when it is warm outside) for the prescribed amount of time and make adjustments as needed.

4.2.5(a) The time delay for the equipment will be set as appropriate for the climate zone (e.g., no time delay for hot humid climates).

4.2.6 Attach a manufacturer's retrofit identification label and instructions to the modified appliance.

5. MOBILE HOME–SPECIFIC

5.1. Installation Requirements

5.1.1 Installation requirements for mobile homes are the same as those for conventional homes.

6. MULTI-FAMILY–SPECIFIC

6.1. Installation Requirements

6.1.1 Independent Forced Air Units (FAU)

6.1.1(a) When an individual dwelling unit has an independently operating FAU in a multi-family building, installation requirements are the same as those for conventional homes.

6.1.2 Common System (Serving Multiple Dwelling Units)

6.1.2(a) When a centralized air system serves multiple dwelling units and/or common areas (e.g., lobby, entertainment room, kitchen, etc.) in a multi-family building, the installation of this measure is not allowed.

7. DOE-SPECIFIC

7.1. Assessment Requirements

7.1.1 This measure is not a DOE measure.

8. POST-INSTALLATION GUIDELINES

8.1. Quality Check

8.1.1 Check the fan-off time delay for proper operation in heating and air conditioning modes.

8.2. Client Education

8.2.1 Explain the function of the EFC to the client.

8.3. Clean-Up and Disposal Requirements

8.3.1 All replaced parts, packing materials, and other debris shall be cleaned up and disposed of or recycled properly.

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life

9.1.1 LIHEAP: 10 years

9.1.2 DOE: Not applicable to this measure.

9.2 The EFC shall:

9.2.1 Be compatible with the HVAC or heat pump unit on which it is installed

9.2.2 Include a control module and wiring harness

9.2.3 Have the following certifications:

9.2.3(a) Low-voltage (24-volt AC) controllers: Listing not required

9.2.3(b) Line voltage (110-volt AC) controllers: Underwriters Laboratories (UL) or equivalent listing required

10. WARRANTY

10.1 Manufacturer—1 year

10.2 Contractor—1 year

8.2.4 Smart and programmable thermostats:

8.2.4(a) The thermostat shall be programmed with the client present in accordance with the manufacturer's instructions, considering the client's wishes.

8.3. Clean-Up and Disposal Requirements

8.3.1 Packaging materials (except those with usage instructions), replaced appliances, and other debris shall be removed from the premises and disposed of properly.

8.3.2 Thermostats containing mercury shall be disposed of in accordance with universal waste regulations as set forth by the Department of Toxic Substances Control (DTSC) and the Environmental Protection Agency (EPA).

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life

9.1.1 LIHEAP: 10 years

9.1.2 DOE: 15 years

9.2 All thermostats shall be compatible with the HVAC equipment they control.

9.3 Programmable thermostats shall:

9.3.1 Have a lithium or alkaline battery for power and for backup

9.3.2 Be system-powered, not battery-powered, on 24-volt systems

9.3.3 Have battery backup or another program-saving backup system

9.3.4 Be digital with a built-in anti–short cycle feature

9.3.5 Have at least four setback periods per 24-hour day with:

9.3.5(a) Change cycle increments ≤30 minutes

9.3.5(b) Setback capability ≥10°F

9.3.6 Be programmable for both weekdays and weekends

9.3.7 Have a manual override and a positive on/off switch that is easily accessible

9.4 Smart thermostats must:

9.4.1 Be ENERGY STAR–certified

9.4.2 Be certified to meet Title 24 requirements

9.4.3 Include a trim plate to cover holes from the previous installation

9.4.4 Accommodate a common ("C") wire when one is present at the installation location

9.4.4(a) Note: If a C wire in good condition is not present at the installation location, install a new C wire or an approved adapter kit (Fig. 7-2).

FIG. 7-2: C-WIRE ADAPTER KIT

9.5 Manual thermostats:

9.5.1 May be digital or analog (if requested by the customer) with a built-in anti–short cycle feature

9.5.2 Must include a positive on/off switch

9.6 Heat pump thermostats shall:

9.6.1 Be smart thermostats that minimize the use of supplementary electric resistance heating during start-up and recovery from setbacks

9.6.2 Prevent supplementary electric resistance heater operation when the heat pump alone can meet the heating load

9.6.3 Have a supplementary heat lock-out that interfaces with an outdoor temperature sensor

9.7 Wiring

9.7.1 All wiring shall be 18-gauge and conform to manufacturer's specifications and local code.

10. WARRANTY

10.1 Manufacturer—1 year

10.2 Contractor—1 year

8.3.2 Furniture and other household items moved for installation work shall be returned to their original positions.

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life

9.1.1 Duct Repair and Sealing

9.1.1(a) LIHEAP: 10 years

9.1.1(b) DOE: 10 years

9.1.2 Duct Insulation

9.1.2(a) LIHEAP: 10 years

9.1.2(b) DOE: 20 years

9.2 Ducts and Component Materials

9.2.1 Materials shall comply with:

9.2.1(a) Current Title 24 Residential Compliance Manual, Chapter 4

9.2.1(b) Current California Mechanical Code (CMC), Chapter 6

9.2.2 Only exterior-rated ducts and components shall be used when installed outdoors or in weather-exposed areas.

9.2.3 Rigid Metal Duct and Sheet Metal Components

9.2.3(a) All rigid metal ducts, plenums, and metal components shall be of non-corrosive metal.

9.2.4 All Flexible Duct

9.2.4(a) Ducts shall conform to National Fire Protection Association (NFPA) 90B and UL 181 (Class 1).

9.2.4(b) Non-metallic insulated ducts with air-permeable core not allowed.

9.2.4(c) The duct jacket (vapor barrier) shall be made of ultraviolet (UV)-resistant material (e.g., silver metalized polyester jacket).

9.2.4(d) New fittings shall be used with new flexible non-metallic duct

9.2.4(d1) All new fittings shall be beaded at each core connection (e.g., both ends of a sleeve).

9.2.4(d2) Starting collars must be 4" installed length and made of 26-gauge galvanized steel (up to 14" diameter).

9.2.4(d3) Splicing sleeves must be 6" in length and made of 26-gauge galvanized steel (up to 14" diameter).

9.2.5 Rigid fiberglass ducts shall conform with UL 181 and the current CMC.

9.2.6 Duct Board

9.2.6(a) High-density fiberglass duct board shall conform with American Society for Testing and Materials (ASTM) C726, NFPA 90B, or UL 181 (Class 1).

9.2.6(b) Foam board is not allowed as a barrier material in the repair or sealing of building cavities used as ducts, platforms, or other duct system components.

9.3 Sealants

9.3.1 Approved sealants shall be UL-listed and labeled per Table 8-3.

9.3.2 Foam sealants shall not be allowed in the sealing of building cavities used as ducts, platforms, or other duct system components.

9.3.3 Mastics and Mesh

9.3.3(a) All approved mastics shall be UL-labeled and listed as identified in Table 8-3, non-toxic, water-resistant, and rated for exterior use.

9.3.3(a1) Outdoor applications must be rated for exterior applications.

9.3.3(b) At a minimum, mesh used to reinforce duct mastic shall be:

9.3.3(b1) Fiberglass material, 9 x 9 minimum weave per inch, and 0.006" thick

9.3.3(b2) 2" minimum width for use on flexible and rigid metal ducts

9.3.3(b3) 3" minimum width for use on rigid fiberglass ducts

TABLE 8-3: APPROVED DUCT SEALING MATERIALS

Duct Type	Sealing Material	UL Identification
Rigid metal and fiberglass duct and components	Metallic tape (pressure-sensitive)	Marked 181A-P or 181A-P/181B-FX
	Heat-activated tape	Marked 181A-H
	Mastic	Labeled 181A-M or 181A-M/181B-M
Flexible ducts	Metallic tape (pressure-sensitive)	Marked 181B-FX or 181A-P/181B-FX
	Mastic	Labeled 181A-M or 181A-M/181B-M

9.3.4 Metallic Tape

9.3.4(a) Cloth-backed rubber adhesive tapes are not permitted.

9.3.4(b) Approved metallic tapes shall be listed and marked in accordance with Table 8-3.

9.3.4(c) Other tapes may be used only for the specific applications described below:

9.3.4(c1) Flexible non-metallic and flexible metallic ducts

- Cloth-backed butyl-adhesive tapes may be allowed if California Electrical Code (CEC)–approved for use in California (i.e., indicated by "CA" in the product number).

9.3.4(c2) Rigid metal ducts and components

- Butyl tape without UL 181A-P or UL 181B-FX markings may be used to seal rigid metal-to-metal connections.

9.3.4(c3) Access panels

- Use metallic tapes with non-butyl (e.g., acrylic) adhesive.

9.3.4(c4) High-temperature applications

- Use metallic tapes with non-butyl (e.g., acrylic) adhesive and a service temperature rating of at least 265°F.

9.3.5 Caulking materials shall be:

9.3.5(a) Non-toxic

9.3.5(b) Selected and applied in accordance with Section 32 Infiltration Reduction

9.4 Mechanical Fastenings

9.4.1 Screws: #8 sheet metal screws shall be used.

9.4.2 Drawbands and Clamps (Duct Ties)

9.4.2(a) Drawbands shall:

9.4.2(a1) Be weather- and UV-resistant nylon duct ties rated for outdoor use

9.4.2(a2) Have a tensile strength rating of 150 lb.

9.4.2(a3) Be marked UL 181B-C

9.4.2(b) Drawbands must be tightened with an adjustable tensioning tool in accordance with the duct manufacturer's instructions.

9.4.2(c) Clamps shall be stainless steel worm-drive clamps.

9.5 Duct Supports

9.5.1 All Ducts

9.5.1(a) Support materials shall be corrosion-resistant and shall conform to the duct manufacturer's installation instructions, Title 24 Standards, and CMC Chapter 6.

9.5.2 Flexible Ducts (Horizontal and Vertical)

9.5.2(a) Non-metallic support straps:

9.5.2(a1) Polypropylene monofilament, woven polyester, polyester scrim–reinforced vinyl laminate, or equivalent

9.5.2(a2) Minimum width: 1¾"

9.5.2(a3) Minimum tensile strength: 70 lb. per inch of width

9.5.2(b) Sheet metal support straps and saddles

9.5.2(b1) Width: 1½" minimum

9.5.2(b2) Thickness: 26-gauge minimum

9.5.3 Rigid Ducts (Horizontal and Vertical)

9.5.3(a) Horizontal rigid round metal ducts

9.5.3(a1) Up to 10" diameter

- Galvanized steel straps, same gauge as duct, 1" minimum width or
- 18-gauge galvanized steel wire

9.5.3(a2) 11"–40" diameter

- Galvanized steel straps, same gauge as duct, 1" minimum width or
- 8-gauge galvanized steel wire tied to a galvanized steel band, 1" minimum width, surrounding the duct

9.5.3(b) Vertical rigid round metal ducts

9.5.3(b1) Up to 10" diameter

- 18-gauge galvanized steel straps, 2" minimum width

9.5.3(b2) 11"–20" diameter

- 16-gauge galvanized steel straps, 2" minimum width

9.6 Duct Insulation

9.6.1 Flame-spread index not to exceed 25 and smoke-developed index not to exceed 50 where tested in accordance with ASTM E84 or UL 723.

9.6.2 R-value shall be as shown in Table 8-4, or greater if required by local code.

TABLE 8-4: DUCT INSULATION MINIMUM R-VALUES

Climate Zone	Minimum R-Value
3, 5, 6, 7	R-6
1, 2, 4, 9 – 16	R-8

9.6.3 Approved Insulation Attachment Materials

9.6.3(a) Drawbands (duct ties)

9.6.3(b) Non-corrosive wire, 20-gauge minimum

9.6.3(c) Rust-resistant nails or staples

9.6.3(d) Metallic (pressure-sensitive) tape

9.7 Mobile Home–Specific Duct Materials

9.7.1 Where material specifications are not identified specifically for mobile homes, conventional home specifications shall apply.

9.7.2 The rodent barrier shall be composed of material equivalent or superior to the existing bellyboard.

9.7.3 When crawlspace ducts are accessible to animals, only internally insulated rigid metal ducts shall be used.

9.7.4 When crawlspace ducts are not accessible to animals, flexible ducts may be installed to:

9.7.4(a) Replace damaged or deteriorated ducts (e.g., crossover ducts)

9.7.4(b) Install a new ducted return system

9.7.5 All flexible ducts for mobile homes must:

9.7.5(a) Conform to NFPA 90B and UL 181 Class 1

9.7.5(b) Have duct insulation minimum thermal resistance (R-value) ≥4.2 (when required by local code)

9.7.5(c) Have vapor barrier material as described below:

9.7.5(c1) Rated for mobile home use (e.g., with HUD markings on the jacket)

9.7.5(c2) Minimum thickness of 3.5 mils

9.7.5(c3) Maximum permeance of 1.0 perm

9.7.6 Flexible Non-Metallic Ducts

9.7.6(a) Non-metallic flexible duct core shall be fabricated with a spring steel helix bonded within non-porous material (e.g., molded composite or two-ply lamination of polyester).

9.7.7 Flexible Metallic Ducts

9.7.7(a) Metallic flexible duct core shall be fabricated from minimum 0.0065" thick aluminum material or equivalent.

9.7.8 Rigid Metal Ducts

9.7.8(a) Only galvanized or aluminum ducts shall be allowed.

9.7.8(b) The gauge of any rigid metal duct patch shall equal or exceed the gauge of the existing duct.

10. WARRANTY

10.1 Manufacturer—1 year

10.2 Contractor—1 year

8.1.4 Operation of the WHF at high speed shall not cause any combustion appliance to fail CAS testing.

8.2. Client Education

8.2.1 The client will be provided with a one-page "How to operate your whole house fan" informational sheet and instructions about required periodic maintenance.

8.2.2 Demonstrate the fan operation and controls to the occupant.

8.2.3 Explain the need to open the required number of windows or doors before turning on the fan.

8.3. Clean-Up and Disposal Requirements

8.3.1 All debris, packaging, and other materials shall be removed from the property and disposed of properly.

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life

9.1.1 LIHEAP: 20 years

9.1.2 DOE: Not applicable to this measure

9.2 WHF

9.2.1 All WHFs shall:

9 2 1 (a) Be Underwriters Laboratories (UL)-listed (or equivalent) and compliant with UL 507

9 2 1 (b) Have a thermally protected motor rated for 120-volt alternating current

9 2 1 (c) Have a minimum of two speeds or a variable speed control

9 2 1 (d) Have a minimum expected service life of 20 years

9.3 Fan Controls

9.3.1 WHF shall have:

9.3 1 (a) A wall-mounted or remote-controlled manual-on/automatic-off timer or controller that allows timed operation

9.3 1 (a1) The WHF control must not be activated by a device that turns it on automatically.

9 3 1 (b) An attic-mounted thermostatic safety limit switch that turns off the WHF when the attic temperature is above 185°F

9.4 Fan Sizing

9.4.1 The appropriate fan CFM shall be determined based on the living space volume or the desired effect using 1.5 CFM/sq. ft. of conditioned floor area.

9.5 Fan System Design

9.5.1 Inline fan: A remote fan connected with a flexible duct to a damper-equipped, ceiling-mount intake assembly/plenum and grille.

9 5 1 (a) The duct shall be UL 181 metallic flexible duct or the duct supplied with the fan.

9 5 1 (b) The plenum and duct shall be sized in accordance with Building in California's "Field Duct Sizing Chart" (available at http://buildingincalifornia.com/wp-content/uploads/2014/03/duct-sizing-chart.pdf).

9.5.2 Standard fan: A recessed, ceiling-mounted fan with a barometric shutter.

10. WARRANTY

10.1 Manufacturer warranty—3 years minimum

10.2 Contractor warranty—1 year

8. POST-INSTALLATION GUIDELINES

8.1. Quality Check

8.1.1 Ensure that filters, supports, and covers are installed properly.

8.2. Client Education

8.2.1 Occupants shall be shown how to remove and reinstall the filter.

8.2.2 The importance of timely replacement of the filters for occupant health and appliance operation shall be emphasized.

8.3. Clean-Up and Disposal Requirements

8.3.1 Old filters and debris shall be removed from the premises and disposed of properly.

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life

9.1.1 LIHEAP: 4 years

9.1.2 DOE: Not applicable to this measure.

9.2 Filters for Existing Forced Air Systems

9.2.1 A MERV 6–type filter shall be used when specifically allowed by the manufacturer of the existing system.

9.2.2 "Hog Hair" Type and Other Bonded Filters

9.2.2(a) 1" thickness shall be used in central HVAC systems.

9.2.2(b) ½" thickness shall be used in a window/wall AC.

9.2.3 Foam Filter

9.2.3(a) The filter shall be ¼" single-layer foam, 20–30 pores per inch.

9.2.3(b) A foam filter shall be installed only when a bonded fiber filter is not feasible or is prohibited by the appliance manufacturer.

9.2.4 Other Materials

9.2.4(a) "Sock"-type foam and other specialty materials shall only be installed when specified by the appliance manufacturer.

9.3 Filters for New Forced Air Systems

9.3.1 Filters shall:

9.3.1(a) Be minimum efficiency reporting value (MERV) 6 or better when installed in a new/replacement forced air unit (FAU) or filter grille

9.3.1(b) Be Underwriters Laboratories (UL)–listed Class 2 filter material

9.3.1(c) Conform to Air-Conditioning, Heating, and Refrigeration Institute (AHRI) 680 or 681 (SI) and UL-900

9.4 Support Rods and Filter Supports for Unframed Air Filters

9.4.1 Support rods shall be corrosion-resistant.

9.4.1(a) Steel rods must be galvanized.

10. WARRANTY

10.1 Manufacturer—90 days

10.2 Contractor—90 days

8. POST-INSTALLATION GUIDELINES

8.1. Quality Check

8.1.1 Combustion appliance safety (CAS) testing

8.1.1(a) If CAS or combustion appliance zone (CAZ) testing is required, a post-test shall be conducted after kitchen exhaust installation, repair, or replacement is performed. Follow the procedure outlined in Appendix A Combustion Appliance Safety Protocol.

8.1.1(b) Test all natural draft appliances as prescribed in Appendix A Combustion Appliance Safety Protocol in all locations that can be depressurized by the operating kitchen exhaust unit.

8.2. Client Education

8.2.1 The client shall be supplied with both verbal and written instructions for:

8.2.1(a) Proper operations and maintenance of the kitchen exhaust

8.2.1(b) Safety considerations

8.2.1(c) Warranty

8.2.2 The occupant/property manager shall be advised to keep the grease filters and termination fittings clean.

8.3. Clean-Up and Disposal Requirements

8.3.1 Replaced exhaust fans, parts, and debris shall be removed from the property and disposed of in accordance with local requirements.

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life

9.1.1 LIHEAP: 10 years

9.1.2 DOE: Not applicable to this measure

9.2 Duct Materials and Insulation

9.2.1 All ducts shall comply with manufacturer's instructions and local code (e.g., for flame spread rating).

9.2.2 Rigid duct:

9.2.2(a) Galvanized steel: Minimum 26-gauge

9.2.2(b) Aluminum: Minimum 24-gauge

9.2.2(c) PVC smooth plastic pipe: Minimum Schedule 80

9.2.3 Flexible duct:

9.2.3(a) Semi-rigid metallic aluminum: Minimum 0.0065" thick and UL-listed 181B

9.2.4 Duct materials and insulation shall have a maximum flame-spread index of 25 and smoke-developed index of 50 per American Society of Testing and Materials (ASTM) E84, UL 723, or National Fire Protection Association (NFPA) 255

9.2.5 The minimum R-value for duct insulation shall be in accordance with Title 24, by California Energy Commission (CEC) climate zone:

9.2.5(a) Climate zones 3, 5, 6, 7: Minimum R-value of R-6

9.2.5(b) Climate zones 1, 2, 4, 8 – 16: Minimum R-value of R-8

9.3 Motor Repair and Other Component Repairs

9.3.1 The motor shall be UL-listed or a UL-recognized component.

9.3.2 The motor and components shall be replaced with a manufacturer's replacement motor or, if necessary, a compatible model that fits without altering the motor or fan housing.

9.3.3 All exhaust fans/hoods shall be:

9.3.3(a) Listed and labeled for kitchen ventilation by a recognized laboratory, such as UL, European Testing Laboratory, or Canadian Standards Association

9.3.3(b) 100 CFM minimum, or as required per sizing calculations

9.3.3(c) Rated with a noise level of ≤3.0 sones at one or more airflow settings ≥100 CFM, in accordance with American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) 62.2

9.3.3(c1) Exception: Fans with a minimum airflow setting >400 CFM need not comply with the sone requirement.

9.4 Range Hood

9.4.1 Range hood/kitchen exhaust shall:

9.4.1(a) Be as wide as the cooktop and constructed of metal at least 0.0122" thick

9.4.1(b) Have a light and a multi- or variable-speed fan

9.4.1(c) Be equipped with a removable interior grille for wall- and ceiling-mount fans

9.4.1(d) Have exhaust ducts of metal with a smooth interior surface

9.4.1(e) Include a roof flashing system and roof cap for vertical ducts that provide a watertight seal

9.4.1(f) Have durable and waterproof exterior wall components and siding attachments

9.5 Exhaust Terminal

9.5.1 The terminal shall be constructed of aluminum, sheet metal, or ultraviolet (UV)-protected plastic and equipped with maximum ½" weave rodent or insect screen.

9.6 Backdraft Damper

9.6.1 A metal gravity-type backdraft damper shall be located in the fan housing, in the vent duct, or in the wall or roof termination assembly.

9.7 Mobile Home Sidewall Exhaust Fans

9.7.1 The unit shall be designed to fit the wall thickness at the mounting location.

9.8 Kitchen Exhaust Serving as Mechanical Ventilation

9.8.1 When the kitchen exhaust model will be used for dwelling mechanical ventilation, the unit must conform with the sone, fan size limits, and other mechanical requirements in Section 12 Mechanical Ventilation.

9.8.1(a) The maximum fan size for an MV system installed in the kitchen exhaust location is 90 CFM.

9.8.1(b) Intermittent MV units in a kitchen exhaust location shall be certified by the manufacturer to comply with Title 24.

10. WARRANTY

10.1 Manufacturer—1 year

10.2 Contractor—1 year

8.2.3(b) The system operation guide or a label indicating the presence and purpose of the MV system shall be permanently posted:

8.2.3(b1) At the indoor electrical panel (or subpanel), when present, or

8.2.3(b2) When there is no indoor electrical panel, in full sight elsewhere indoors in a location approved by client

8.2.3(c) The operation guide/label format shown in Fig. 12-11 shall be utilized.

8.3. Clean-Up and Disposal Requirements

8.3.1 Decommissioning Existing Exhaust or Supply Ventilation Systems

8.3.1(a) Power supply/conductors shall be disconnected and properly terminated in a visible junction box.

8.3.1(b) Fan components (housing, fan, and ducting) that cannot be reused shall be removed and disposed of lawfully.

8.3.1(c) An existing duct, if abandoned, may be removed, and the hole may be closed off and insulated to preserve the thermal and pressure boundary.

8.3.1(d) All shell and duct leakage bypasses created by the installation of MV shall be air-sealed.

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life

9.1.1 LIHEAP: 10 years

9.1.2 DOE: Not applicable to this measure

9.2 Airflow Measuring Device

9.2.1 The device shall:

9.2.1(a) Measure airflow in CFM with a range of 10–120 CFM

9.2.1(b) Have a resolution of at least 1.0 CFM or exhaust fan flow measurement accuracy of 10%

9.2.2 Acceptable devices include:

9.2.2(a) An exhaust fan flow meter with a digital gauge (up to 124 CFM, exhaust only)

9.2.2(b) A flow capture hood

9.2.2(c) The Minneapolis Duct Blaster® with a powered capture hood (exhaust or supply with a range of 10–300 CFM)

9.2.2(d) A large vane anemometer with averaging or snapshot capability and with a display showing airflow in CFM

9.2.2(d1) Multiple readings across the fan are required without a funnel/hood; a single reading is acceptable with a funnel/hood.

9.3 MV System Components (Fans, Controllers, and Ducts)

9.3.1 General Specifications:

9.3.1(a) Components shall be:

9.3.1(a1) ASHRAE 62.2 2016–compliant for whole-house MV use

9.3.1(a2) Underwriters Laboratories (UL)–listed or equivalent

9.3.2 Fans:

9.3.2(a) Fans shall be rated for continuous operation at the required CFM.

9.3.2(b) Certification for specific fan types:

9.3.2(b1) Ceiling-mount exhaust or inline exhaust: ENERGY STAR®–certified

9.3.2(b2) Wall-mount exhaust or supply: Home Ventilating Institute (HVI)–certified

9.3.2(b3) Inline supply: ENERGY STAR– or HVI-certified

9.3.2(b4) HRV or ERV: HVI-certified

9.3.2(b5) Whole-house ventilation/kitchen exhaust combination unit: ENERGY STAR–certified

9.3.2(c) Sound (sone) level:

9.3.2(c1) Sone level certification for a continuously operating whole-house MV system shall not exceed 1.0 sone, in accordance with ASHRAE 62.2.

- Exception: The 1.0-sone limit does not apply to an in-line or remote fan with at least 4' of ducting between the fan unit and the indoor termination/grille.

9.3.3 Fan controllers shall be rated for:

9.3.3(a) Automatic, continuous, and intermittent operation

9.3.3(b) An amperage that meets or exceeds the fan load

9.3.4 Duct Materials and Insulation

9.3.4(a) All ducts shall comply with manufacturer's instructions and local code (e.g., for flame spread rating).

9.3.4(b) Rigid duct:

9.3.4(b1) Galvanized steel: Minimum 26-gauge

9.3.4(b2) Aluminum: Minimum 24-gauge

9.3.4(b3) PVC smooth plastic pipe: Minimum Schedule 80

9.3.4(c) Flexible duct:

9.3.4(c1) Semi-rigid metallic aluminum: Minimum 0.0065" thick and UL-listed 181B

9.3.4(d) Duct materials and insulation shall have a maximum flame-spread index of 25 and smoke-developed index of 50 per American Society of Testing and Materials (ASTM) E84, UL 723, or National Fire Protection Association (NFPA) 255

9.3.4(e) The minimum R-value for duct insulation shall be in accordance with Title 24, by California Energy Commission (CEC) climate zone:

9.3.4(e1) Climate zones 3, 5, 6, 7: Minimum R-value of R-6

9.3.4(e2) Climate zones 1, 2, 4, 8 – 16: Minimum R-value of R-8

9.3.5 Duct Intakes,Terminations, and Dampers

9.3.5(a) Intakes and terminations shall be constructed of aluminum, sheet metal, or ultraviolet (UV)-protected plastic and equipped with corrosion-resistant ¼"–½" weave insect/rodent screen.

9.3.5(b) A compatible metal or plastic damper shall be present in the system.

9.3.6 MV Air Filters

9.3.6(a) All air filters shall be tested to an efficiency of MERV 6 in accordance with American National Standards Institute (ANSI)/ASHRAE Standard 52.2.

9.3.6(b) Pressure drop across filter will match equipment capabilities.

9.3.7 Passive inlet vents shall have:

9.3.7(a) An indoor fresh air inlet with:

9.3.7(a1) A replaceable or washable filter for incoming air

9.3.7(a2) Manual flow control (e.g., shutter or louver) to control incoming air

9.3.7(a3) A through-the-wall sleeve/duct that is adjustable to the wall thickness

9.3.7(b) An outdoor inlet that:

9.3.7(b1) Protects from wind and precipitation (e.g., with hood and/or louvers)

9.3.7(b2) Has an insect/rodent screen

10. WARRANTY

10.1 Manufacturer—1 year

10.2 Contractor—1 year

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life

9.1.1 Water Heater Repair

9.1.1(a) LIHEAP: 4 years

9.1.1(b) DOE: Not applicable to this measure

9.1.2 Water Heater Replacement/Energy Efficiency Upgrade

9.1.2(a) LIHEAP: 10 years

9.1.2(b) DOE: 13 years

9.2 Component Parts (All Water Heater Types)

9.2.1 Drain pan: Corrosion-resistant metal pan not less than 1½" in depth with a ¾" drain

9.2.2 Water Pipes

9.2.2(a) Installed water lines and valves must be lead-free.

9.2.2(b) Flexible metallic (copper and stainless steel), reinforced flexible, braided stainless steel, or polymer braided with ethylene propylene dimonomer core connectors that connect a water heater to the piping system shall comply with American Society of Mechanical Engineers (ASME) A112.18.6/Canadian Standards Association (CSA) B125.6.

9.2.2(c) Copper, copper alloy, or stainless steel flexible connectors shall not exceed 24".

9.2.3 Seismic strap kit shall:

9.2.3(a) Be an approved bracing system (strap kit) certified by the California Division of the State Architect (will have the stamp of approval on the box) and comply with California Health and Safety Code §19211

9.2.3(b) Meet or exceed the bracing requirements for the tank size

9.2.4 TPV

9.2.4(a) The line must be galvanized steel, hard drawn copper, or chlorinated polyvinyl chloride (CPVC).

9.2.4(b) The valve shall:

9.2.4(b1) Be listed and manufactured to American National Standards Institute (ANSI) Z21.22

9.2.4(b2) Meet the sizing/pressure requirements of the water heater listing

9.3 All Appliances

9.3.1 All installed water heaters shall:

9.3.1(a) Meet or exceed California Energy Commission (CEC) efficiency standards and be listed in the CEC's database of certified appliances

9.3.1(b) Be listed and labeled in accordance with local code

9.3.1(c) Be ENERGY STAR®–certified and UL-listed or equivalent

9.4 Water Heater Sizing (All Water Heater Types)

9.4.1 Water heater unit capacity must be no less than the 2022 CPC minimum "First Hour Rating" (FHR) guidelines, as shown in Table 13-1.

TABLE 13-1: MINIMUM CAPACITY FOR WATER HEATERS (FHR)

Number of Bathrooms	1–1.5			2–2.5				3–3.5			
Number of Bedrooms	1	2	3	2	3	4	5	3	4	5	6
FHR*	38	49	49	49	62	62	74	62	74	74	74

*FHR is the water heater capacity expressed in gallons on the yellow EnergyGuide label. It is the amount of hot water the heater can supply per hour (starting with a tank full of hot water).

9.5 Mobile Home Water Heaters (Electric, Natural Gas, and Propane Storage Types)

9.5.1 A gas water heater is required to be direct vent type when located inside the living space).

9.5.2 The water heater shall have a maximum standby loss of 7% (25–35 gallons) or 8% (>35 gallons).

9.5.3 Efficiency requirements from Conventional Home and Multi-Family Water Heaters (Electric, Natural Gas, and Propane) shall apply.

9.6 Conventional Home and Multi-Family Water Heaters (Electric, Natural Gas, and Propane)

9.6.1 Storage Electric Resistance Water Heaters

9.6.1(a) All electric water heaters shall have a minimum uniform energy factor (UEF) as shown in Table 13-2.

TABLE 13-2: MINIMUM UEF FOR STORAGE ELECTRIC WATER HEATERS, BASED ON FHR*

Tank Volume (Gallons)	FHR 18–<51	FHR 51–<75	FHR ≥75
30	0.92	0.92	0.93
40	0.91	0.92	0.93
50	0.91	0.92	0.93
55	0.91	0.92	0.93

*Based on Table F-2 from the CEC, Title 20, January 2020

9.6.2 Storage Natural Gas or Propane Hot Water Heaters

9.6.2(a) All installed natural gas or propane storage-type water heaters must:

9.6.2(a1) Be low–nitrogen oxide (NOx) burner systems when required by local code

9.6.2(a2) Have an FVIR combustion chamber when the unit to be replaced is an open-combustion unit

9.6.2(a3) Have a minimum UEF as shown in Table 13-3

TABLE 13-3: MINIMUM UEF FOR STORAGE GAS WATER HEATERS, BASED ON FHR*

Tank Volume (Gallons)	FHR 18–<51	FHR 51–<75	FHR ≥75
30	0.54	0.60	0.65
40	0.52	0.58	0.64
50	0.50	0.56	0.63
55	0.49	0.55	0.62
60	0.74	0.77	0.79

*Title 24 prescriptive requirement published in Water Heater Efficiency Guide, CEC, October 2022

9.6.3 Gas Pipes

9.6.3(a) All valves and flexible connectors must be new.

9.6.3(b) Gas valves will be UL-listed (or equivalent) and American Gas Association (AGA)- or CSA-certified.

9.6.3(c) Flexible connectors will be listed (e.g., by the International Association of Plumbing and Mechanical Officials [IAPMO]) epoxy-coated or stainless steel units.

9.6.3(d) Fuel gas piping will comply with latest adopted California Mechanical Code (CMC).

9.6.3(e) Copper gas lines and butt-soldered joints are not allowed.

9.6.4 Gas Water Heater Vent System

9.6.4(a) Will be composed of UL-listed vent connectors, components, and Type B vent pipes.

9.7 Conventional Home HPWH

9.7.1 Water heaters shall:

9.7.1(a) Be compliant with Northwest Energy Efficiency Alliance Advanced (NEEA) Water Heater Specification Tier 3 or higher

9.7.1(b) Have a minimum UEF according to the corresponding climate zone as listed in Table 13-4:

TABLE 13-4: MINIMUM UEF BY CLIMATE ZONE*

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	≥3.00 plus a solar water heating system with solar saving fraction ≥0.4

*Title 24 prescriptive requirement published in Water Heater Efficiency Guide, California Energy Commission, October 2022

9.7.2 Ducts and terminals shall be heating, ventilation, and air conditioning–quality sheet metal ducts or UL-listed flexible metal ducts with terminals designed to protect against moisture entry and pest intrusion (i.e., screened).

10. WARRANTY

10.1 Repair—All Water Heater Types

10.1.1 Parts—90 days

10.1.2 Contractor—1 year

10.2 Replacement/Installation—Gas and Electric Water Heaters

10.2.1 Manufacturer—5 years (tank)/1 year (other)

10.2.2 Contractor—1 year

10.3 Installation—HPWH

10.3.1 Manufacturer—6 years

10.3.2 Contractor—1 year

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life

9.1.1 LIHEAP: 4 years

9.1.2 DOE: 13 years

9.2 Blanket Material

9.2.1 Maximum flame-spread index of 25 and maximum smoke-developed index of 50, per American Society for Testing and Materials (ASTM) E84, or Underwriters Laboratories (UL) 723, or National Fire Protection Association (NFPA) 255

9.2.2 Mineral fiber only, with vinyl or fiber-reinforced foil facing

9.2.3 LIHEAP minimum R-value: R-6

9.2.4 DOE storage water heaters: Minimum R-11

9.2.5 DOE non-fired central units: Minimum R-12.5

9.3 Straps and Buckles

9.3.1 Maximum flame-spread index of 25 and maximum smoke-developed index of 50 per ASTM E84, or UL 723, or NFPA 255

9.3.2 Polypropylene blanket straps and compatible buckles or other mechanical strap locks

9.4 Tape

9.4.1 Maximum flame-spread index of 25 and maximum smoke-developed index of 50 per ASTM E84, UL 723, or NFPA 255

9.4.2 Vinyl or fiber-reinforced foil compatible with or the same material as the facing. (See Blanket Material.)

9.4.3 Minimum width 3"

9.4.4 Duct tape is not allowed

10. WARRANTY

10.1 Manufacturer—1 year

10.2 Contractor—1 year

7.2. Installation Requirements

7.2.1 Water Heater Pipe Insulation

7.2.1(a) Installation requirements for DOE are the same as those for LIHEAP except as specified below.

7.2.1(b) Single-Family

7.2.1(b1) Excerpted from 2017 SWS 7.8102.2:

- The first 6' of inlet and outlet piping will be insulated in accordance with manufacturer specifications.
- Combustible pipe insulation must maintain a minimum clearance of 6" from gas water heater draft hood.

7.2.1(c) Mobile Home

7.2.1(c1) Requirements for mobile homes are the same as those for single-family homes.

8. POST-INSTALLATION GUIDELINES

8.1. Quality Check

8.1.1 Ensure:

8.1.1(a) The insulation covers all applicable areas

8.1.1(b) The attachment method complies with this standard

8.1.1(c) Proper clearances are maintained

8.2. Client Education

8.2.1 None

8.3. Clean-Up and Disposal Requirements

8.3.1 Scraps and debris shall be removed and disposed of properly.

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life

9.1.1 Water Heater Pipe Insulation

9.1.1(a) LIHEAP: 10 years

9.1.1(b) DOE: 13 years

9.1.2 Exterior Pipe Insulation

9.1.2(a) LIHEAP: 10 years

9.1.2(b) DOE: Not applicable to this measure.

9.2 All materials shall have a maximum flame-spread index of 25 and maximum smoke-developed index of 450 per American Society of Testing and Materials (ASTM) E84, Underwriters Laboratories (UL) 723, or Uniform Building Code (UBC) Standard 8-1.

9.3 Glue shall be compatible with insulation material and manufacturer's instructions.

9.4 Water heater pipe insulation material shall:

9.4.1 Be resistant to degradation from moisture, ultra-violet light, and extremes in temperature, or a jacket or facing.

9.4.2 Be made of pre-formed foam (e.g. closed-cell polyethylene) that conforms to ASTM C534

9.4.2(a) The inside diameter of the pre-formed material shall be appropriate for the size of the pipe being insulated

9.4.3 Be rated for temperatures up to 180°F

9.4.4 Have a minimum thickness per Table 15-1:

TABLE 15-1: PIPE INSULATION THICKNESS

Pipe Diameter	Thickness	Min. R-Value
<1"	1"	R-7.7
1"–<1½"	1½"	R-12.5
1½"–<4"	1½"	R-11

9.5 Pipe Insulation Types Not Allowed

9.5.1 Sheet or semi-molded insulation

9.5.2 Heat tape or strap insulation

9.6 Exterior pipe insulation shall be either:

9.6.1 Pre-formed fiberglass insulation

9.6.1(a) Self-sealing lap fiberglass pipe insulation, rated for exterior use

9.6.1(b) Designed to be secured and sealed to be watertight with exterior-rated materials

9.6.2 Pre-formed foam insulation:

9.6.2(a) Made of pre-formed foam (e.g. closed-cell polyethylene) that conforms to ASTM C534

9.6.2(a1) The inside diameter of the pre-formed material shall be appropriate for the size of the pipe being insulated

9.7 Tape shall be:

9.7.1 Specified by insulation manufacturer or

9.7.2 Minimum 2"-wide pressure-sensitive metallic tape labeled UL 181A-P or UL 181B-FX

9.7.2(a) Cloth duct tape and electrical tape are not allowed.

9.8 Ties shall be:

9.8.1 UV-rated plastic cable ties or

9.8.2 Corrosion-resistant wire and metal sleeves

10. WARRANTY

Install

10.1 Contractor—1 year

10.2 Manufacturer—1 year

8. POST-INSTALLATION GUIDELINES

8.1. Quality Check

8.1.1 The timer shall be checked to ensure proper operation.

8.1.2 The timer shall be set to accommodate the client's hot water requirements (minimum two setback cycles per day).

8.1.3 The water heater thermostat shall be set at 120°F or as prescribed by local code.

8.1.4 Installers shall allow for client comfort in programming the timer.

8.2. Client Education

8.2.1 Clients shall be educated on proper use and programming of the water heater timer, including potential danger when adjusting an outdoor timer in damp or wet conditions.

8.3. Clean-Up and Disposal Requirements

8.3.1 Packaging materials that include manufacturer's instructions or warranty information will be given to the customer.

8.3.2 All other installation and packaging materials shall be removed from the premises and disposed of properly.

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life

9.1.1 LIHEAP: 4 years

9.1.2 DOE: Not applicable to this measure

9.2 All Water Heater Timers

9.2.1 Electrical Specification

9.2.1(a) The electrical circuit current capacity shall be greater than the maximum requirements of the water heater.

9.3 Timer Mechanism

9.3.1 The timer mechanism shall be:

9.3.1(a) Underwriters Laboratory (UL)-listed or equivalent

9.3.1(b) An electromechanical or digital timing mechanism

9.3.1(b1) An electromechanical timer should have captive trippers when feasible.

9.4 Outdoor Use

9.4.1 The timer shall be located in a National Electrical Manufacturers Association (NEMA) 3-, 4-, or 6-series weatherproof enclosure for outdoor use.

9.5 Programming Capability

9.5.1 The timer must have:

9.5.1(a) A manual override switch

9.5.1(b) Seven-day programmability

10. WARRANTY

10.1 Manufacturer—1 year

10.2 Contractor—1 year

8. POST-INSTALLATION GUIDELINES

8.1. Quality Check

8.1.1 Operate the faucet to check for leaks and adequate water flow.

8.1.1(a) If a leak is present, tighten the aerator in small increments until the leaking stops. Do not over-tighten.

8.1.1(b) If necessary, replace or adjust the gasket washer and sealant tape.

8.2. Client Education

8.2.1 Both verbal and written instructions (which may include unit packaging) shall be provided regarding:

8.2.1(a) Proper operation and maintenance

8.2.1(b) How to remove, clean, and replace the aerator if the client's water quality is likely to cause the aerator to clog

8.2.1(c) Warranty

8.3. Clean-Up and Disposal Requirements

8.3.1 Packaging materials that include manufacturer's instructions or warranty information will be given to the customer.

8.3.2 All other installation and packaging materials shall be removed from the premises and disposed of properly.

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life

9.1.1 LIHEAP: 4 years

9.1.2 DOE: Not applicable to this measure

9.2 Aerators shall:

9.2.1 Be metal (e.g., chrome-plated brass)

9.2.2 Conform to the American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME) A112.18.1 (2012)

9.2.3 Have a maximum flow rate of:

9.2.3(a) Kitchen: 1.8 gpm with optional temporary flow of 2.2 gpm at 60 psi

9.2.3(b) Bath: 1.2 gpm at 60 psi

10. WARRANTY

10.1 Manufacturer—3 years

10.2 Contractor—1 year

7.1.1(c4) The maximum installed cost for all PL water measures is $250.

7.1.1(d) When this measure is paid for by LIHEAP, or is cost-shared with LIHEAP, and other dwelling costs are billed to DOE, DOE-specific assessment and installation policies will apply. For additional details, refer to Appendix D Energy Audit/Priority List Protocol.

7.2. Installation Requirements

7.2.1 Installation requirements for DOE are the same as those for LIHEAP.

7.2.2 Single-Family

7.2.2(a) None

7.2.3 Mobile Home

7.2.3(a) Requirements for mobile homes are the same as those for single-family homes.

8. POST-INSTALLATION GUIDELINES

8.1. Quality Check

8.1.1 Operate the showerhead to check the connections for leaks and adequate water flow.

8.1.1(a) If a leak is present, tighten the showerhead in small increments until the leaking stops. Do not over-tighten.

8.1.1(b) If necessary, replace or adjust the gasket washer and sealant tape.

8.2. Client Education

8.2.1 The client shall be supplied with:

8.2.1(a) Instructions for proper operation and maintenance

8.2.1(b) Warranty

8.3. Clean-Up and Disposal Requirements

8.3.1 Replaced showerheads, parts, and packaging shall be removed from the property and disposed of properly.

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life

9.1.1 LIHEAP: 4 years

9.1.2 DOE: 15 years

9.2 All showerheads shall:

9.2.1 Be the pressure-compensating type for consistent performance (i.e., to maintain a constant temperature under varying pressures)

9.2.2 Have a maximum flow rate of 1.8 gpm at 80 psi

9.3 Wall-mount showerheads shall:

9.3.1 Be the "self-cleaning" type or able to be cleaned without being unscrewed from the shower arm

9.3.2 Be the non-aerating type

9.3.3 Have a metal ball joint (e.g., chrome-plated brass)

9.4 Handheld showerheads

9.4.1 Hose: Minimum 48" length, capable of swiveling at both ends, and constructed of reinforced (e.g., with nylon) flexible vinyl or polyvinylchloride (PVC) material

9.4.2 Mounting bracket: Designed to attach to the shower arm (not the wall) and constructed of heavy-duty thermoplastic (e.g., acrylonitrile-butadiene-styrene [ABS]) or equivalent with an all-metal swivel ball (e.g., chrome-plated brass)

9.4.3 Attachment: Fit standard-thread shower arms and standard adapters

9.4.4 Anti-siphon valve

9.5 Showerarm adapters shall:

9.5.1 Be metal (e.g., chrome-plated brass)

9.5.2 Have a ½" national pipe taper (NPT) fitting on the showerhead end

10. WARRANTY

10.1 Manufacturer—3 years

10.2 Contractor—1 year

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life

9.1.1 LIHEAP: TSV/thermostatic showerhead—10 years

9.1.2 DOE:

9.1.2(a) TSV—Not applicable to this measure

9.1.2(b) Thermostatic showerhead—15 years

9.2 All TSVs and thermostatic showerheads shall be:

9.2.1 Compliant with International Association of Plumbing and Mechanical Officials Guide Criteria (IAPMO IGC) 244-2015A

9.2.2 Threaded to attach to showerheads and shower arms with ½" national pipe taper (NPT) fittings.

10. WARRANTY

10.1 Manufacturer—1 year

10.2 Contractor—1 year

6. MULTI-FAMILY–SPECIFIC

6.1. Installation Requirements

6.1.1 When only an individual multi-family unit will be served, installation requirements are the same as those for conventional homes.

6.1.2 There are no multi-family whole-building installation requirements. The conventional home (single-family) criteria apply to all multi-family whole-building installations.

6.1.3 When the measure will be included in a multi-family whole-building project, the installation will apply only within the dwelling units.

6.1.3(a) Common area installation (e.g., in a lobby, entertainment room, etc.) is not allowed for this measure.

7. DOE-SPECIFIC

7.1. Assessment Requirements

7.1.1 This measure is not a DOE measure.

8. POST-INSTALLATION GUIDELINES

8.1. Quality Check

8.1.1 The tank shall be filled and flushed at least two times.

8.1.2 All joints shall be checked for water leaks and tightened as needed for a proper seal.

8.1.3 The toilet shall be level, solid, and secure.

8.2. Client Education

8.2.1 Both verbal and written instructions shall be provided regarding:

8.2.1(a) Operation, care, and cleaning of the toilet

8.2.1(b) Acquisition of replacement parts

8.2.1(c) Warranty

8.2.2 The contractor's and toilet manufacturer's warranty documentation shall be given to the customer.

8.3. Clean-up and Disposal Requirements

8.3.1 All parts and debris associated with the toilet replacement shall be removed from the premises, and the work site shall be left clean.

8.3.2 The removed toilet shall be disposed of (recycled when possible) in accordance with local requirements.

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life

9.1.1 LIHEAP: 20 years

9.1.2 DOE: Not applicable to this measure

9.2 Accessories

9.2.1 Water Shut-Off Valve (Angle Stop) and Supply Line

9.2.1(a) The water supply line shall be braided hose with brass fittings.

9.2.1(b) The water shut-off valve shall comply with International Association of Plumbing and Mechanical Officials (IAPMO) and California Plumbing Code (CPC) requirements.

9.2.2 Wax Ring with Flange

9.2.2(a) The ring shall be thick or reinforced wax with a polyethylene flange that complies with Federal Specification (FS) TT-P-1536A.

9.2.2(a1) A flange is not required when a second ring is placed on top of the first for additional thickness.

9.2.3 Replacement Toilet Anchor Bolts ("Johnny Bolts"), Washers, and Nuts

9.2.3(a) Replacement hardware shall be:

9.2.3(a1) Brass bolts:, 2¼" length by 5⁄16" diameter minimum, with captive corrosion-resistant (e.g., stainless steel) washers included to secure the flange bolt in an upright position

9.2.3(a2) Brass open-cap acorn nuts

9.2.4 Toilet bolt caps shall be plastic or ceramic, color-matched to the toilet.

9.2.5 Replacement plastic toilet flanges and toilet flange extensions and spacers shall comply with American Society of Mechanical Engineers (ASME) A112.4.3.

9.2.6 Toilet shims shall be:

9.2.6(a) White plastic or other waterproof material for use with toilets

9.2.6(b) Snap-off shims or shims that are easy to trim with a sharp knife

9.3 Toilets shall:

9.3.1 Be WaterSense-labeled

9.3.2 Be single-flush rated 1.28 gpf or less

9.3.3 Have a maximum performance rating of ≥350 grams

9.3.4 Have a fully glazed, 2" minimum trapway

9.3.5 Have an elongated or round bowl per availability, client preference, and location dimensions and clearances

9.3.6 Have a minimum 15" bowl height (excluding seat) for a standard toilet

9.3.6(a) When Americans with Disabilities Act (ADA) compliance is required, the vertical distance from the finished floor to the top of the seat shall be a minimum 15" and maximum 19".

9.3.6(b) Unit height shall be selected in accordance with the client's physical needs and wishes.

9.4 Flooring Material

9.4.1 Plywood shall be exterior-grade, pressure-treated, or marine-grade material.

9.4.2 Replacement flooring shall match the height of the surrounding floor material.

9.4.3 Additional support to joists shall be installed when needed to make the floor solid.

9.5 Caulk (to seal between the toilet base and the floor) shall:

9.5.1 Be mold-resistant acrylic latex or equivalent

9.5.2 Comply with American Society of Testing and Materials (ASTM) C834, C920, or C1311

9.6 The toilet seat shall be thermoplastic (e.g., polypropylene injection molded plastic) or thermoset (e.g., Thermodur® or Duroplast®).

10. WARRANTY

10.1 Manufacturer—3 years

10.2 Contractor—1 year

7.1.2 If the unit is identified as having operational issues that create an unsafe environment, the unit shall be repaired or replaced using alternative funding.

7.1.2(a) If alternative funding is not available, the appliance shall be removed with written client permission, or the condition requires home deferral.

7.1.2(b) The condition shall be documented on the CSD 542 Weatherization Deferral Form if alternative funding is not used to correct the condition.

7.1.3 Mobile Home Combustion Appliances

7.1.3(a) All cooking appliances left in place after weatherization in mobile homes must meet the Manufactured Home Construction and Safety Standards.

7.1.3(a1) If a client will not allow removal of an unsafe cooking appliance from the home, and repair or replacement is not feasible under LIHEAP, deferral is required.

8. POST-INSTALLATION GUIDELINES

8.1. Quality Check

8.1.1 Follow the manufacturer's start-up/test procedures to ensure proper operation of the cooktop and oven.

8.1.2 Verify that each new or repaired cooktop or range and oven burner operates properly.

8.1.3 After air is purged from the line, verify that the gas cooktop and oven burners light and burn properly over the full range (high to low).

8.1.4 Verify that the clock, timer, and electronic controls operate properly.

8.1.5 Perform troubleshooting per the manufacturer's instructions as needed to correct problems.

8.1.6 Perform post-CAS appliance repair/replacement testing for CO in accordance with the Appendix A Combustion Appliance Safety Protocol.

8.2. Client Education

8.2.1 Give the client verbal instructions and demonstrate features and operation of the cooking appliance, including the troubleshooting guide in the owner's manual.

8.2.1(a) If the range has a battery igniter, advise the client on replacing the battery.

8.2.2 Show the client the location of the gas shut-off valve, electrical shut-off, and GFCI (if installed).

8.2.3 The client shall be informed of the importance of using exhaust ventilation when cooking and of the importance of keeping burners and broilers clean to limit the production of CO.

8.3. Clean-Up and Disposal Requirement

8.3.1 Follow the manufacturer's cleaning recommendations.

8.3.2 Remove from the appliance any marks and residue left by protective shipping material and smudges that occurred during shipping and installation.

8.3.3 Clean the cabinet, oven, cooktop, and controls.

8.3.4 Remove all replaced appliances and parts from the property and dispose of them properly.

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life

9.1.1 LIHEAP:

9.1.1(a) Repair—4 years

9.1.1(b) Install—10 years

9.1.2 DOE: Not applicable to this measure

9.2 Gas Components

9.2.1 Replacement gas ranges must:

9.2.1(a) Be Canadian Standards Association (CSA)–certified, Underwriters Laboratories (UL)–listed, or equivalent

9.2.1(b) Comply with American National Standards Institute (ANSI) Z21.1

9.2.1(c) Have electronic ignition (shall not have standing pilots)

9.2.1(c1) Ranges with battery ignition are allowed.

9.2.1(c2) The range must be compatible with the fuel used (i.e., natural gas, liquid petroleum or electric).

9.2.1(d) Have sealed or standard burners

9.2.1(e) Have a standard oven

9.2.1(e1) Ranges with self-cleaning ovens are allowed.

9.2.2 Replacement gas cooktops require electronic ignition unless it is not possible to provide a 110-volt alternating current circuit to the cooktop location.

9.2.3 Gas shut-off valves and adapters will be new, brass, and CSA- or American Gas Association (AGA)–approved.

9.2.4 The flexible gas connector will be:

9.2.4(a) New coated or uncoated stainless steel up to 6' in length

9.2.4(b) Compliant with ANSI Z21.24/CSA 6.10 or AGA-approved

9.3 Electrical components supplied by the installer shall meet NEMA standards and be UL-listed or equivalent (e.g., power supply cord, circuit breaker or fuse, and receptacle).

9.3.1 The receptacle shall match the plug on the appliance power cord (pigtail) (e.g., NEMA type 14-50R four-wire or 10-50R three-wire 240-volt receptacle) and be approved by the manufacturer.

9.3.2 Replacement electric range or cooktops shall be:

9.3.2(a) UL-listed or equivalent

9.3.2(b) Compliant with local code

9.3.2(c) Sealed or standard design burners, with a standard oven

9.3.2(c1) Glass-top and self-cleaning models are allowed.

9.4 Replacement gas wall ovens shall be:

9.4.1 CSA-certified, UL-listed, or equivalent

9.4.2 Compliant with ANSI Z21.1

9.4.3 Equipped with electronic ignitions (shall not have standing pilot)

9.4.4 Single- or double-wall configuration, and may feature a self-cleaning mode

9.4.5 Approved for use in the planned installation location

9.4.5(a) Units to be installed undercounter must be labeled for undercounter installation.

9.5 Replacement electric wall ovens shall be:

9.5.1 UL-listed or equivalent

9.5.2 Compliant with local code

9.5.3 Single- or double-wall configuration, and may feature a self-cleaning mode

9.5.4 Approved for use in the planned installation location

9.5.4(a) Units to be installed undercounter must be labeled for undercounter installation.

10. WARRANTY

Repair

10.1 Manufacturer—90 days

10.2 Contractor—1 year

Install

10.3 Manufacturer—1 year

10.4 Contractor—1 year

8.2.1(b) Cooking limitations at lower wattages (longer cooking time, inability to properly cook some items, etc.)

8.3. Clean-Up and Disposal Requirements

8.3.1 An existing inoperable/damaged microwave shall be removed from the home and disposed of properly:

8.3.1(a) Remove the microwave oven door to permanently disable the unit and

8.3.1(b) Dispose of the decommissioned appliance in accordance with state and local regulations

8.3.2 Remove all packaging and debris from the work site.

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life

9.1.1 LIHEAP: 10 years

9.1.2 DOE: Not applicable to this measure

9.2 Counter space shall be considered when selecting the microwave oven capacity and power rating.

9.3 All units shall:

9.3.1 Be Underwriters Laboratories (UL)-listed countertop models

9.3.2 Have electronic controls with ten or more power settings

9.3.3 Have a minimum capacity of 0.7 cu. ft.

9.3.4 Have a power rating of 800–1100 watts

9.3.5 Have a grounded, three-prong power cord

9.4 If needed, an extension cord shall be:

9.4.1 New, UL-listed, and in accordance with the manufacturer's specifications

9.4.2 A three-conductor cord with three-prong grounding plug

9.4.3 Rated appropriately for the appliance, minimum 14 American Wire Gauge (AWG)

9.4.4 The shortest feasible length with a maximum length of 6'

10. WARRANTY

10.1 Manufacturer—1 year

10.2 Contractor—1 year

7.1.6 Mobile Home Combustion Appliances

7.1.6(a) All combustion appliances left in place after weatherization in mobile homes must meet the Manufactured Home Construction and Safety Standards.

7.1.6(a1) If a client will not allow removal of an unsafe gas refrigerator from the home, deferral is required.

7.2. Installation Requirements

7.2.1 Installation requirements for DOE are the same as those for LIHEAP.

8. POST-INSTALLATION GUIDELINES

8.1. Quality Check

8.1.1 Temperature controls shall be set appropriately and demonstrated to occupants.

8.2. Client Education

8.2.1 If the client is not willing to give up a second refrigerator, education shall be provided regarding the energy cost to operate the second unit.

8.2.2 The occupant will be provided with:

8.2.2(a) Specific information on the proper maintenance of the equipment

8.2.2(b) Warranty information

8.2.2(c) Operation manuals

8.2.2(d) Installer contact information

8.2.3 If the refrigerator is plugged into an exposed duplex receptacle, educate the client that a maximum of one other appliance may be plugged into the second outlet, and that it shall not be used to plug in a toaster, microwave oven, hot plate, hair dryer, curling iron, or other high-wattage appliance.

8.3. Clean-Up and Disposal Requirements

8.3.1 Replaced parts and materials will be recycled or disposed of in accordance with federal, state, or local regulations.

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life

9.1.1 LIHEAP: 15 years

9.1.2 DOE: 15 years

9.2 Replacement Primary Refrigerators

9.2.1 The replacement appliance shall:

9.2.1(a) Be ENERGY STAR®–certified unit or must

9.2.1(a1) Meet California Energy Commission (CEC) energy efficiency standards and

9.2.1(a2) Have an SIR higher than the SIR for a comparable ENERGY STAR model

9.2.1(b) Be white in color

9.2.1(b1) Exception: Client-requested color is allowed if it is available at no additional cost.

9.2.1(c) Have the freezer on top, or be a side-by-side model in larger sizes when a top freezer is not available or a bottom freezer costs more

9.2.1(d) Not be equipped with an icemaker or water dispenser

9.2.1(e) Be sized in accordance with Table 23-1, except when installation of a larger unit is justified by an SIR ≥1.0

9.2.2 The maximum storage capacity of any replacement refrigerator shall be 23 cu. ft.

9.2.3 An extension cord, if needed, must be:

9.2.3(a) Underwriters Laboratories (UL)-listed

9.2.3(b) Three-conductor

9.2.3(c) Minimum 14 American Wire Gauge (AWG)

9.2.3(d) Maximum 6' long

10. WARRANTY

10.1 Manufacturer warranty—1 year

10.2 Contractor warranty—1 year

6. MULTI-FAMILY–SPECIFIC

6.1. Installation Requirements

6.1.1 When only an individual multi-family unit will be served, installation requirements are the same as those for conventional homes.

6.1.2 There are no multi-family whole-building installation requirements. The conventional home (single-family) criteria apply to all multi-family whole-building installations.

6.1.3 When the measure will be included in a multi-family whole-building project, the installation will apply only within the dwelling units.

6.1.3(a) Common area installation (e.g., in a kitchen, entertainment room, reception area, etc.) for this measure is not allowed.

7. DOE-SPECIFIC

7.1. Assessment Requirements

7.1.1 This measure is not a DOE measure.

8. POST-INSTALLATION GUIDELINES

8.1. Quality Check

8.1.1 Fan and Light

8.1.1(a) Ensure the fan, light, and all controls operate properly.

8.1.1(b) Ensure the light kit set screws are tight.

8.1.2 Blade Balance

8.1.2(a) The fan must rotate smoothly without undue wobbling.

8.1.2(b) Balance the blades (e.g., using a supplied balancing kit) as needed.

8.2. Client Education

8.2.1 For all measures installed, supply the client with both verbal and written instructions for:

8.2.1(a) Proper operations and maintenance

8.2.1(b) Safety considerations

8.2.1(c) Warranty

8.3. Clean-Up and Disposal Requirements

8.3.1 Remove all replaced ceiling fans, fixtures, and parts from the property and dispose of them properly.

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life

9.1.1 LIHEAP: 10 years

9.1.2 DOE: Not applicable to this measure

9.2 Units shall:

9.2.1 Be ENERGY STAR–certified and Underwriters Laboratories (UL)-listed

9.2.2 Be ceiling-mounted units only

9.2.3 Meet 110-volt electrical requirements

9.2.4 Have three-speeds or variable speed control

9.2.5 Have separate fan and light switch controls on the fan when a light kit is present

9.3 The UL-listed fan unit shall:

9.3.1 Be capable of reversible fan action

9.3.2 Permit convenient consumer adjustment of the fan speed by one or more wall-mounted switches, a remote control, or readily accessible pull chains

9.3.2(a) The remote control shall be UL-listed and compatible with the fan.

9.4 Light kits shall be LED and meet the manufacturer's specifications.

10. WARRANTY

10.1 Manufacturer—3 years

10.2 Contractor—1 year

8.2.1(c2) All always-on devices should remain on.

8.3. Clean-Up and Disposal Requirements

8.3.1 All packaging materials and other debris shall be removed from the premises.

8.3.2 Furniture and other household items moved for installation work shall be returned to their original positions.

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life

9.1.1 LIHEAP: 8 years

9.1.2 DOE: Not applicable to this measure

9.2 Approved materials shall:

9.2.1 Be listed to the latest Underwriters Laboratories (UL) 1449 standard, and be listed to the latest UL 1363 standard, if corded

9.2.2 Be IR-controlled with an IR remote sensor or an IR remote sensor and motion detector

9.2.3 Be rated for 120 volts and 15 amps

9.2.4 Provide a minimum of 1,000 joules of surge protection for all outlets

9.2.5 Have a resettable circuit breaker

9.2.6 Have a maximum standby power draw of 1 watt

9.3 The T2 APS shall be equipped with:

9.3.1 A "smart" power-saving function that automatically turns off power to all switched devices within 5 minutes after the television is turned off.

9.3.2 An adjustable timer (delay period) that:

9.3.2(a) Automatically turns off the television and switched outlets after a minimum 1-hour delay period if no activity is detected

9.3.2(b) Can be manually programmed for a longer delay period

9.3.2(c) Produces a warning signal that alerts the user before power to the television is turned off

10. WARRANTY

10.1 Manufacturer—1 year

10.2 Contractor—1 year

7.2.3 Mobile Home

7.2.3(a) Requirements for mobile homes are the same as those for single-family homes.

8. POST-INSTALLATION GUIDELINES

8.1. Quality Check

8.1.1 The installer and quality control inspector shall test all installed LED bulbs and confirm that they perform properly and the lighting level is adequate for the client.

8.2. Client Education

8.2.1 None

8.3. Clean-Up and Disposal Requirements

8.3.1 All replaced bulbs and fixtures shall be removed from the home and disposed of in accordance with the requirements of the local jurisdiction.

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life

9.1.1 LIHEAP:

9.1.1(a) Interior bulb—16 years

9.1.1(b) Exterior bulb—15 years

9.1.2 DOE: Exterior and interior bulbs—15 years

9.2 All LED bulbs shall be:

9.2.1 ENERGY STAR®–certified

9.2.2 Underwriters Laboratories (UL)–listed or equivalent

9.2.3 Omni-directional (capable of at least 300° light direction)

9.2.4 Dimmable to less than 10% of output for those locations on dimming switches

9.2.5 Selected for a specific location as shown in Table 26-2.

TABLE 26-2: COLOR-CORRELATED TEMPERATURE (CCT) BY INSTALLATION LOCATION

Installation Location	CCT in Degrees Kelvin (K)	Lighting Characteristic
Indoors	2700K	Soft white
	3000K	Warm white
	3000K	Neutral white
	3500K	Natural white
Outdoors	4000/4100K	Cool white
	5000/6500K	Daylight

9.3 Installed LEDs must have a minimum Color Rendering Index (CRI) of 90.

9.4 LED bulbs for enclosed fixtures must be labeled JA8-2019-E.

9.5 For outdoor locations: Protected from the weather per manufacturer's instructions, and the bulb and fixture shall be rated for damp or wet locations.

9.6 Dimmers, photo sensors, timers (mechanical or solid state), and vacancy or occupancy sensors: LED bulbs may be installed only when the LED is compatible.

10. WARRANTY

10.1 Manufacturer—3 years

10.2 Contractor—1 year

6. MULTI-FAMILY–SPECIFIC

6.1. Installation Requirements

6.1.1 When only an individual multi-family unit will be served, installation requirements are the same as those for conventional homes.

6.1.2 There are no multi-family whole-building installation requirements. The conventional home (single-family) criteria apply to all multi-family whole-building installations.

6.1.3 When the measure will be included in a multi-family whole-building project, the installation will apply only within the dwelling units.

6.1.3(a) Common area installation (e.g., in a lobby, hallway, kitchen, laundry room, etc.) is not allowed for this measure.

7. DOE-SPECIFIC

7.1. Assessment Requirements

7.1.1 This measure is not a DOE measure.

8. POST-INSTALLATION GUIDELINES

8.1. Quality Check

8.1.1 Test all installed LED night-lights for proper operation.

8.1.2 Cover the photo sensor (Fig. 27-1) to simulate darkness.

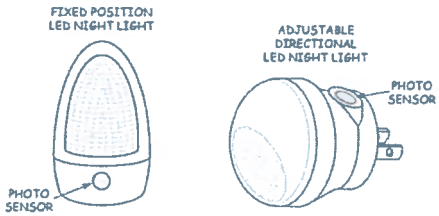

FIG. 27-1: NIGHT-LIGHT MODELS AND SENSOR LOCATION

8.1.3 Devices unplugged to allow night-light installation shall be moved to another outlet.

8.2. Client Education

8.2.1 The client will receive operation instructions.

8.2.2 The manufacturer's written warranty will be provided when available.

8.3. Clean-Up and Disposal Requirement

8.3.1 Packaging materials that include manufacturer's instructions or warranty information will be given to the customer.

8.3.2 All other installation and packaging materials shall be removed from the premises and disposed of properly.

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life

9.1.1 LIHEAP: 16 years

9.1.2 DOE: 16 years

9.2 All LED night-lights shall be:

9.2.1 Maximum wattage 0.5 watts

9.2.2 Underwriters Laboratories (UL)–listed or equivalent

9.2.3 Equipped with an integrated photoelectric (auto-on) switch that turns on the night-light when the room is dark

10. WARRANTY

10.1 Manufacturer—1 year

10.2 Contractor—1 year

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life

9.1.1 LIHEAP:

9.1.1(a) Interior fixtures—16 years

9.1.1(b) Exterior fixtures—15 years

9.1.2 DOE: Not applicable to this measure

9.2 All Fixtures

9.2.1 All fixture types must:

9.2.1(a) Be Underwriters Laboratories (UL)-listed and compliant with Title 24 requirements

9.2.1(b) Utilize UL-listed, properly sized connectors

9.3 All Outdoor Fixtures:

9.3.1 Fixtures marked "suitable for damp locations" shall be installed out of direct contact with precipitation in partially protected locations (e.g., under canopies, in closed porches, and in carports).

9.3.2 Fixtures marked "suitable for wet locations" may be installed in damp locations and in unprotected outdoor locations where the fixture is installed >4' above the ground.

9.3.3 Light Controls

9.3.3(a) Exterior fixtures shall be controlled by:

9.3.3(a1) Photo-control and motion sensor or

9.3.3(a2) Motion sensor or automatic time switch control

9.3.4 Any installed vacancy sensors, motion sensors, and dimmers must be certified to comply with Title 20 Appliance Efficiency Regulations.

9.4 LED bulbs installed in fixtures shall be:

9.4.1 ENERGY STAR®–certified

9.4.2 Listed in the California Energy Commission (CEC) Lighting Database

9.4.3 Marked with "JA8-2019" ("JA8-2019-E" for enclosed and recessed fixtures) per Title 24

9.4.4 Labeled "dimmable" when controlled by a dimmer

9.5 The correlated color temperature (CCT) in Table 28-1 may be used to select the LED fixture most suitable to the customer's preference.

TABLE 28-1: LED FIXTURE CCT CHARACTERISTICS

Installation Location	CCT in Degrees Kelvin (K)	Lighting Characteristic
Indoors	2700K	Soft White
	3000K	Warm White
	3000K–3500K	Neutral Natural White
Outdoors	4000/4100K	Cool White
	5000K–6500K	Daylight

10. WARRANTY

10.1 Manufacturer—1 year

10.2 Contractor—1 year

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life

9.1.1 LIHEAP: 4 years

9.1.2 DOE: Not applicable to this measure

9.2 LED wattage shall:

9.2.1 Be selected based on the equivalent light output of the incandescent, fluorescent, or halogen fixture to be replaced or

9.2.2 Be dimmable

9.3 All LED torchiere replacements shall have a lighting efficacy of 61 lumens per watt.

9.4 The LED torchiere lamp will be:

9.4.1 UL-listed or equivalent

9.4.2 ENERGY STAR®–certified

10. WARRANTY

10.1 Manufacturer warranty—1 year

10.2 Contractor warranty—1 year

8.2.2 Written instructions and warranty documents

8.3. Clean-up and Disposal Requirements

8.3.1 All replaced items, scraps, and other debris resulting from the VSS installation shall be removed from the premises using lead-safe practices when applicable.

8.3.2 Furniture and other household items moved for installation work shall be returned to their original positions.

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life

9.1.1 LIHEAP: 8 years

9.1.2 DOE: Not applicable to this measure

9.2 All VSS shall be:

9.2.1 Underwriters Laboratories (UL)–listed

9.2.2 Designed for installation in a wall-mount switch box

9.2.3 Title 24–compliant and listed in the California Energy Commission (CEC) Appliance Efficiency Database

9.2.4 Adjustable time delay, with maximum 20-minute delay

9.2.5 Manual on/automatic off

9.2.6 Not convertible to an occupancy sensor

9.2.7 Rated for use with the applicable lighting type

9.3 VSS for Specific Circuit Types

9.3.1 For single light–only circuits: Single pole

9.3.2 For light and exhaust fan controlled by one switch: Dual-load and rated for fan load

9.3.3 For multi-way and dimmable lighting circuits: Rated for use in such circuits

9.4 Sensor Types

9.4.1 Select the type appropriate for the location:

9.4.1(a) PIR

9.4.1(b) US

9.4.1(c) A combination of both sensor types

10. WARRANTY

10.1 Manufacturer—1 year

10.2 Contractor—1 year

8.2. Client Education

8.2.1 Proper operation and maintenance of fireplace doors and/or dampers shall be explained to the client.

8.2.2 Occupants will be notified of changes or repairs made to doors and/or windows and will be educated on how to operate and maintain weatherstripping and caulk around door/window and trim.

8.2.2(a) Occupants will be advised of possible drying and shrinking effects of applicable materials, proper ventilation to prevent moisture issues, and other potential warranty issues.

8.2.3 Occupants will be educated about the need to keep the door from the garage to the house closed.

8.2.4 Occupants will be advised to not warm up vehicles or use any gas engine appliances or grills in the garage, even if the main door is left open.

8.3. Clean-Up and Disposal Requirements

8.3.1 Installation debris shall be removed from the property and disposed of properly.

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life

9.1.1 Access Covers

9.1.1(a) LIHEAP: 4 years

9.1.1(b) DOE: 10 years

9.1.2 Caulking

9.1.2(a) LIHEAP: 4 years

9.1.2(b) DOE: 10 years

9.1.3 Cover Plate Gaskets

9.1.3(a) LIHEAP: 20 years

9.1.3(b) DOE: 10 years

9.1.4 Door Replacement

9.1.4(a) LIHEAP: 15 years

9.1.4(b) DOE: 20 years

9.1.5 Door Repair (Including SGDs)

9.1.5(a) LIHEAP: 15 years

9.1.5(b) DOE: 10 years

9.1.6 Glass Replacement

9.1.6(a) LIHEAP: 10 years

9.1.6(b) DOE: 10 years

9.1.7 MER

9.1.7(a) LIHEAP: 4 years

9.1.7(b) DOE: 10 years

9.1.8 SGD Replacement

9.1.8(a) LIHEAP: 15 years

9.1.8(b) DOE: 10 years

9.1.9 Storm Windows

9.1.9(a) LIHEAP: 10 years

9.1.9(b) DOE: 15 years

9.1.10 Vent Covers

9.1.10(a) LIHEAP: 4 years

9.1.10(b) DOE: Not applicable to this measure.

9.1.11 Weatherstripping

9.1.11(a) LIHEAP: 4 years

9.1.11(b) DOE: 10 years

9.1.12 Window Repair

9.1.12(a) LIHEAP: 20 years

9.1.12(b) DOE: 10 years

9.1.13 Window Replacement

9.1.13(a) LIHEAP: 20 years

9.1.13(b) DOE: 20 years

9.1.14 Whole House Air Sealing

9.1.14(a) LIHEAP: Not applicable to this measure.

9.1.14(b) DOE: 10 years

9.2 Restricted Materials

9.2.1 All MER sealing materials shall be used in accordance with safety data sheet instructions, material specifications, and manufacturers' instructions. The following special restrictions also apply:

9.2.2 UL 181 metallic tape shall not be used for any shell sealing purpose in any location (exposed or non-visible).

9.2.3 Foam board may be left exposed only in the attic and crawlspace.

9.2.3(a) Foam board installed in other locations shall be covered in accordance with local codes.

9.2.4 Foam sealant may be used to seal gaps in penetrations (e.g., plumbing and electrical), subject to the following limitations:

9.2.4(a) Gap size and use shall conform with the manufacturer's specifications and local code.

9.2.4(b) Fire-resistant foam (e.g., orange or red) shall be used to seal penetrations in common walls/floors/ceilings between adjacent residences (e.g., multi-unit dwellings).

9.3 Attic Access Cover—Horizontal

9.3.1 Cover Material

9.3.1(a) Field-fabricated access door: Gypsum (drywall), minimum ⅝" thick

9.3.1(b) Prefabricated access door assembly: Commercially available

9.3.2 Framing Material (Joist Blocking)

9.3.2(a) Same dimension as joist (e.g., 2" x 4" or 2" x 6")

9.3.2(b) No. 2 hem-fir or better

9.3.3 Trim Material

9.3.3(a) Window/door trim/molding (interior- or exterior-grade)

9.3.3(b) Adequate thickness and width to attach to ceiling joists and extend into the opening far enough to support the cover (e.g., ⅝" x 3½")

9.3.3(c) Spackle or wood putty (to cover recessed nails)

9.3.4 Attachments

9.3.4(a) Minimum 3" nails for blocking

9.3.4(b) Finish nails for attaching trim (long enough to penetrate joist at least ½", e.g., 1⅝" long)

9.3.5 Weatherstripping

9.3.5(a) Open or closed cell foam tape, in accordance with the material specification for weatherstripping

9.3.6 Insulation

9.3.6(a) Flexible or rigid insulation, with an R-value equal to the R-value of insulation on the attic floor

9.4 Attic Access Cover—Vertical

9.4.1 Cover Material

9.4.1(a) Gypsum (drywall), minimum ½" thick with plywood backing

9.4.1(b) Minimum ⅝" plywood (interior- or exterior-grade, CCX or better), for wood-only cover/door

9.4.1(c) Minimum ½" plywood (interior- or exterior-grade, CDX or better) to serve as backing for gypsum-clad cover/door

9.4.2 Framing Material

9.4.2(a) Same dimension as studs (e.g., 2" x 4")

9.4.2(b) No. 2 hem-fir or better

9.4.3 Trim Material

9.4.3(a) Window/door trim/molding (interior- or exterior-grade), minimum 2" wide

9.4.3(b) Spackle or wood putty (to cover recessed nails)

9.4.4 Hinges in Firewall Applications

9.4.4(a) Minimum 3½" x 3½" spring-loaded with adjustable tension

9.4.4(b) Adequate spring tension to make access cover self-closing

9.4.5 Attachments

9.4.5(a) Minimum 3" nails for blocking

9.4.5(b) Finish nails for attaching trim (long enough to penetrate the joist at least ½", e.g., 1⅝" long)

9.4.5(c) Corrosion-resistant screws for hinges

9.4.5(c1) Sized per hinge manufacturers specifications and

9.4.5(c2) Long enough to penetrate framing at least ½"

9.4.5(d) Heavy-duty construction adhesive (to glue plywood to gypsum)

9.4.6 Weatherstripping

9.4.6(a) Open or closed cell foam tape, in accordance with the material specification for weatherstripping or

9.4.7 Insulation

9.4.7(a) Flexible or rigid insulation with an R-value equal to knee walls

9.5 Caulking

9.5.1 Select sealants in accordance with:

9.5.1(a) Sealant compatibility with the surfaces being sealed

9.5.1(b) The size of the gap being filled

9.5.1(c) Application temperature limits

9.5.1(d) Support for expected wind and mechanical pressure loads

9.5.1(e) Allowance for expansion and contraction differential between dissimilar materials

9.5.2 Only fire-resistant materials will be used between attached dwelling units, and in contact with HPDs (e.g. chimneys, combustion appliance vents, and non-insulation contact (IC)–rated recessed lights).

9.6 Cover Plate Gaskets

9.6.1 All gaskets shall be:

9.6.1(a) Fire-resistant

9.6.1(b) Pre-cut to fit when the correct size is available

9.6.1(b1) Rocker-type switches and rectangular receptacles:

- Gaskets shall have rectangular perforations shaped for those applications (rather than using standard receptacle gaskets with rounded perforations).
  - Closed-cell foam
  - Minimum ⅛" thick

9.7 Crawlspace Access Cover—Horizontal (Indoors)

9.7.1 Cover Material

9.7.1(a) Prefabricated access door assembly (commercially available) or

9.7.1(b) Field-fabricated access door

9.7.1(c) Substrate of ¾" plywood, CCX or better

9.7.1(d) Finish lumber: No. 2 or better

9.7.2 Framing Material (Joist Blocking)

9.7.2(a) Same dimension as joist (e.g., 2" x 4" or 2" x 6")

9.7.2(b) No. 2 hem-fir or better

9.7.3 Attachments

9.7.3(a) Minimum 3" nails for blocking

9.7.3(b) Corrosion-resistant screws for hinges

9.7.3(c) Sized in accordance with hinge manufacturer's specifications and

9.7.3(d) Long enough to penetrate framing at least ⅝"

9.7.4 Weatherstripping

9.7.4(a) Open- or closed-cell foam tape, in accordance with material specification for weatherstripping

9.7.5 Insulation

9.7.5(a) Flexible or rigid insulation with R-value equal to the R-value of the floor insulation

9.8 Crawlspace Access Cover—Vertical (Outdoors)

9.8.1 Cover Material

9.8.1(a) Metal

9.8.1(a1) Screened metal vent (commercially available or shop-fabricated) or

9.8.1(a2) Solid metal access cover (commercially available or shop-fabricated)

9.8.1(a3) Metal: Minimum 20-gauge

9.8.1(a4) Screen: ¼" metal mesh or expanded metal or equivalent

9.8.1(b) Wood

9.8.1(b1) Minimum ½" exterior-grade plywood, CCX or better

9.8.2 Framing Material (box frame)

9.8.2(a) Minimum 1" x 2" redwood or pressure-treated fir, no. 2 or better

9.8.3 Hinges

9.8.3(a) Cabinet hinges or better

9.8.3(b) Corrosion-resistant

9.8.4 Latches

9.8.4(a) Cabinet latches or better

9.8.4(b) Corrosion-resistant

9.8.5 Attachments

9.8.5(a) Box frame and metal frame

9.8.5(a1) Concrete nails or corrosion-resistant screws and anchors

9.8.5(a2) Sized for ½" penetration into concrete

9.8.5(b) Corrosion-resistant screws for hinges

9.8.5(b1) Sized in accordance with hinge manufacturer's specifications and

9.8.5(b2) Long enough to penetrate framing at least ⅝"

9.9 Glazing in Doors

9.9.1 Safety glass is required except in jalousie windows and windows with panes >3" in width and height.

9.9.1(a) Polycarbonate may be used in lieu of glass if allowed by local code.

9.9.1(b) U-factor and solar heat gain coefficient (SHGC) shall comply with Table 32-6.

9.9.1(c) Safety glazing shall be permanently labeled and installed per the 2013 CRC, §R308.4.

TABLE 32-6: GLAZED DOOR PERFORMANCE REQUIREMENTS

Efficiency Factor	Climate Zone	Maximum Value
U-Factor	All	0.32
SHGC	1, 3, and 5	No requirement
	2 and 6–16	0.25

9.10 Door Repair/Replacement Materials

9.10.1 Doors—Fire-Resistance

9.10.1(a) Garage door to living space shall be:

9.10.1(a1) A 20-minute fire-rated door tested per National Fire Protection Association (NFPA) 252

9.10.1(a2) Equipped with a self-closing and self-latching device

9.10.1(b) Entrance doors in multi-family units shall have the fire rating specified by the local jurisdiction.

9.10.2 The jamb shall be:

9.10.2(a) Exterior-grade only

9.10.2(b) ⅝"-thick stock standard; ¾" minimum

9.10.3 Hardware

9.10.3(a) All door closure system components shall be base models. Ornate or complex lockset materials are not allowed.

9.10.3(b) A deadbolt is required to have a thumb turn on the interior side. (An interior key deadbolt is not allowed.)

9.10.4 Door Jamb Sealant

9.10.4(a) Injected foam is allowed only if appropriate for the intended use and installed strictly in accordance with the manufacturer's instructions.

9.10.5 Nails

9.10.5(a) Use finishing or casing nails for interior applications.

9.10.5(b) Use galvanized nails for exterior applications.

9.10.6 Shoes, Door Bottoms, and Sweeps

9.10.6(a) Solid aluminum extrusions

9.10.6(b) Pliable gasket of vinyl, thermoplastic elastomer (TPE), silicone, or equivalent

9.10.6(c) Solid aluminum carrier, 0.05" minimum nominal thickness, with elongated mounting holes 9" OC maximum

9.10.6(c1) Exception: For shoes, a plastic carrier is allowed when standard aluminum will not fit.

9.10.6(d) Shoes

9.10.6(d1) A U-shoe is standard; an L-shoe is allowed when a U-shoe will not fit.

9.10.6(d2) Shall have rain drip in exposed outdoor locations

9.10.6(d3) A tall (e.g., 3"-high) U-shoe may be used when the door bottom is cut too short or is too worn/weak to accept a standard (1½"-high) U-shoe.

9.10.6(e) Stationary sweeps shall have a pliable gasket of vinyl or silicone.

9.10.6(f) Automatic door bottom

9.10.6(f1) Retractable type only; a flip sweep is not allowed

9.10.6(g) Metal saddle threshold

9.10.6(g1) Solid aluminum only; a "gasket saddle" with a vinyl top gasket is not allowed

9.10.6(g2) Shall have a floor-sealer gasket of vinyl, TPE, silicone, or equivalent

9.10.6(h) Wooden saddle threshold

9.10.6(h1) Hardwood only; a "gasket saddle" with a vinyl top gasket is not allowed

9.10.6(i) Bumper threshold

9.10.6(i1) Solid aluminum with bumper gasket of vinyl, TPE, silicone, or equivalent

9.10.7 Threshold Risers

9.10.7(a) Risers shall be made of material that matches the threshold (aluminum or hardwood).

9.10.7(b) Screws (minimum three per riser) must be compatible with threshold materials.

9.10.8 Threshold Shim/Elevator Materials

9.10.8(a) Non-wood: Aluminum and plastic (e.g., vinyl)

9.10.8(b) Solid wood: Redwood, cedar, pressure-treated fir, or solid hardwood (degradation-resistant and exterior-grade)

9.11 Exterior Doors

9.11.8(a) Doors shall comply with the fire-resistance requirements of local code (e.g., 2016 CRC Section R337.8).

9.11.8(b) When equipped with glass, the door shall be equipped with safety glass unless the pane is <3" in height or width

9.11.8(c) Replacement doors shall be limited to standard solid core slab or panel doors. (No ornate design, stained glass, decorative windows, etc., is allowed unless required by the State Historical Preservation Office and approved by weatherization waiver.)

9.11.1 Dimensions

9.11.1(a) A 1¾" door is required when jambs are replaced.

9.11.1(b) A 1⅜" door is allowed when jabs are not replaced and a 1¾" door will not fit.

9.11.2 Composition

9.11.2(a) Non-metallic veneer: Minimum ⅛" thick with exterior-grade glue

9.11.2(b) Core:

9.11.2(b1) Wood doors must be solid core.

9.11.2(b2) Metal doors must have a minimum R-6 insulated core.

9.11.3 Finish/Sealer

9.11.3(a) All doors, including those that are cut to fit on-site, will be sealed (painted or primed) to prevent moisture intrusion.

9.11.3(b) Pre-hung doors will be factory-sealed (primed or painted).

9.11.3(c) Wood Doors

9.11.3(c1) Acceptable sealers are paint, urethane, and varnish.

- Clear "water seal" products are not allowed.

9.11.3(d) Metal doors

9.11.3(d1) Acceptable sealers are oil-based or epoxy paint only.

9.11.3(e) Jamb and casing/trim

9.11.3(e1) Acceptable sealers are paint, urethane, and varnish.

- Clear "water seal" products not allowed.
- Exterior-grade material must be used in exterior locations.

9.11.4 Hinges

9.11.4(a) Hinges shall:

9.11.4(a1) Conform to American National Standards Institute (ANSI)/Builders Hardware Manufacturers Association (BHMA) A156.1

9.11.4(a2) Be constructed of brass or stainless steel, minimum 0.120" thick

9.11.4(a3) Be loose-pin type unless mounted toward the exterior

9.11.4(a4) Be fixed-pin type when mounted toward the exterior

- A fixed pin is not required on the middle hinge.

9.11.4(b) 1⅜" doors require a minimum hinge size of 3½" x 3½".

9.11.4(c) 1¾" doors require a minimum hinge size of 4" x 4".

9.11.4(d) Hinges in firewall applications

9.11.4(d1) Minimum 3½" x 3½" spring-loaded with adjustable tension

9.11.4(d2) Adequate spring tension to make access cover self-closing

9.11.5 Screws to Attach Hinges

9.11.5(a) Wood and metal jambs: Brass or stainless steel flathead screws or as specified/ supplied by manufacturer

9.11.5(b) Pre-hung units and replacement jambs: Screws shall penetrate the trimmer stud at least ⅝".

9.12 Interior/Appliance Enclosure Doors and Hardware

9.12.1 Interior-grade, hinged, hollow-core, and louvered doors are allowed (e.g., for appliance enclosures and communication between rooms for combustion ventilation air).

9.12.2 Thickness: 1⅜" or 1¾"

9.12.3 Veneer: Minimum ⅛" thick

9.12.4 Hinges

9.12.4(a) Two or three hinges (three hinges for solid wood or solid core)

9.12.4(b) Constructed of brass or stainless steel

9.12.4(c) Conforming with ANSI/BHMA A156.1

9.12.4(d) Minimum hinge size: 3½" x 3½" and 0.120" thick.

9.12.5 Screws for hinges: Brass or stainless steel flathead screws

9.13 Mobile Home Swinging Exterior Replacement Doors

9.13.1 Doors must have:

9.13.1(a) Rigid stiles and rails (e.g., channel steel and/or wood)

9.13.1(b) Permanently finished skin (e.g., fiberglass or vinyl-clad metal)

9.13.2 Out-Swinging Doors

9.13.2(a) Must be pre-hung entrance doors manufactured for mobile homes

9.13.2(b) Must have a flanged metal frame (jambs, header, and sill) with integral weather seals (e.g., extruded flap vinyl, bulb seal, etc.)

9.13.3 In-Swinging "House-Type" Doors

9.13.3(a) Material and installation criteria for house-type doors installed in mobile homes are the same as those for conventional entrance doors.

9.13.3(b) The door blank may be installed independently if feasible.

9.13.3(c) A pre-hung unit may be installed when it is the best option.

9.14 Fireplace Chimney Damper

9.14.1 Factory-Built (Zero Clearance) Fireplaces

9.14.1(a) Repair or replacement parts shall be specified by the fireplace manufacturer.

9.14.2 Masonry Fireplaces

9.14.2(a) Commercially available top-sealing (chimney top) dampers

9.14.2(b) Sized to fit the chimney termination

9.14.2(c) Controllable from indoors (e.g., with a control cable inside the fireplace)

9.15 Fireplace Glass Doors

9.15.1 All glass doors shall:

9.15.1(a) Fit the smallest dimensions of the fireplace opening

9.15.1(b) Seal against the fireplace surface (e.g., with gasket or strips of fiberglass insulation)

9.15.1(c) Meet the requirements listed below based on fireplace type

9.15.2 Factory-Built (Zero Clearance) Fireplaces

9.15.2(a) Commercially available glass doors

9.15.2(b) Designed for use with zero clearance fireplaces

9.15.2(c) Sized and shaped to fit against and seal off the fireplace opening

9.15.3 Masonry Fireplaces

9.15.3(a) Commercially available glass doors

9.15.3(b) Designed for use with masonry fireplaces

9.15.3(c) Sized and shaped to fit against and seal off the fireplace opening

9.16 Sealants

9.16.1 All Materials

9.16.1(a) Contractor must comply with Proposition 65 requirements.

9.16.1(b) Exterior sealants will be durable, pest resistant, and provide a weather-appropriate seal.

9.16.2 Bond breaker tape shall:

9.16.2(a) Be polyethylene, polypropylene, PTFE, or closed-cell foam

9.16.2(b) Have self-adhesive backing.

9.16.3 Elastomeric joint sealant must be compliant with American Society of Testing and Materials (ASTM) C920

9.16.3(a) Includes polysulfide, polyurethane, and silicone

9.16.3(b) Neutral cure (oxime or alkoxy) sealants must be used for masonry applications.

9.16.4 Fire-resistant foam must be compliant with ASTM E814, UL 1479, or ASTM E84 Class 1.

9.16.4(a) Firestop or fireblock foam

9.16.4(b) Usually red or orange in color

9.16.5 Foam sealant must be:

9.16.5(a) UL-classified

9.16.5(b) Class A or Class 1 per ASTM E84

9.16.5(c) Minimally expanding

9.16.6 High-temperature caulk must be rated for constant service up to at least 450°F (e.g., room-temperature vulcanizing [RTV] red silicone available for service up to 600°F, such as automotive RTV gasket sealant).

9.16.7 Latex sealant must be compliant with ASTM C 834

9.16.7(a) Includes latex, acrylic latex, and siliconized acrylic

9.16.8 Solvent-release sealant must be compliant with ASTM C 1311

9.16.8(a) Includes acrylic, butyl rubber, and chlorosulfonated polyethylene

9.17 Wall or Shell Patching

9.17.1 Mesh Plumbing Patches

9.17.1(a) 28–30-gauge non-corrosive metal with self-adhesive backing

9.17.1(b) Backing shall be a strong pressure-sensitive adhesive film

9.17.1(c) Backing shall be reinforced with fiberglass mesh or equivalent

9.17.1(d) Patches shall be cut to fit snugly around pipes (e.g., pre-cut for installation around 2", 1½", ¾", and ½" pipes)

9.17.2 Finishing Compound

9.17.2(a) Lightweight, non-shrinking spackling compound or

9.17.2(b) Drywall joint compound or equivalent

9.17.3 Sheet Metal

9.17.3(a) Aluminum or galvanized sheet metal; minimum thickness 0.007"

9.17.4 Radiant Barrier Material

9.17.4(a) Commercially available foil/bubble/foil

9.17.4(b) Class A/Class 1, minimum thickness 5⁄16"

9.17.5 Foam Board

9.17.5(a) Polyisocyanurate foil–clad on both sides, ASTM C 1289 or Federal Standard (FS) HH-I-1972

9.18 Weatherstripping

9.18.1 Rigid gasket jamb materials (aluminum carrier)

9.18.1(a) Solid extruded aluminum carrier, 0.05" minimum nominal thickness

9.18.1(b) Pliable gasket of vinyl, TPE, silicone, or equivalent

9.18.1(c) The carrier shall have elongated mounting holes, 9" OC maximum

9.18.1(d) The secondary seal between the carrier and the mounting surface shall be a minimum of ⅛" wide and extend the full length of the carrier

9.18.2 Spring and Cushion Metal

9.18.2(a) Brass, bronze, or stainless steel only; aluminum is not allowed

9.18.3 Cushion Synthetic Pressure-Sensitive Door Gaskets

9.18.3(a) Polypropylene, TPE, silicone, or equivalent

9.18.3(b) L-shaped stabilizer with self-adhesive backing

9.18.4 Flanged bulb (Compression Bulb)

9.18.4(a) Pliable gasket of TPE or silicone (e.g., teardrop-shaped seal)

9.18.4(b) Minimum ⅜" wide with self-adhesive stabilizer flange

9.18.5 Round Tube

9.18.5(a) Pliable gasket of TPE, silicone, or equivalent

9.18.6 Foam Tape

9.18.6(a) The color shall be compatible with the surrounding materials (e.g., light-color foam for light-color surfaces).

9.18.6(b) Closed-cell foam tape shall be UV-resistant with self-adhesive backing.

9.18.6(c) Open-cell foam tape shall have self-adhesive backing.

9.18.7 V-Shape Fin Seal

9.18.7(a) Durable V-seal of silicone or equivalent material, with stabilizer flange and adhesive backing. (This is different from a vinyl V-strip.)

9.18.8 Replacement Kerf-In Bulb and Foam

9.18.8(a) Properly sized for the retaining channel

9.18.9 Replacement Pile

9.18.9(a) Fin seal type whenever feasible

9.18.9(b) Properly sized for the retaining channel

9.18.10 Corner Pads

9.18.10(a) Pile pad shall have self-adhesive backing

9.18.11 Mechanical Attachments

9.18.11(a) All screws, nails, staples, and other fasteners shall be:

9.18.11(a1) Non-corrosive metal

9.18.11(a2) Properly sized for each application

9.18.12 Pressure-Sensitive Adhesive

9.18.12(a) Minimum adhesion strength of 65 ounces per inch on all self-adhesive products

9.18.12(b) Required on all self-adhesive products

9.19 Window Repair

9.19.1 Replacement glass will be sized to the original width, height, and depth and comply with Table 32-7.

TABLE 32-7: MATERIALS REQUIREMENTS BY GLASS TYPE AND HOME TYPE

Glass Type	Maximum Pane Size	
	Conventional Home*	Mobile Home
Single-strength (SS): Allowed when double-strength glass is too thick for the frame	16 sq. ft.	11 sq. ft.
Double-strength (DS): Recommended to replace single-strength glass when the frame thickness is adequate	24 sq. ft.	15 sq. ft.
3/16" Plate Glass	45 sq. ft.	30 sq. ft.
1/4" Plate Glass	65 sq. ft.	43 sq. ft.
Heat-Strengthened Glass	SS: 32 sq. ft. DS: 48 sq. ft. 3/16" plate: 90 sq. ft. 1/4" plate: 130 sq. ft.	SS: 22 sq. ft. DS: 30 sq. ft. 3/16" plate: 60 sq. ft. 1/4" plate: 86 sq. ft.
Fully Tempered Glass	SS: 64 sq. ft. DS: 96 sq. ft. 3/16" plate: 180 sq. ft. 1/4" plate: 260 sq. ft.	SS: 44 sq. ft. DS: 60 sq. ft. 3/16" plate: 120 sq. ft. 1/4" plate: 172 sq. ft.
*The listed glass sizing criteria are for installation in conventional home locations with low design pressure. For code requirements applicable to other locations, see chapter 24 of the current California Building Code or consult the local building department.		

9.19.2 Plastic Materials

9.19.2(a) All panes must be ultraviolet-treated polycarbonate, minimum 1/8" thick.

9.19.2(b) All sheeting must have sufficient rigidity to prevent bowing after installation.

9.19.2(c) Acrylic sheets and plastic film are not allowed.

9.19.3 Jalousie Windows

9.19.3(a) Minimum 3/16" glass will be installed.

9.19.3(b) Maximum pane length will be 48".

9.19.3(c) All attachment clips must be present.

9.19.3(d) Regular, patterned, frosted, tempered, and heat-strengthened glass is allowed.

9.19.3(e) Wired, laminated, and sandblasted glass is not allowed.

9.19.4 Safety glass must be:

9.19.4(a) Compliant with ANSI Z97.1

9.19.4(b) Permanently labeled per the current CRC

9.19.5 Glass Quality

9.19.5(a) The quality of the replacement glass will equal or exceed that of the existing glass.

9.19.6 Wood Casing/Trim

9.19.6(a) Use exterior-grade casing/trim in exterior locations.

9.19.6(b) Paint-grade casing/trim is acceptable unless the existing jamb has a natural finish.

10. WARRANTY

10.1 Manufacturer—One year on all products except as specified by the manufacturer or unless otherwise specified below

10.1.1 Caulk—10 years

10.1.2 Weatherstripping—3 years

8.1.5 Clean all replacement window and SGD glass inside and out.

8.2. Client Education

8.2.1 Supply the client with both verbal and written instructions for:

8.2.1(a) Proper operations and maintenance

8.2.1(b) Safety considerations

8.2.1(c) Warranty

8.3. Clean-Up and Disposal Requirements

8.3.1 Remove all replaced windows, SGDs, broken glass, debris, and other miscellaneous parts from the property and dispose of them properly.

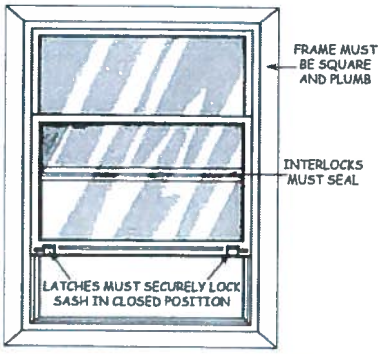

FIG. 33-12: POST-INSTALLATION QUALITY CHECK

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life

9.1.1 LIHEAP: 20 years

9.1.2 DOE: 20 years

9.2 All replacement window and SGD materials shall be:

9.2.1 ENERGY STAR®–certified

9.2.2 Compliant with local code and bear an National Fenestration Rating Council (NFRC) temporary label

9.2.3 Compliant with the warranty requirements below

9.2.4 Compliant with the following Title 24 energy efficiency standards:

9.2.4(a) U-Factor in all California Energy Commission (CEC) climate zones: Maximum 0.30

9.2.4(b) Solar heat gain coefficient:

9.2.4(b1) CEC climate zones 1, 3, 5, 16: No requirement

9.2.4(b2) CEC climate zones 2, 4, 6–15: Maximum 0.23

9.2.5 Selected by type in accordance with Table 33-1:

TABLE 33-1: REPLACEMENT WINDOWS BY TYPE

Existing Window Type	Replacement Window Type
Horizontal slider	Horizontal slider
Vertical slider	Vertical or horizontal slider
Picture window	Picture or sliding window
Jalousie window	Vertical or horizontal slider

9.3 Mobile home windows and SGDs shall be designed for manufactured home use.

9.3.1 Egress windows must be labeled to show they comply with the Code of Federal Regulations (CFR) Title 24 3280.404 and American Architectural Manufacturers Association (AAMA) 1704.

9.4 An SGD must have an interlock at the meeting rail.

9.5 Openable windows must have insect screens.

9.6 Exterior wooden stop and casing materials must be exterior-grade.

9.7 Sealing materials:

9.7.1 Caulk

9.7.1(a) The contractor must comply with Proposition 65 requirements.

9.7.1(b) Sealants applied indoors must be non-toxic.

9.7.2 Solvent release sealants include acrylic, butyl rubber, and chlorosulfonated polyethylene and must conform to American Society for Testing and Materials (ASTM) C1311.

9.7.3 Latex sealants include latex, acrylic latex, and siliconized acrylic and must conform to ASTM C834.

9.7.4 Elastomeric joint sealants include polysulfide, polyurethane, and silicone and must conform to ASTM C920 or other ASTM standards for elastomeric sealants (e.g., C603, C734, C1250, and D2202).

9.7.5 Foam sealants must be:

9.7.5(a) Used only when specified by the window manufacturer

9.7.5(b) Minimally expanding

9.7.5(c) Class A or Class 1 per ASTM E84

9.7.5(d) Fire-resistant foam compliant with ASTM E814 or Underwriters Laboratories (UL) 1479

9.8 Attachment materials:

9.8.1 Screws must be non-corrosive #8 or larger.

10. WARRANTY

10.1 Manufacturer—10 years (insulated glass unit [IGU])/3 years (other)

10.2 Contractor—1 year

6.1.3 When the measure will be included in a multi-family whole-building project, the installation will apply only within the dwelling units.

6.1.3(a) Common area installation (e.g., in a lobby, entertainment room, etc.) is not allowed for this measure.

7. DOE-SPECIFIC

7.1. Assessment Requirements

7.1.1 This measure is not a DOE measure.

8. POST-INSTALLATION GUIDELINES

8.1. Quality Check

8.1.1 Perform post-installation CAS testing of open-combustion appliances that draw combustion air from the living space. See Appendix A Combustion Appliance Safety Protocol.

8.2. Client Education

8.2.1 The client must be provided with both written and verbal instructions for the safe operation and/or removal of all storm windows installed in egress locations.

8.2.1(a) Instructions must be in a durable form (e.g., a permanent instruction label attached to the window, or an instruction card printed on card stock).

8.2.2 The client must be notified of changes or repairs made and be educated on how to operate and maintain storm windows, weatherstripping, and caulk around windows and trim.

8.3. Clean-Up and Disposal Requirements

8.3.1 Installation debris shall be removed from the property and disposed of properly.

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life

9.1.1 LIHEAP: 10 years

9.1.2 DOE: Not applicable to this measure

9.2 Storm Window Frame

9.2.1 Aluminum frame windows must conform to American National Standards Institute (ANSI)/ American Architectural Manufacturers Association (AAMA) 1002.10.

9.2.2 Wood frame windows must conform to Section 3 of ANSI/National Wood Window and Door Association (NWWDA) I.S.2.

9.2.3 Rigid vinyl frame windows must be ultraviolet (UV)-resistant and conform to American Society of Testing and Materials (ASTM) standards.

9.3 Storm Window Glazing

9.3.1 Glass must conform to ASTM C1036 Standard Specification for Flat Glass for conventional homes and AAMA 1701.2 for mobile homes.

9.3.2 Polished wire glass must conform to ANSI Z97.1.

9.3.3 Safety glass must conform to ANSI Z97.1 and be permanently labeled.

9.3.4 Plastic glazing must:

9.3.4(a) Be UV- and scratch-resistant polycarbonate

9.3.4(b) Be a minimum of ⅛" thick

9.3.4(c) Conform to ANSI Z97.1

9.3.5 Glass Selection

9.3.5(a) Conventional home

9.3.5(a1) Glass shall be selected in accordance with the currently adopted California Residential Code (CRC).

9.3.5(a2) The maximum pane size for each frame type and thickness of glass must be as specified in Table 34-1 unless location-specific requirements of the CRC are more restrictive.

TABLE 34-1: GLASS THICKNESS

Glass Thickness	Maximum Glass Size	
	Aluminum or Wood Frame	Rigid Vinyl Frame
Single strength	16 sq. ft.	Not allowed
Double strength	24 sq. ft.	17 sq. ft.*
3/16" plate	45 sq. ft.	25 sq. ft.
1/4" plate	65 sq. ft.	Not allowed
*Vertical measurement shall not exceed 4'.		

9.3.5(b) Mobile home

9.3.5(b1) The maximum pane size for each frame type and thickness of glass will be as specified in Table 34-2.

TABLE 34-2: GLASS THICKNESS—MOBILE HOMES

Glass Thickness	Maximum Glass Size	
	Aluminum or Wood Frame	Rigid Vinyl Frame
Single strength	11 sq. ft.	Not allowed
Double strength	15 sq. ft.	15 sq. ft.**
3/16" plate	30 sq. ft.	25 sq. ft.
1/4" plate	43 sq. ft.	Not allowed
**Vertical measurement shall not exceed 4'.		

9.4 Hardware and fasteners must be aluminum, stainless steel, or other non-corrosive material compatible with the frame.

9.5 Angled Corners (Rake Windows)

9.5.1 Frame corners shall be metal.

9.5.2 Adjustable internal frame corners are allowed.

9.5.2(a) Durable, solid plastic (two legs riveted in the center) is acceptable when adjustable metal frame corners are not available.

9.6 Sealants

9.6.1 Glazing tape must:

9.6.1(a) Be closed cell foam

9.6.1(b) Be a minimum of 1/8" thick

9.6.1(c) Conform to ASTM C509

9.6.2 Pre-formed gaskets must conform to ASTM C509.

9.6.3 Caulk

9.6.3(a) The contractor must comply with Proposition 65 requirements.

9.6.3(b) Sealants applied indoors must be non-toxic.

9.6.4 Solvent release sealants include acrylic, butyl rubber, and chlorosulfonated polyethylene and must conform to ASTM C1311.

9.6.5 Latex sealants include latex, acrylic latex, and siliconized acrylic and must conform to ASTM C834.

9.6.6 Elastomeric joint sealants include polysulfide, polyurethane, and silicone and must conform to ASTM C920 or other ASTM standards for elastomeric sealants (e.g., C603, C734, C1250, and D2202).

9.6.7 Foam sealants must be:

9.6.7(a) Minimally expanding

9.6.7(b) Class A or Class 1 per ASTM E84

9.6.7(c) Fire-resistant foam compliant with ASTM E814 or Underwriters Laboratories (UL) 1479

10. WARRANTY

10.1 Manufacturer—1 year

10.2 Contractor—1 year

8.3. Clean-Up and Disposal Requirements

8.3.1 All scraps and debris from the installation will be removed and disposed of properly.

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life

9.1.1 LIHEAP: 4 years

9.1.2 DOE: Not applicable to this measure

9.2 Square Corners

9.2.1 Rigid metal internal frame corners will be used.

9.2.2 Adjustable and plastic corners are not allowed.

9.3 Angled Corners (Rake Windows)

9.3.1 Frame corners shall be metal.

9.3.1(a) Adjustable internal frame corners are allowed.

9.3.1(b) Durable, solid plastic (two legs riveted in the center) are acceptable when adjustable metal frame corners are not available.

9.4 Window Screen Frame Materials

9.4.1 Wood is not allowed.

9.4.2 Rigid vinyl is not allowed.

9.4.3 Steel shall be zinc- or cadmium-plated.

9.4.4 Aluminum

9.4.4(a) A minimum of .025" thickness, 7/16" x 1" dimension for windows up to 25 sq. ft.

9.4.4(b) A minimum of .032" thickness, 7/16" x 1" dimension for windows larger than 25 sq. ft.

9.4.5 Vinyl or fiberglass shall be lead-free and flame-resistant (e.g., National Fire Protection Association [NFPA] 101 Class B CS-191 53, Code of Federal Regulations [CFR] Part 1610.61, International Building Code [IBC] 903.1 Class A).

9.4.6 Metal louvers are not allowed.

9.5 Shading Coefficient

9.5.1 Shade screens must have a shading coefficient of 0.36 or less at a 75° profile angle on clear single-pane glass or be rated to block/absorb/dissipate at least 70% of the sun's heat and glare.

9.6 Clips

9.6.1 Clips must be:

9.6.1(a) Corrosion-resistant metal (not plastic)

9.6.1(b) Compatible with the screen frame

9.6.1(c) Sized so the barrel rests on the mounting surface

10. WARRANTY

10.1 Manufacturer—1 year

10.2 Contractor—1 year

8.3. Clean-Up and Disposal Requirements

8.3.1 All packaging and film remnants will be removed and disposed of properly.

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life

9.1.1 LIHEAP: 4 years

9.1.2 DOE: Not applicable to this measure

9.2 All Types

9.2.1 Film shall:

9.2.1(a) Be selected to reduce heat and light energy transmission through windows

9.2.1(b) Have a solar heat gain coefficient of 0.35

9.2.1(c) Have a U-factor of 0.40

9.2.1(d) Be UV-treated

9.2.1(e) Be self-adhesive

9.2.1(e1) Non-adhesive film is not allowed.

9.3 Polyester

9.3.1 Minimum thickness: 0.0010" (1 mil)

10. WARRANTY

10.1 Manufacturer—10 years

10.2 Contractor—1 year

8. POST-INSTALLATION GUIDELINES

8.1. Quality Check

8.1.1 Combustion appliance safety testing must be performed upon completion of all measures that affect air tightness of home, per Appendix A Combustion Appliance Safety Protocol.

8.1.2 Completed attic sections shall be confirmed to have an even level of insulation at the prescribed R-value in accordance with Table 37-1.

8.1.3 Confirm that damage has not occurred to the roof or ceiling during installation

8.1.4 Once installed, insulation shall not be compressed or scattered, which could impact the efficiency of the insulation R-value.

8.1.5 The clearance zone for HPDs and vents shall be cleared of overblown insulation.

8.2. Client Education

8.2.1 Attic/Ceiling Access

8.2.1(a) The purpose of insulation and proper access operation will be communicated to client.

8.2.2 Disappearing Stairs

8.2.2(a) Educate the client on how to use the access to ensure the integrity of the insulated and sealed assembly throughout its service life.

8.2.2(b) The purpose of the entire measure (insulation, air seal, protective barrier, proper attic stair operation) shall be communicated to client.

8.2.3 Whole House Fan

8.2.3(a) When a whole house fan is present, educate the client on how to use it to ensure the integrity of the insulated assembly throughout the fan's service life and to prevent disturbance of the insulation.

8.2.4 Required Documentation

8.2.4(a) A completed copy of the CSD 610 Insulation Certificate shall be provided to the client.

8.2.4(a1) The certificate shall be completed and signed by the contractor responsible for installing the insulation. The manufacturer, brand, total installed R-value, etc. of the insulation installed in the roof/ceiling, walls, floor, and slab edge shall be documented.

8.2.4(a2) The installer shall also verify compliance with ventilation and infiltration reduction measures for the building envelope.

8.3. Clean-Up and Disposal Requirements

8.3.1 Upon completion, the residence shall be returned to its original condition and left free of job-related dust and debris inside and out.

8.3.2 A HEPA filter vacuum shall be used for all vacuuming.

8.3.2(a) All areas between indoor work areas and the home entrance shall be vacuumed.

8.3.2(b) The area between the home entrance/access and the insulation truck shall be swept or vacuumed.

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life

9.1.1 LIHEAP:

9.1.1(a) Blown-in/batt—20 years

9.1.1(b) All other types—Not applicable to this measure

9.1.2 DOE:

9.1.2(a) Blown-in/batt—30 years

9.1.2(b) All other types—20 years

9.2 All insulation shall be certified to comply with the material specifications in the California Code of Regulations (CCR), Title 24, Part 12, Chapters 12–13 and "Standards for Insulating Material."

9.3 Vapor barrier shall be rated no higher than one perm.

9.4 When required as a condition of permit:

9.4.1 Installed IC-rated fixtures must be listed for zero clearance insulation contact, with a label that certifies it as airtight (leakage less than 2.0 CFM at 75 Pascals when tested to ASTM E283).

9.4.2 Installed fixture covers for non-IC-rated fixtures shall be fireproof and listed for the purpose. The covers shall only be used where a non-IC fixture has a thermal switch that disconnects the electricity to the light if the temperature exceeds unsafe levels (e.g., TENMAT® and Insulite® covers).

9.4.2(a) Note: Products that act as dams for can lighting, but do not allow insulation to cover the area over the fixture, are not acceptable.

9.5 Permanent Blocking

9.5.1 Batts: Must comply with American Society of Testing and Materials (ASTM) C665

9.5.2 Non-corrosive metal, minimum 0.007" thick

9.5.3 Commercially available plastic chutes and cardboard baffles (for eave vent chutes and baffles only)

9.6 Mineral Fiber Insulation

9.6.1 Batts and blankets: Must comply with ASTM C665

9.6.2 Loose fill: Must comply with ASTM C764 and ASTM E84

9.7 Cellulose Loose Fill

9.7.1 Must be licensed for sale in California

9.7.2 Must be listed in the Department of Consumer Affairs' "Directory of Certified Insulation Materials"

9.8 Rigid Insulation

9.8.1 Must be reformed polyisocyanurate board, foil-faced on both sides

9.8.2 Must comply with Federal Standard (FS) HH-1-1972

9.8.3 High-density fiberglass board must comply with ASTM C726

9.9 Access Cover Insulation

9.9.1 Refer to Table 37-1.

9.10 Attic/Ceiling Access Door/Cover

9.10.1 Refer to Section 32 Infiltration Reduction, Material Specifications.

9.11 Strapping material must have a minimum expected service life of 20 years

9.12 Material Specifications for Mobile Homes

9.12.1 All insulation shall be certified to comply with the material specifications in the California Code of Regulations, Title 24, Part 12, Chapters 12–13, Article 3, "Standards for Insulating Material." In the applicable methods:

9.12.1(a) Loose-fill fiberglass shall comply with ASTM C764 and ASTM E84.

9.12.1(a1) Loose-fill rock wool or cellulose is not allowed.

9.12.1(b) Pre-formed expanded polystyrene foam board shall:

9.12.1(b1) Comply with ASTM C578

9.12.1(b2) Have a minimum density of 1 lb. per cu. ft.

9.12.1(c) Pre-formed foil faced polyisocyanurate or polyurethane foam board shall comply with FS HH-I-1972.

9.12.1(d) All flexible mineral fiber shall comply with ASTM C665.

9.12.1(e) Roof board shall:

9.12.1(e1) Be high-density fiberglass

9.12.1(e2) Comply with ASTM C726

9.12.1(e3) Have a minimum density of 3 lbs per cu. ft.

9.12.2 Synthetic membranes

9.12.2(a) Polyvinyl chloride material

9.12.2(a1) Minimum thickness: 40 mil

9.12.2(a2) Embedded rip-stop fiber scrim required

9.12.2(b) Ethylene propylene diene monomer and Hypalon™ rubber

9.12.2(b1) Minimum thickness: 45 mil

9.12.2(b2) Shall comply with ASTM D4637

9.12.3 Roofing material

9.12.3(a) Aluminum

9.12.3(a1) Materials shall have a minimum thickness of 0.024" for roofing material and 0.019" for gable end enclosures.

9.12.3(b) Steel

9.12.3(b1) Materials shall have a minimum 30-gauge thickness and comply with ASTM A361/361M.

9.12.3(c) Baked-on enamel or equivalent coating is a best practice.

9.12.4 Roof cover material

9.12.4(a) Materials shall be:

9.12.4(a1) Approved and listed by the Department of Housing and Urban Development (HUD)

9.12.4(a2) Approved by the manufacturer for mobile home roof cap applications

9.12.4(a3) Adequately puncture-resistant to withstand the environmental hazards of the location in which it will be installed (e.g., dropping pinecones, tree branches, etc.)

9.12.4(a4) Light in color

9.12.5 Wood edging and furring

9.12.5(a) Redwood or pressure-treated fir is preferred.

9.12.5(b) #2 or better Douglas fir is acceptable.

9.12.5(c) Nominal cross-sectional dimensions shall be minimum 2" x 2".

9.12.6 Metal edging without wooden perimeter

9.12.6(a) Aluminum: 0.028" thickness

9.12.6(b) Galvanized steel: 26 gauge

9.12.7 Metal drip rail, edge trim and flashing, end and ridge caps

9.12.7(a) Aluminum: 0.024" thickness

9.12.7(b) Galvanized steel: 30 gauge

9.12.8 Mechanical fasteners

9.12.8(a) All screws, nails, or staples shall be a minimum of ¾" long and non-corrosive (cadmium-plated or equivalent)

9.12.8(b) All screws shall be #8 minimum size, flathead, and of the proper type and size to ensure a permanent attachment.

9.12.8(c) All washers shall be 3" minimum diameter and contain a center recess to place the screw head flush with or below the insulation surface

9.12.9 Caulking

9.12.9(a) Elastomeric sealant types include polysulfide, polyurethane, and silicone.

9.12.9(a1) Shall comply with ASTM standards for elastomeric sealants (e.g., C920, C603, C734, C1250, and D2202)

9.12.10 Putty tape shall be self-sealing, pliable, and long-life–type adhesive.

10. WARRANTY

10.1 Manufacturer—Limited lifetime

10.2 Contractor—1 year

8.3. Clean-Up and Disposal Requirements

8.3.1 Upon completion, the residence shall be returned to its original condition and left free of job-related dust and debris inside and out.

8.3.2 A high-efficiency particulate air filter vacuum shall be used for all vacuuming.

8.3.3 Access inside the living space

8.3.3(a) All areas between indoor work areas and the home entrance shall be vacuumed.

8.3.4 Access outside the living space

8.3.4(a) All areas between the access and the insulation truck shall be swept or vacuumed.

8.3.5 Return dwelling to its original state

8.3.5(a) Indoors

8.3.5(a1) Remove coverings (e.g., plastic sheeting) from furniture, appliances, electronic devices, etc.

8.3.5(a2) Remove scraps and debris, and vacuum clean all areas affected by the insulation process.

8.3.5(a3) Return to their original position any household furnishings moved to perform the job.

8.3.5(a4) Outdoors

8.3.5(a5) Untie bushes, etc., and return them to their original condition.

8.3.5(a6) Remove plastic covers from plants and remove walking planks from garden beds.

8.3.5(a7) Remove all leftover insulation, packaging materials, plastic sheeting, insulation scraps, debris, ground covers/tarps, tools, and equipment.

8.3.6 All clean-up materials shall be removed from the premises and disposed of properly.

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life

9.1.1 LIHEAP:

9.1.1(a) Dense pack/rigid/full batt in airtight cavities—20 years

9.1.1(b) All other types—Not applicable to this measure

9.1.2 DOE:

9.1.2(a) Dense pack/rigid/full batt in airtight cavities—30 years

9.1.2(b) All other types—20 years

9.2 All insulation shall be certified to comply with the California Code of Regulations, Title 24, Part 12, Chapter 12–13, "Standards for Insulating Material."

9.3 Flexible and Rigid Materials

9.3.1 Non-absorbent, fire-rated insulation with a minimum life expectancy of 10 years shall be used.

9.3.2 Flexible mineral fiber shall conform to ASTM C665.

9.3.3 High density fiberglass board shall conform to ASTM C726.

9.3.4 Rigid foam shall be pre-formed, foil-faced polyisocyanurate board that conforms to Federal Specification (FS) HH-I-1972/1.

9.3.5 Facing shall meet applicable code requirements.

9.4 Loose-Fill Materials

9.4.1 Loose-fill fiberglass will meet a flame spread rating of 25 or less and a smoke development rating of 450 or less when tested in accordance with ASTM E84.

9.4.2 Loose-fill mineral fiber shall conform to ASTM C764.

9.4.3 Loose-fill cellulose shall be licensed for sale in California and listed in the Department of Consumer Affairs "Directory of Certified Insulation Materials."

9.5 Vapor Retarder (Membrane)

9.5.1 Minimum 6-mil plastic sheeting with an appropriate perm rating for the region.

9.6 Filling and Patching/Plugging

9.6.1 Use materials appropriate for the application.

9.6.1(a) Exterior-grade for all exterior applications

9.6.1(b) Compatible with the surrounding material

9.6.1(c) Installed in accordance with manufacturer's instructions

9.6.1(d) Finished to blend with the surrounding wall

9.6.2 Plugs shall:

9.6.2(a) Be compatible with the siding

9.6.2(b) Not be vented

9.6.2(c) Be resistant to shrinkage and expansion

10. WARRANTY

10.1 Manufacturer—Limited lifetime

10.2 Contractor—1 year

7.2.2(c) Excerpted from 2017 SWS 4.1301.6:

7.2.2(c1) Pier Construction Subfloor Insulation—Batt Installation Loose Fill with Rigid Barrier

- A rigid air barrier will be mechanically fastened to underside of floor assembly to protect insulation
- Seams and penetrations will be sealed

7.2.3 Mobile Home

7.2.3(a) Excerpted from 2017 SWS 4.1303.2:

7.2.3(a1) A rigid air barrier will be installed in contact with the bottom of the joists, when feasible

7.2.3(a2) Rigid air barrier will be fastened as to not sag, bend, or fall off

7.2.3(a3) Seams, holes, and joints in the air barrier will be sealed

8. POST-INSTALLATION GUIDELINES

8.1. Quality Check

8.1.1 Combustion appliance safety testing must be performed upon completion of all measures that affect air tightness of home, per Appendix A Combustion Appliance Safety Protocol.

8.1.2 The required clearance zones for HPDs and crawlspace venting shall be unobstructed by insulation or vapor retarder.

8.1.3 Completed floor insulation sections shall be confirmed to have an even level of insulation at the prescribed R-value.

8.1.4 There shall be no voids, gaps, or separations from the sub-floor.

8.1.5 Installed insulation shall not be compressed more than 10% to negatively impact the efficiency of the insulation R-value.

8.1.6 The number of bags of insulation installed shall be confirmed and must match the number required on the manufacturer's coverage chart.

8.2. Client Education

8.2.1 A copy of the completed CSD 610 Insulation Certificate must be provided to the client.

8.2.2 Unless virgin resin or reinforced material ≥10 mil was installed, the client shall be advised that the vapor retarder is biodegradable, will have a life span much shorter than the home (approximately 5 years), and will need to be replaced to remain effective.

8.3. Clean-Up and Disposal Requirements

8.3.1 Upon completion, the residence shall be returned to its original condition and left free of job-related dust and debris indoors and outdoors.

8.3.1(a) All areas between indoor work areas and the home entrance shall be vacuumed.

8.3.1(b) The area between the home entrance/access and the insulation truck shall be swept or vacuumed.

8.3.2 A high-efficiency particulate air filter vacuum shall be used for all vacuuming.

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life

9.1.1 LIHEAP:

9.1.1(a) Loose and batt types installed in fully closed, air-tight cavities—20 years

9.1.1(b) Rigid insulation—20 years

9.1.1(c) All other types including loose fill and batt not installed in fully closed, air-tight cavities—Not applicable to this measure

9.1.2 DOE:

9.1.2(a) Loose and batt types installed in fully closed, air-tight cavities—30 years

9.1.2(b) Rigid insulation—30 years

9.1.2(c) All other types including loose fill and batt not installed in fully closed, air-tight cavities—20 years

9.2 All insulation materials shall be approved for sale in California and certified to comply with the material specifications in the California Code of Regulations, Title 24, Part 12, Chapters 12–13, article 3, "Standards for Insulating Material."

9.3 Insulation material used in mobile homes will be non-corrosive and of minimal water absorbency.

9.4 Mineral Fiber

9.4.1 Batts shall conform to American Society of Testing and Materials (ASTM) C665 for material and facing (including flame spread and smoke density).

9.4.2 Loose fill shall conform to ASTM C764 and ASTM E84.

9.5 Cellulose loose fill shall be listed in the Department of Consumer Affairs' "Directory of Certified Insulation Materials."

9.6 Rigid insulation shall be:

9.6.1 Pre-formed polyisocyanurate board, foil-faced on both sides, that conforms with Federal Standard (FS) HH-1-1972/1 or

9.6.2 High-density fiberglass board that conforms with ASTM C726

9.7 Vapor retarder shall be:

9.7.1 Class I vapor retarder with a perm rating of ≤0.1

9.7.1(a) Can be ≥6 mil sheet polyethylene or unperforated aluminum foil (e.g., foil/scrim/kraft)

9.7.2 Class II vapor retarder with a perm rating of 0.1–1.0 (semi-impermeable)

9.7.2(a) Can be sheet polyethylene

9.7.3 In accordance with tear- and puncture-resistance standard ASTM E1745

9.8 Insulation cover shall be a minimum 70-perm breathable cover.

9.9 Supports and Anchors

9.9.1 All attachment materials shall be corrosion resistant have a minimum expected service life of 10 years.

9.9.2 Staples shall be ≥18-gauge, minimum ¼" crown for lath or ⅜" crown for other supports, and provide ≥⅝" joist penetration.

9.9.3 Nails shall be galvanized with ≥⅝" joist penetration.

9.9.4 Wire supports shall be minimum 20-gauge galvanized wire.

9.9.5 Woven wire shall be galvanized wire.

9.9.6 Polypropylene netting shall have ≥75-lb. breaking strength.

9.9.7 Spring Wire Support Rods ("Lightning Rods") for Flexible Insulation Types

9.9.7(a) Spring steel wire with chisel points (lightning rods, wirestays)

9.9.7(b) Minimum 13-gauge

9.10 Foundation vents shall conform with Section 41 Crawlspace Ventilation.

9.10.1 New or modified vents shall be covered with ¼" weave galvanized mesh.

9.11 Access Cover Insulation

9.11.1 Refer to Table 39-1.

9.12 Crawlspace Access Door/Cover

9.12.1 Refer to Section 32 Infiltration Reduction, Material Specifications.

10. WARRANTY

10.1 Manufacturer—Limited lifetime

10.2 Contractor—1 year

8.2. Client Education

8.2.1 When turbine vents are installed, advise the client to leave them uncovered even during cold weather.

8.3. Clean-Up and Disposal Requirements

8.3.1 Installation debris and parts shall be removed from the property and disposed of properly.

9. MATERIAL SPECIFICATIONS

9.1 Measure Effective Useful Life (EUL)

9.1.1 LIHEAP: 20 years

9.1.2 DOE: Included in conjunction with Section 37 Attic and Ceiling Insulation EUL

9.2 Vents shall be made of corrosion-resistant material screened with corrosion-resistant mesh with openings of ⅛" (#8 weave mesh)–¼" (#4 weave mesh).

9.3 Powered attic vents are not allowed within the weatherization program.

10. WARRANTY

10.1 Manufacturer—1 year

10.2 Contractor—1 year