



# CSD LIWP STANDARDS

FOR

## CEILING FAN - DRAFT

Category	Criteria
<b>1. MEASURE</b>	1.1. Replacement of an existing ceiling fan with ENERGY STAR <sup>®</sup> certified LED light fixture that cannot be retrofitted with LED bulbs. 1.2. This measure is classified as an Enhanced Measure <u>NOT</u> requiring an energy audit. 1.3. The following requirements are in addition to all applicable requirements found in the General Installation Guidelines.
<b>2. LICENSING</b>	2.1. This measure requires a Class B General Building Contractor or C-10 Electrical Contractor license for purposes of the LIWP program.
<b>3. FEASIBILITY CRITERIA</b>	3.1. Install this measure when: <ul style="list-style-type: none"> <li>a. A ceiling fan is present with incandescent bulbs in the light kit.</li> </ul> 3.2. Do <u>NOT</u> install this measure when: <ul style="list-style-type: none"> <li>a. The existing ceiling fan does not have a light kit, or CFLs or LEDs are already present in the light kit of the existing fan.</li> <li>b. Electrical hazard is present that cannot be corrected.</li> <li>c. Unsafe structural condition is present that cannot be corrected.</li> <li>d. Fan is located in an unconditioned location.</li> </ul>
<b>4. ADDITIONAL ASSESSMENT CRITERIA</b>	4.1. Light Level <ul style="list-style-type: none"> <li>a. Lighting level must be appropriate to the size of the space to be lit and to the total preferred light level of the client.</li> </ul>
<b>5. MINIMUM INSTALLATION GUIDELINES</b>	5.1. Measure shall be installed in accordance with manufacturer's instructions and specifications, local building code and 2016 CEC requirements. 5.2. Electrical Requirements <ul style="list-style-type: none"> <li>a. Swag chain kit shall be used when hard-wiring is not feasible, unless prohibited by manufacturer or local code.</li> </ul> 5.3. Controllers <ul style="list-style-type: none"> <li>a. Dimmers (including light dimmer on a remote control) shall not be used to control the fan motor.</li> <li>b. A speed controller shall not be used to control fan lighting.</li> </ul>
<b>6. POST-INSTALLATION GUIDELINES</b>	6.1. Operational Checks <ul style="list-style-type: none"> <li>a. Fan and Light               <ul style="list-style-type: none"> <li>- The fan and light shall function properly in accordance with manufacturers' specification.</li> <li>- All controls shall work properly.</li> <li>- The light kit set screws shall be tight, for quiet operation.</li> </ul> </li> <li>b. Blade Balance               <ul style="list-style-type: none"> <li>- The fan shall rotate smoothly, without wobbling.</li> <li>- Blades shall be balanced (e.g., using supplied balancing kit) to ensure smooth operation at all speeds.</li> </ul> </li> </ul>
<b>7. MATERIAL SPECIFICATIONS</b>	7.1. Ceiling Fan <ul style="list-style-type: none"> <li>a. ENERGY STAR certified with Title 24 compliant light kit.</li> <li>b. 110-volt, minimum 3-speed control.</li> <li>c. Separate fan and light switch controls on fan.</li> </ul>

	<p>d. UL listed motor and/or fan unit. e. Remote control UL-listed and compatible with fan.</p> <p>7.2. Ceiling Fan Sizing</p> <p>a. Shall be appropriate for room dimensions and by manufacturer specification. b. When not specified, use this guide:</p> <table border="1" data-bbox="678 275 1076 449"> <thead> <tr> <th>ROOM SIZE</th> <th>FAN SIZE</th> </tr> </thead> <tbody> <tr> <td>Up to 75 sq. ft.</td> <td>29" – 36"</td> </tr> <tr> <td>76 – 144 sq. ft.</td> <td>36" – 42"</td> </tr> <tr> <td>145 – 225 sq. ft.</td> <td>44"</td> </tr> <tr> <td>226 – 400 sq. ft.</td> <td>50" – 54"</td> </tr> </tbody> </table> <p>7.3. Light Kit &amp; LED Bulbs</p> <p>a. Light kits shall be ENERGY STAR certified Title 24 compliant and equipped with LED bulbs. b. Installed LEDs shall be listed for use in a ceiling fan, due to vibration.</p> <p>7.4. Swag Chain Kit: UL listed (or equivalent) and properly grounded (compliant with local code).</p>	ROOM SIZE	FAN SIZE	Up to 75 sq. ft.	29" – 36"	76 – 144 sq. ft.	36" – 42"	145 – 225 sq. ft.	44"	226 – 400 sq. ft.	50" – 54"
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Up to 75 sq. ft.	29" – 36"										
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145 – 225 sq. ft.	44"										
226 – 400 sq. ft.	50" – 54"										
<b>8. WARRANTY</b>	8.1. Manufacturer Warranty – 3 years										



# CSD LIWP STANDARDS

FOR

## CEILING INSULATION - DRAFT

Category	Criteria
<b>1. MEASURE</b>	<p>1.1. Ceiling and knee wall insulation reduces unwanted heat loss or gain and can decrease the energy demands of heating and cooling systems.</p> <p>1.2. This measure is classified as an Enhanced Measure requiring:</p> <ol style="list-style-type: none"> <li>a. An energy audit when some insulation <u>is</u> present.</li> <li>b. No energy audit when insulation is <u>not</u> present.</li> </ol> <p>1.3. The following requirements are in addition to all applicable requirements found in the General Installation Guidelines.</p>
<b>2. LICENSING</b>	<p>2.1. This measure requires a Class B General Building Contractor or C-2 Insulation and Acoustical Contractor license for purposes of the LIWP program.</p>
<b>3. FEASIBILITY CRITERIA</b>	<p>3.1. Install this measure when (<u>ALL</u> of the following shall apply):</p> <ol style="list-style-type: none"> <li>a. The ceiling area separates conditioned and unconditioned space.</li> <li>b. At least 100 square feet of attic is feasible to insulate.</li> <li>c. Energy audit shows a SIR of 1.0 or greater (when energy audit is required)</li> </ol> <p>3.2. Do <u>NOT</u> install this measure when:</p> <ol style="list-style-type: none"> <li>a. Existing insulation level meets Title 24 requirement for new construction.</li> <li>b. Existing insulation is vermiculite material.</li> <li>c. An exhaust fan terminates in the attic and cannot be vented to the outdoors.</li> <li>d. An unsafe structural or electrical attic condition is present that cannot feasibly be corrected.</li> <li>e. Knob-and-Tube (K&amp;T) wiring is present and energized.</li> <li>f. Roof leak is present.</li> <li>g. Structure is unsound and cannot support the weight of insulation.</li> <li>h. Required attic venting is not feasible to install.</li> </ol>
<b>4. ADDITIONAL ASSESSMENT CRITERIA</b>	<p>4.1. Electrical Safety Requirements</p> <ol style="list-style-type: none"> <li>a. Electrical hazards in the attic shall be corrected, if feasible, before insulation may be installed.</li> </ol> <p>4.2. Knee Wall and Skylight Well Insulation: Uninsulated knee walls and skylight wells shall be insulated when ceiling insulation is installed.</p>
<b>5. MINIMUM INSTALLATION GUIDELINES</b>	<p>5.1. Measure shall be installed in accordance with manufacturer's instructions and specifications, local building code, the 2016 Title 24 requirements and the LIWP CAS Protocol.</p> <p>5.2. Ceiling Insulation Required R-Value:</p> <ol style="list-style-type: none"> <li>a. Insulation for ceilings, knee walls, and skylight wells shall be installed to satisfy current Title 24 requirements for <u>new construction</u>.             <ul style="list-style-type: none"> <li>- R-30: Climate zones 1, 11-16</li> <li>- R-38: Climate zones 2-10.</li> <li>- Uninsulated knee walls and skylight wells: R-19 flexible insulation shall be installed and secured in place.</li> </ul> </li> <li>b. Access cover shall be insulated and weatherstripped per Item 5.8.</li> </ol> <p>5.3. Attic Preparation</p> <ol style="list-style-type: none"> <li>a. When the attic contains an HVAC unit and/or ducts, work on the appliance and duct testing/sealing shall be complete <u>before</u> insulation is installed.</li> </ol>

- b. If required, additional attic ventilation shall be installed prior to insulation work and billed within this measure.
  - c. Care shall be taken to prevent damage to the home and furnishings by the insulation hose, ladders, etc.
  - d. Dwelling interior shall be protected with runners/drop cloths, when access is indoors.
  - e. All cutting of batts shall occur outside the living space or inside the attic.
  - f. One depth marker shall be installed for every 300 square feet of attic area, with the bottom of the marker at the air barrier, to determine where additional insulation is needed. Markers shall be left in place to aid in inspection.
- 5.4. Vapor Barrier (when required by the local jurisdiction)
- a. Vapor barrier criteria apply to flexible mineral fiber batts/blankets installed directly onto the attic floor, knee wall, or skylight well (not to batts installed for blocking purposes).
  - b. Vapor barrier shall not be installed over existing insulation (with the exception of batts used for blocking).
  - c. When installed, barrier is placed toward winter warm side (directly on attic floor).
- 5.5. Permanent Blocking of Vents and Heat-Producing Devices (HPDs)
- a. Insulation shall not be installed over energized wires that are not insulated or have frayed or decayed insulation or unsafe splices. When a hazard exists, hazard area shall be blocked as described in the following table.

Wire Hazard	ELECTRICAL WIRING REQUIREMENTS
Open Junction Boxes	<ul style="list-style-type: none"> <li>• All electrical junctions will be flagged to be seen above the level of the insulation.</li> <li>• Protect box with a standard cover plate. When installed, it is acceptable to blow loose fill insulation over the box.</li> </ul>
Wire Connections Protruding from a Junction Box	<ul style="list-style-type: none"> <li>• Protect connections with a box extension AND standard cover plate.</li> <li>• Install mineral fiber blocking that exceeds the height of adjoining loose fill by 4", and extends away at least 14-1/2" x 12" in all directions.</li> </ul>
Wire Connections without Junction Box (Spider Web)	<ul style="list-style-type: none"> <li>• Protect connections with mineral fiber blocking that exceeds the height of adjoining loose fill by 4", and extends away at least 14-1/2" x 12" in all directions.</li> </ul>
Knob-and-Tube	<ul style="list-style-type: none"> <li>• Shall be treated in accordance with LIWP Standards Attachment B and CEC Article 394.</li> </ul>

- b. Clearance zone shall provide a cleared space free of insulation surrounding a heat producing device (HPD) or vent, in accordance with the following table.
  - Note 1: No blocking is required where loose fill is not present or if the HPD is mounted above the top of the insulation.
  - Note 2: Local code may supersede these requirements.

GENERAL BLOCKING REQUIREMENTS FOR ALL HPD TYPES	
Loose Fill Insulation	<ul style="list-style-type: none"> <li>• Minimum 3" clearance zone required in all directions around:               <ul style="list-style-type: none"> <li>- Recessed light fixtures ("IC" and "Non-IC" types)</li> <li>- Exposed fluorescent fixtures</li> <li>- Doorbell transformers</li> <li>- Motors for range hoods and exhaust fans</li> <li>- Appliance vent pipes made of metal</li> <li>- Masonry chimneys</li> <li>- Electric water heater</li> <li>- Combustion appliances</li> </ul> </li> <li>• Flexible mineral fiber blocking shall extend at least an additional 14-1/2" from the clearance zone in all directions.</li> </ul>

	<ul style="list-style-type: none"> <li>• Non-combustible blocking materials are required. <ul style="list-style-type: none"> <li>- Blocking shall extend from the attic floor to 4" above the insulation level.</li> <li>- Metal blocking (dam) shall be permanently attached to the ceiling/framing with staples, nails, or screws.</li> <li>- Baffles and chutes must be kept 3" away from HPDs, if non-metal.</li> </ul> </li> <li>• If covered by a fire-rated, airtight enclosure instead of a dam, 24" minimum top clearance is required. <ul style="list-style-type: none"> <li>- Top cover shall have an R-value of 0.50 or less.</li> <li>- Insulation must not cover the top of the enclosure.</li> <li>- Caulk, mastic, or foam will be used on all edges, gaps, cracks, holes, and penetrations of closure material.</li> <li>- <u>Note</u>: Gypsum enclosures that house fluorescent light fixtures do not require protection from loose fill insulation.</li> </ul> </li> </ul>
<b>Flexible Insulation</b>	<ul style="list-style-type: none"> <li>• 3" clearance zone required for from HPD on all sides.</li> <li>• When flexible is installed over loose fill, blocking shall be used to prevent loose fill from entering the clearance zone.</li> </ul>

c. Appliances Located in Attics: Additional clearance zones apply, as identified in the table below, or may be superseded by manufacturer specifications.

<b>FURNACE/HEAT PUMP BLOCKING REQUIREMENTS</b>	
Loose Fill	<ul style="list-style-type: none"> <li>• 12" around back, sides, and top.</li> <li>• 24" clearance in front.</li> <li>• 3" clearance for vent pipes (6" if single-wall).</li> </ul>
Flexible	<ul style="list-style-type: none"> <li>• 12" on all sides.</li> <li>• 3" clearance for vent pipes (6" if single-wall).</li> <li>• 6" clearance below units drawing combustion air from bottom.</li> </ul>
<b>GAS WATER HEATER BLOCKING REQUIREMENTS</b>	
Loose Fill	<ul style="list-style-type: none"> <li>• 6" around back and sides.</li> <li>• 12" clearance in front.</li> <li>• 3" clearance for vent pipes (6" if single-wall).</li> </ul>
Flexible	<ul style="list-style-type: none"> <li>• 6" on all sides.</li> <li>• 3" clearance for vent pipes (6" if single-wall).</li> </ul>
<b>APPLIANCE PLATFORM AND CATWALK BLOCKING REQUIREMENTS</b>	
All Insulation Types	<ul style="list-style-type: none"> <li>• Install insulation underneath both, when accessible.</li> <li>• Insulation shall <u>not</u> be installed on top of platforms, unless clearances can be met.</li> </ul>

5.6. Blocking of Building Cavities and Attic Ventilation

a. All vents, individual or continuous, shall be protected with blocking.

b. General Requirements

- Blocking shall conform to Item 5.8(b) and be installed to extend to the top plate.
- Metal, flexible mineral fiber (batts), and manufactured pre-cut cardboard and preformed plastic baffles/chutes (for eave vents) may be used.
  - Note: Nonmetallic baffles and chutes shall not be used to block HPDs.
- Rigid materials shall be permanently attached to the ceiling/framing with staples, nails, or screws.

5.7. Blocking at Attic Vent Locations

a. Minimum 1" clearance is required between roof sheathing and insulation.

b. Horizontal mineral fiber blocking may rest on existing loose fill, if no loose fill is exposed at the top plate.

- Blocking that extends inward 14-1/2" shall exceed height of loose fill by 4".
- Blocking that extends inward 24" shall equal or exceed height of loose fill.

c. Baffles and Chutes

- When attached to rafters, they shall begin at the top plate and extend above

	<p>loose fill by a minimum of 4" and a maximum of 12".</p> <ul style="list-style-type: none"> <li>- Shall be permanently attached with 2+ mechanical fasteners per rafter.</li> <li>- Minimum air path is 1" x 12" for 16" OC rafters, or 1" x 18" for 24" OC.</li> </ul> <p>5.8. Blocking, Insulation, and Weatherstripping of Attic Access</p> <p>a. When loose fill insulation is present, each functional/usable access shall be blocked.</p> <ul style="list-style-type: none"> <li>- Batts shall extend from the attic floor to top of loose fill <u>and</u> extend at least 14-1/2" from access opening in all directions.</li> <li>- Metal barrier material shall <u>not</u> be installed.</li> <li>- When wood members (2-by framing, plywood, etc.) surround the access and extend from attic floor to top of loose fill, blocking is <u>not</u> required.</li> <li>- When wood members are present but do not extend to top of loose fill, batts (faced or unfaced) may be used in combination with wood members to achieve required blocking height.</li> </ul> <p>b. All attic entry doors/covers accessed from conditioned space shall be insulated to the same R-value as the attic floor, and shall be non-compressed rigid or flexible material that is permanently attached.</p> <p>c. Access hatch frames shall be weatherstripped.</p>
<p><b>6. POST-INSTALLATION GUIDELINES</b></p>	<p>6.1. Operational Checks</p> <p>a. Installation shall be in accordance with manufacturer specifications, applied evenly with no gaps, voids, compressions, misalignments, or possible wind intrusions from lack of blocking.</p> <p>b. Insulation shall not be compressed or to impact the insulation R-value.</p> <p>c. Clearance zone for HPDs and vents shall be verified free of insulation overblow.</p>
<p><b>7. MATERIAL SPECIFICATIONS</b></p>	<p>7.1. All insulation types shall be certified to comply with CCR, Title 24, Part 12, Chapters 12-13, "Standards for Insulating Material", and to requirements by type:</p> <p>a. Mineral Fiber</p> <ul style="list-style-type: none"> <li>- Flexible (Batts): Conformance to ASTM C665.</li> <li>- Loose Fill: Conformance to ASTM C764.</li> </ul> <p>b. Cellulose, Loose Fill: Licensed for sale in California and listed in Department of Consumer Affairs "Directory of Certified Insulation Materials"</p> <p>c. Rigid:</p> <ul style="list-style-type: none"> <li>- Preformed polyisocyanurate board foil-faced on both sides, in conformance with FS HH-1-1972.</li> <li>- High Density Fiberglass Board: Conformance to ASTM C726.</li> </ul> <p>7.2. Vapor Barrier (when required): Maximum of 1 perm</p> <p>7.3. Blocking Materials</p> <p>a. Batts: Flexible mineral fiber (unfaced or faced).</p> <p>b. Metal: Corrosion-resistant, minimum 0.007" thick</p> <p>c. Eave Vent Chutes and Baffles: Commercially available plastic or cardboard.</p> <p>d. Wood: Framing members and attached sheathing (e.g., plywood).</p>
<p><b>8. WARRANTY</b></p>	<p>8.1. Manufacturer Warranty – 1 year</p>



# CSD LIWP STANDARDS

FOR

## ELECTRONICALLY COMMUTATED BLOWER MOTOR – DRAFT

Category	Criteria									
<b>1. MEASURE</b>	1.1. High-efficiency brushless electronically commutated motor (ECM) installed to replace the existing direct drive Permanent Split Capacity (PSC) blower motor in a central A/C system. 1.2. This measure is classified as an Enhanced Measure <u>NOT</u> requiring an energy audit. 1.3. The following requirements are in addition to all applicable requirements found in the General Installation Guidelines.									
<b>2. LICENSING</b>	2.1. This measure requires a C-20 Warm-Air Heating, Ventilating, and Air-Conditioning Contractor license for purposes of the LIWP program.									
<b>3. FEASIBILITY CRITERIA</b>	3.1. Install this measure when ( <u>all</u> of the following shall apply): a. The dwelling has a functional central refrigerated cooling system (A/C or heat pump) with a direct drive PSC blower motor. b. The dwelling is located in Climate Zones 9 – 15. 3.2. Do <u>NOT</u> install this measure when: a. Existing central A/C unit: <ul style="list-style-type: none"> <li>- Is inaccessible, is non-operational, or is in need of service or repair (other than simple blower motor replacement).</li> <li>- Has a hazardous condition that cannot feasibly be corrected.</li> <li>- Has a defective or excessively-leaky plenum or duct system that cannot feasibly be repaired or sealed.</li> <li>- Is on a recall list (e.g., Consumer Product Safety Commission: <a href="https://www.cpsc.gov/Recalls">https://www.cpsc.gov/Recalls</a>).</li> <li>- Will be replaced.</li> </ul> b. Air handler cabinet is too narrow to provide clearance for the new motor. c. Replacement blower motor requires special mounting hardware/bracket that cannot feasibly be installed.									
<b>4. ADDITIONAL ASSESSMENT CRITERIA</b>	4.1. Horsepower (HP) Rating: <ul style="list-style-type: none"> <li>a. Record the HP rating of the existing motor and the A/C capacity in tons.</li> <li>b. Specify an EMC that can provide the HP rating that most closely matches that of the existing motor, using the following table as a guide.</li> </ul> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Motor HP</th> <th>HVAC A/C Tons</th> <th>Furnace kBtuh</th> </tr> </thead> <tbody> <tr> <td>1/5 to 1/2</td> <td>1.5 to 3</td> <td>40 to 95</td> </tr> <tr> <td>1/2 to 1</td> <td>3.5 to 5</td> <td>100 to 150</td> </tr> </tbody> </table> 4.2. Determine if filter is cleanable or is to be replaced, with costs included as part of this measure.	Motor HP	HVAC A/C Tons	Furnace kBtuh	1/5 to 1/2	1.5 to 3	40 to 95	1/2 to 1	3.5 to 5	100 to 150
Motor HP	HVAC A/C Tons	Furnace kBtuh								
1/5 to 1/2	1.5 to 3	40 to 95								
1/2 to 1	3.5 to 5	100 to 150								
<b>5. MINIMUM INSTALLATION GUIDELINES</b>	5.1. Measure shall be installed in accordance with manufacturer's instructions and specifications, local building code and LIWP CAS protocols. 5.2. Pre-Installation <ul style="list-style-type: none"> <li>a. Measure static pressure in the supply plenum with the PSC motor running in cooling mode.</li> </ul> 5.3. Motor Installation									

	<ul style="list-style-type: none"> <li>a. Install the ECM using specified mounting hardware (e.g., bellyband, spacers, bracket). <ul style="list-style-type: none"> <li>- If new holes must be drilled, securely bolt the motor in those locations (not with sheet metal screws).</li> <li>- Center motor in the blower housing, and position wiring harness.</li> <li>- Secure the blower wheel locking bolt to flat side of the motor shaft.</li> </ul> </li> <li>5.4. Electrical <ul style="list-style-type: none"> <li>a. Select ECM speed in cooling mode that produces the same static pressure in the supply plenum that the PSC motor did.</li> <li>b. Place a completed ECM wiring label/sticker near the existing wiring diagram.</li> </ul> </li> <li>5.5. Air filters are to be cleaned or replaced per assessment decision.</li> </ul>
<b>6. POST-INSTALLATION GUIDELINES</b>	<ul style="list-style-type: none"> <li>6.1. Operational Checks <ul style="list-style-type: none"> <li>a. Measure shall be tested after installation and shall function properly in accordance with manufacturer's specifications.</li> </ul> </li> </ul>
<b>7. MATERIAL SPECIFICATIONS</b>	<ul style="list-style-type: none"> <li>7.1. Motor Type <ul style="list-style-type: none"> <li>a. Variable speed ECM appropriate for use as an HVAC replacement direct drive blower motor.</li> <li>b. UL or CSA-recognized component.</li> <li>c. ECM capable of providing the horsepower that matches the HVAC system.</li> </ul> </li> <li>7.2. Accessories (When Required) <ul style="list-style-type: none"> <li>a. Digital Programmer <ul style="list-style-type: none"> <li>- For installation of ECMs that require programming.</li> <li>- Compatible with the motors it will be used to program.</li> </ul> </li> <li>b. Motor Mounting Devices <ul style="list-style-type: none"> <li>- Commercially available replacement mounting hardware.</li> <li>- Compatible with the ECM being installed.</li> </ul> </li> </ul> </li> </ul>
<b>8. WARRANTY</b>	<ul style="list-style-type: none"> <li>8.1. Manufacturer Warranty – 2 years</li> </ul>



# CSD LIWP STANDARDS

FOR

## EFFICIENT FAN CONTROLLER - DRAFT

Category	Criteria
<b>1. MEASURE</b>	1.1. Installation of a retrofit efficient fan controller (EFC) that extends an air-handler run time, to extract more heating/cooling from the HVAC system. 1.2. This measure is classified as an Enhanced Measure <u>NOT</u> requiring an energy audit. 1.3. The following requirements are in addition to all applicable requirements found in the General Installation Guidelines.
<b>2. LICENSING</b>	2.1. This measure requires a C-20 Warm-Air Heating, Ventilating and Air-Conditioning Contractor for purposes of the LIWP program.
<b>3. FEASIBILITY CRITERIA</b>	3.1. Install this measure when ( <u>ALL</u> of the following shall apply): a. Dwelling is in CZ 4 or 8 – 16. b. Dwelling is cooled by a central HVAC system (package unit, split system, heat pump, gas or electric furnace, or hydronic system) that is operating safely and properly, or will be replaced under the program. c. All FAU housing access panels are functional and secure. d. The HVAC system has a 24 VAC (24 volts, alternating current) thermostat and blower control.  3.2. Do <u>NOT</u> install this measure when: a. HVAC unit requires service or replacement that is not feasible b. HVAC unit is on a recall list (e.g., Consumer Product Safety Commission: <a href="https://www.cpsc.gov/Recalls">https://www.cpsc.gov/Recalls</a> ). c. A suitable installation location for the EFC is not available. d. An EFC is already in place.
<b>4. ADDITIONAL ASSESSMENT CRITERIA</b>	4.1. EFC shall be installed on these HVAC models: a. High efficiency (with or without condensing furnace), and using a brushless permanent magnet (BPM) fan motor, or b. Standard efficiency and using a permanent split capacity (PSC) fan motor. c. <u>Note</u> : When FAU is a heat pump, EFC must be compatible with heat pump installation. Check the EFC manufacturer’s specifications.  4.2. HVAC units requiring service, repair, or replacement shall be resolved before an EFC is installed.  4.3. Determine if filter is cleanable or needs to be replaced with costs included as part of this measure.
<b>5. MINIMUM INSTALLATION GUIDELINES</b>	5.1. Measure shall be installed in accordance with manufacturer’s instructions and specifications, and the local building code.  5.2. Installation a. Verify proper operation of the HVAC system in heating and/or cooling mode, and proper system voltage, before attempting installation.

<p><b>6. POST-INSTALLATION GUIDELINES</b></p>	<p>6.1. Operational Checks</p> <ul style="list-style-type: none"> <li>a. Following installation, and in accordance with manufacturer’s recommendations, operate the furnace (when cold outside) or the air conditioner (when warm outside) for the prescribed amount of time.</li> <li>b. Attach manufacturer’s retrofit identification label and instructions to the HVAC appliance.</li> <li>c. Fan-off time delay shall be checked according to manufacturer’s instructions. <ul style="list-style-type: none"> <li>- The GreenFan EFC™ shall extend air handler run time in both heating and air conditioning modes for the specified time periods.</li> <li>- The Western Cooling Control 1(WCC1) and Western Cooling Control 20 (WCC20) shall extend air handler run time in air conditioning mode for the specified time.</li> </ul> </li> <li>d. Troubleshooting <ul style="list-style-type: none"> <li>- If the system does not perform as intended (e.g., time delay is improper), corrections shall be made in accordance with manufacturer’s instructions.</li> </ul> </li> </ul>
<p><b>7. MATERIAL SPECIFICATIONS</b></p>	<p>7.1. EFC Controller Selection</p> <ul style="list-style-type: none"> <li>a. EFC for furnaces must be capable of switching the furnace fan from low to high speed, and supported by the system control board.</li> <li>b. At the time of this publication, there are only two products that meet the CSD material specifications: <ul style="list-style-type: none"> <li>- For heating and/or cooling systems: <ul style="list-style-type: none"> <li>• GreenFan® Efficient HVAC Fan Controller™ (<a href="http://mygreenfan.com/">http://mygreenfan.com/</a>) UL Listed for: <ul style="list-style-type: none"> <li>- Heating and cooling FAUs and heat pumps</li> <li>- Hydronic heating systems</li> </ul> </li> </ul> </li> <li>- For cooling-only systems: <ul style="list-style-type: none"> <li>• Western Cooling Control™ (<a href="http://www.proctoreng.com/innovative-products/WCC.html">http://www.proctoreng.com/innovative-products/WCC.html</a>): <ul style="list-style-type: none"> <li>- WCC1 for air conditioning systems</li> <li>- WCC20 for heat pump cooling mode</li> </ul> </li> </ul> </li> </ul> </li> </ul>
<p><b>8. WARRANTY</b></p>	<p>8.1. Manufacturer Warranty – 1 year</p>



# CSD LIWP STANDARDS

FOR

## FLOOR INSULATION - DRAFT

Category	Criteria
<b>1. MEASURE</b>	1.1. Floor insulation reduces unwanted heat loss or gain and can decrease the energy demands of heating and cooling systems. 1.2. This measure is classified as an Enhanced Measure requiring: <ol style="list-style-type: none"> <li>a. An energy audit when some insulation <u>is</u> present.</li> <li>b. No energy audit when insulation is <u>not</u> present.</li> </ol> 1.3. The following requirements are in addition to all applicable requirements found in the General Installation Guidelines.
<b>2. LICENSING</b>	2.1. This measure requires a Class B General Building Contractor or C-2 Insulation and Acoustical Contractor license for purposes of the LIWP program.
<b>3. FEASIBILITY CRITERIA</b>	3.1. Install this measure when ( <u>ALL</u> of the following shall apply): <ol style="list-style-type: none"> <li>a. The floor separates conditioned and unconditioned space.</li> <li>b. At least 100 square feet of floor is feasible to insulate.</li> <li>c. Energy audit shows a SIR of 1.0 or greater (when energy audit is required).</li> </ol> 3.2. Do <u>NOT</u> install this measure when: <ol style="list-style-type: none"> <li>a. Existing insulation level meets Title 24 requirement for new construction.</li> <li>b. One or more unsafe condition(s) is present and cannot be corrected.               <ul style="list-style-type: none"> <li>- Unsafe electrical conditions are present and correction is not feasible.</li> <li>- Knob-and-tube (K&amp;T) wiring is present and energized.</li> <li>- Deteriorated or substandard floor sheathing is present.</li> <li>- Safe physical access is not feasible.</li> <li>- Required crawlspace ventilation cannot be installed, when required.</li> </ul> </li> <li>c. Underfloor insulation would be installed but no foundation wall exists (allowing exposure to precipitation, wind, or animals).</li> </ol>
<b>4. ADDITIONAL ASSESSMENT CRITERIA</b>	4.1. Electrical Safety Requirements <ol style="list-style-type: none"> <li>a. Electrical hazards in the crawlspace shall be corrected, if feasible, before insulation may be installed.</li> </ol>
<b>5. MINIMUM INSTALLATION GUIDELINES</b>	5.1. Measure shall be installed in accordance with manufacturer's instructions and specifications, local building code the 2016 Title 24 requirements and the LIWP CAS Protocol. 5.2. R-Value <ol style="list-style-type: none"> <li>a. When no insulation is present (or when existing insulation is damaged/degraded), floor insulation shall be installed to a R-Value of R-19.</li> <li>b. Interior crawlspace access in a horizontal floor assembly:               <ul style="list-style-type: none"> <li>- Access cover shall be insulated to R-19.</li> <li>- Access cover/door shall be weatherstripped with self-adhesive foam tape.</li> </ul> </li> </ol> 5.3. Crawlspace Preparation <ol style="list-style-type: none"> <li>a. All cutting of fiberglass batts and blankets shall occur outside the living space or inside the crawlspace</li> </ol> 5.4. Required Venting <ol style="list-style-type: none"> <li>a. Required crawlspace cross-ventilation shall be installed prior to insulation work and billed within the measure.</li> <li>b. Crawlspace ventilation shall conform to local building code requirements.</li> </ol>

- c. Required NFVA shall be evenly distributed along the lengths of opposite sides.
  - d. Ventilation for each separate space is required.
  - e. Foundation vents shall not be obstructed by insulation.
- 5.5. Insulation Location and Coverage
- a. In locations with freezing temperatures, insulation shall be placed between pipes and cold side.
  - b. Water valves covered by insulation shall be tagged.
  - c. Installation of water pipe heaters is not allowed within the program.
- 5.6. Placement of Floor Insulation (All Types)
- a. Insulation shall be in substantial contact with subfloor without gaps, voids, compressions, misalignments, or wind intrusions.
  - b. If kraft-faced batts are used, facing shall be against the subfloor.
  - c. Minimum 3" clearance shall be between insulation and heat producing devices.
  - d. Insulation shall not block combustion air supply openings or foundation vents with 3" clearance.
- 5.7. Placement of Insulation Supports
- a. Insulation shall not be compressed by supports more than 10% overall.
  - b. Flexible insulation supports shall be sized/spaced in conformance with these requirements:

SUPPORT TYPE	MAXIMUM SPACING	ADDITIONAL REQUIREMENTS
1. Wood Lath	Lath spaced 18" OC maximum.	Attached with galvanized nails or corrosion-resistant staples
2. Wire Span		
• Joists ≤24" OC	Wire span twice in 18". Anchor points maximum 18" apart.	Facing shall be stapled to subfloor.
• 25" – 48" OC	Wire span twice in 12". Anchor points maximum 12" apart.	
3. Woven Wire/Netting	Support shall be anchored to joist every 12".	Support shall <u>not</u> sag more than 1" per 24" of span in any direction.

**6. POST-INSTALLATION GUIDELINES**

- 6.1. Operational Checks
- a. Installation shall be in accordance with manufacturer specifications, applied evenly and with no gaps, voids, compressions, misalignments, or possible wind intrusions from lack of blocking
  - b. Insulation shall not be compressed to impact the efficiency of the insulation.
  - c. 3" clearance zone for HPDs and crawlspace ventilation shall be verified.

**7. MATERIAL SPECIFICATIONS**

- 7.1. All floor insulation material shall be certified to comply with the CCR, Title 24, Part 12, Chapters 12-13, "Standards for Insulating Material".
- 7.2. All support and anchor materials shall have a minimum service life of 10 years.
- a. Staples:
    - Zinc-coated, stainless steel, or similar corrosion-resistant material.
    - Minimum 18 gauge diameter with 5/8" joist penetration.
  - b. Nails: Galvanized nails with 5/8" minimum joist penetration.
  - c. Wire Supports:
    - Shall be zinc-coated, stainless, or similar corrosion-resistant material.
    - Minimum 20 gauge.
  - d. Netting for Flexible Insulation Type
    - Woven wire shall be galvanized.
    - Netting shall be propylene or equivalent. Minimum 75 pound breaking strength.

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**8. WARRANTY**

8.1. Manufacturer Warranty – 1 year

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# CSD LIWP STANDARDS

FOR

## INFILTRATION REDUCTION MEASURES - DRAFT

Category	Criteria
<p><b>1. MEASURE</b></p>	<p>1.1. Installation of infiltration reduction measures reduce the loss of conditioned air from a home's thermal envelope, which saves energy and money. Infiltration reduction measures include:</p> <ul style="list-style-type: none"> <li>a. Caulking (for gaps and cracks up to 5/8")</li> <li>b. Cover Plate Gaskets</li> <li>c. Door Repair/Replacement (*To correct catastrophic leakage only. See Item 4.2.)</li> <li>d. Glass Replacement/Window or Sliding Glass Door Repair</li> <li>e. Minor Envelope Repair (patching and sealing of gaps <math>\geq</math> 5/8")</li> <li>f. Vent Covers – Interior</li> <li>g. Weatherstripping – Exterior Door</li> <li>h. Weatherstripping – Other (for windows, appliance enclosure doors, and access covers where insulation installation is not feasible, etc.)</li> <li>i. Window/Sliding Glass Door Repair/Replacement (*To correct catastrophic leakage only. See Item 4.2.)</li> </ul> <p>1.2. These measures are classified as Enhanced Measures <u>NOT</u> requiring an energy audit.</p> <p>1.3. The following requirements are in addition to all applicable requirements found in the General Installation Guidelines.</p>
<p><b>2. LICENSING</b></p>	<p>2.1. This measure requires a Class B General Building Contractor license for purposes of the LIWP program.</p> <ul style="list-style-type: none"> <li>a. C-17 Glazing Contractor may be used for glass and window replacement.</li> </ul>
<p><b>3. FEASIBILITY CRITERIA</b></p>	<p>3.1. Install this measure when (<u>ALL</u> of the following shall apply):</p> <ul style="list-style-type: none"> <li>a. Cracks, gaps, and holes exist from the conditioned space into the unconditioned ceiling, wall, or crawlspace cavity.</li> <li>b. Leaks are between two conditioned spaces when home is/has: <ul style="list-style-type: none"> <li>- Balloon-framed;</li> <li>- Open-top interior wall cavity; or</li> <li>- Wall connects two adjacent apartment units.</li> </ul> </li> </ul> <p>3.2. Do <u>NOT</u> install this measure when:</p> <ul style="list-style-type: none"> <li>a. Dwelling has no heat source or cooling source(s).</li> <li>b. Home is less than 6 years old</li> <li>c. A combustion appliance safety or indoor air quality hazard exists, and has not or cannot be corrected.</li> <li>d. Dwelling unit envelope is damaged/deteriorated or interior is incomplete.</li> </ul>
<p><b>4. ADDITIONAL ASSESSMENT CRITERIA</b></p>	<p>4.1. Prioritization of Infiltration Reduction Activities</p> <ul style="list-style-type: none"> <li>a. The Shell Leakage Prioritization Table (Attachment A to this measure) shall be followed for the ordering of shell sealing activities by an Assessor.</li> <li>b. No duct or shell leaks shall be sealed when a combustion appliance or indoor air quality hazard exists that cannot be corrected</li> </ul> <p>4.2. Catastrophic Leakage</p> <ul style="list-style-type: none"> <li>a. Catastrophic leakages shall be given the highest priority in shall sealing.</li> <li>b. When measurable as a physical gap, a "Catastrophic Shell Leak" is defined as at least 5 square inches of leakage calculated for a single measure location.</li> </ul>

	<p>Examples include, but are not limited to a(n):</p> <ul style="list-style-type: none"> <li>- Broken window (e.g., does not close completely, broken sash, broken glass, etc.).</li> <li>- Broken exterior door (e.g., will not close, broken frame, hole in door, etc.).</li> <li>- Interior attic or crawlspace access cover that is broken or missing.</li> <li>- Hole/penetration through the building shell (envelope) to outdoors or to an unconditioned cavity in the shell.</li> <li>- Missing fireplace or exhaust fan dampers.</li> <li>- Mobile home belly cavity.</li> </ul>
<b>5. MINIMUM INSTALLATION GUIDELINES</b>	<p>5.1. Approaches to Infiltration Reduction activities</p> <p>a. CSD permits two approaches to air sealing. Contractors may:</p> <ul style="list-style-type: none"> <li>- <u>APPROACH 1</u>: Install no infiltration reduction measures.</li> <li>- <u>APPROACH 2</u>: Install all feasible infiltration reduction measures within the cost maximum set by CSD.</li> </ul> <p>5.2. Order of Installation</p> <p>a. Installers shall follow the Infiltration Reduction Prioritization Table (Attachment A to this measure) to seal air leaks.</p> <p>b. Leaks shall be sealed from highest to lowest priority, unless it is determined and documented that the item is unfeasible to correct, or the item does not apply to the dwelling being served.</p>
<b>6. MATERIAL SPECIFICATIONS</b>	<p>6.1. Due to the complexity of material specifications for the various infiltration-reduction measures, this section is provided in Attachment B to this measure.</p>
<b>7. POST-INSTALLATION</b>	<p>7.1. Operational Checks:</p> <p>a. Perform Combustion Appliance Safety (CAS) testing to ensure that no open combustion appliances located in the living space are creating a hazardous atmosphere as a result of the infiltration reduction activities.</p> <p>b. All CAS testing shall be in accordance with the LIWP CAS Protocol.</p>
<b>8. WARRANTY</b>	<p>8.1. Manufacturer Warranty – 1 year</p> <p>8.2. Manufacturer Warranty for windows – 10 years (IGU) / 3 years (other)</p>

**CSD INFILTRATION REDUCTION ATTACHMENT A**  
**SHELL LEAKAGE PRIORITIZATION TABLE**

Priority	Conventional Homes	Mobile Homes
<b>1</b>	<ul style="list-style-type: none"> <li>• Catastrophic Shell Leakage, a such as:               <ul style="list-style-type: none"> <li>– Missing or defective interior vent covers.</li> <li>– Missing or defective chimney damper.</li> <li>– Range hood damper and gaps around range hood vent.</li> <li>– Door, window, or shell catastrophic leakage.</li> </ul> </li> <li>• Requires photo documentation and calculations.</li> </ul>	<ul style="list-style-type: none"> <li>• Catastrophic Shell Leakage               <ul style="list-style-type: none"> <li>– See Coventional Home.</li> <li>– Required abandonment of the belly cavity returns and installation of a central return.</li> </ul> </li> </ul>
Priority	Conventional Homes	Mobile Homes
<p><b>1. Seal leaks identified by visual inspection and pressure diagnostics according to the following priority.</b>  <b>2. Interior shell sealing shall be sealed before exterior shell sealing, with the largest leaks to be sealed first.</b></p>		
<b>Home INTERIOR Sealing Priorities</b>		
<b>2</b>	<ul style="list-style-type: none"> <li>• Attic/high-level leaks, such as:               <ul style="list-style-type: none"> <li>– Sealing at top plate and sill plate.</li> <li>– Missing attic or crawlspace access cover.</li> <li>– Framing gaps and wall cavity openings.</li> <li>– Ceiling thermal bypasses</li> <li>– Duct penetrations and chaseways in the ceiling.</li> <li>– Electrical penetrations, including gaps around ceiling-mount electrical (junction) boxes.</li> <li>– Knee wall-to-ceiling gaps.</li> <li>– Knee wall penetrations.</li> <li>– Gaps around fluorescent light enclosures.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• See Conventional Home.</li> </ul>
<b>3</b>	<ul style="list-style-type: none"> <li>• Crawlspace/low-level leaks, such as:               <ul style="list-style-type: none"> <li>– Bathtub holes and other plumbing penetrations.</li> <li>– Framing gaps and wall cavity openings.</li> <li>– Duct penetration/chaseway in the floor.</li> <li>– Electrical penetrations at floor level.</li> <li>– Miscellaneous holes in the flooring.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Crawlspace/low-level leaks, such as:               <ul style="list-style-type: none"> <li>– See Conventional Home.</li> <li>– Bellyboard repair (All holes in the bellyboard [rodent barrier] created for underfloor access of the mobile home shall be repaired).</li> </ul> </li> </ul>
<b>4</b>	<ul style="list-style-type: none"> <li>• Interior/mid-level envelope leaks larger than 5/8" (to be resolved under Minor Envelope Repair (defined in Attachment B) or individual line item), such as:               <ul style="list-style-type: none"> <li>– Envelope leaks requiring repair/patch.</li> <li>– Gaps around range hood vent.</li> <li>– Plumbing penetrations under sinks in kitchens and bathrooms requiring a wall patch.</li> <li>– Electrical penetrations, including service panels on interior walls.</li> <li>– At washer hook-ups.</li> <li>– Joints between dissimilar materials, especially around fireplaces and other masonry trim, large ceiling beams, tubs and showers.</li> <li>– Unfinished wall areas inside cabinets, and under kitchen and bathroom sinks.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Mid-level leaks, more than 5/8", such as:               <ul style="list-style-type: none"> <li>– See Conventional Home.</li> <li>– Gaps and holes in floors and walls, especially joints between halves of a double-wide mobile home, the mobile home and an "expando" unit or add-on room, etc.</li> </ul> </li> </ul>

5	<ul style="list-style-type: none"> <li>• Smaller/mid-level interior envelope leaks (up to 5/8"), such as: <ul style="list-style-type: none"> <li>– Attic/crawlspace access cover(s) weatherstripping.</li> <li>– Hidden leaks behind appliances, especially washers and dryers, including dryer exhaust penetration.</li> <li>– Caulk-able plumbing penetrations under sinks and in utility rooms.</li> <li>– Weatherstripping on doors and windows between conditioned and unconditioned space.</li> <li>– Bypasses in walls, including cracks around molding/trim, etc.</li> <li>– Windows and leaks around window-mount appliances.</li> <li>– Other infiltration points identified by Blower Door test, including: <ul style="list-style-type: none"> <li>○ Door or sliding glass door repair (<u>with no catastrophic leakage</u>).</li> <li>○ Window repair or glass replacement (cracked pane, not meeting the catastrophic leak definition).</li> <li>○ Cover plate gaskets.</li> </ul> </li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• See Conventional Home.</li> </ul>
<b>Home EXTERIOR Sealing Priority</b> <i>Exterior caulking occurs primarily to prevent moisture damage, but there is minor infiltration benefit.</i>		
6	<ul style="list-style-type: none"> <li>• Exterior door and window frames, light fixtures, and holes in siding shall be caulked.</li> </ul>	<ul style="list-style-type: none"> <li>• Exterior door and window frames, light fixtures, and holes in siding shall be caulked.</li> <li>• Exterior top and bottom bypasses on mobile home ventilated metal walls shall not be sealed.</li> </ul>

## CSD INFILTRATION REDUCTION ATTACHMENT B

### MATERIAL SPECIFICATIONS TABLE

<b>1. CAULKING</b>	<p>1.1. Contractor must comply with Proposition 65 requirements for all materials.</p> <ul style="list-style-type: none"> <li>a. Acoustical Caulk/Sealant <ul style="list-style-type: none"> <li>- Conformance to ASTM C834</li> <li>- Non-hardening latex compound</li> </ul> </li> <li>b. Solvent Release Sealants <ul style="list-style-type: none"> <li>- Conformance to ASTM C1311.</li> <li>- Includes Acrylic, Butyl Rubber and Chlorosulfonated Polyethylene.</li> </ul> </li> <li>c. Latex Sealants <ul style="list-style-type: none"> <li>- Conformance to ASTM C834.</li> <li>- Includes Latex, Acrylic Latex, and Siliconized Acrylic.</li> </ul> </li> <li>d. Elastomeric Joint Sealants <ul style="list-style-type: none"> <li>- Conformance to ASTM C920 or other ASTM Standards for Elastomeric Sealants (e.g., C603, C734, C1250, and D2202.</li> <li>- Includes Polysulfide, Polyurethane, and Silicone.</li> </ul> </li> <li>e. High Temperature Caulk <ul style="list-style-type: none"> <li>- Sealant rated for constant service up to at least 450°F (e.g., RTV red silicone, available for service up to 600°F, such as automotive RTV gasket sealant).</li> </ul> </li> <li>f. Foam Sealants <ul style="list-style-type: none"> <li>- Class A, or Class 1 per ASTM E84</li> <li>- Minimally-expanding type only</li> <li>- Fire-resistant foam compliant with ASTM E814 or UL 1479.</li> </ul> </li> </ul>
<b>2. COVER PLATE GASKETS</b>	<p>2.1. Gasket material</p> <ul style="list-style-type: none"> <li>a. Fire-resistant, closed cell foam, 1/8" thick minimum.</li> <li>b. Pre-cut to fit rocker-type switches and rectangular receptacles: <ul style="list-style-type: none"> <li>- Gaskets must have rectangular perforations shaped for those applications (instead of standard receptacle gaskets with rounded perforations).</li> </ul> </li> </ul>
<b>3. EXTERIOR DOOR REPAIR / REPLACEMENT</b>	<p>3.1. Casing/Trim</p> <ul style="list-style-type: none"> <li>a. Wood: Exterior grade required in all exterior locations. Paint grade acceptable, unless existing jamb has natural finish.</li> <li>b. Nails: Finishing or casing nails required for interior applications. Galvanized nails required for exterior applications.</li> </ul> <p>3.2. Deadbolts</p> <ul style="list-style-type: none"> <li>a. Functional deadbolts shall be re-used when a door is replaced.</li> <li>b. Knob is required on the interior side (key in lieu of a knob <u>not</u> allowed).</li> </ul> <p>3.3. Door, Exterior Hinged</p> <ul style="list-style-type: none"> <li>a. Shall be in compliance with the fire-resistance requirements of local code (e.g., 2013 CRC Section R327.8).</li> <li>b. Shall be equipped with safety glass when required by the local jurisdiction for the specific installation location.</li> <li>c. Glass in doors greater than 3" must always be safety glass.</li> <li>d. Replacement doors shall be limited to standard solid core slab or panel doors (no ornate design, stained glass, decorative windows, etc., unless required by HPO and approved by weatherization waiver).</li> <li>e. Door "like for like" replacement shall not be allowed unless required by local code.</li> </ul> <p>3.4. Door Composition</p> <ul style="list-style-type: none"> <li>a. Exterior replacement doors shall be a minimum 1-3/8" thick solid core wood door; or</li> </ul>

- b. Metal door, with a minimum R-6 insulated core; or
- c. Any type of door, with a Fire Resistance Rating of at least 20 minutes, per NFPA 252.
  - Doors labeled to have a fire rating of at least 20 minutes shall not be modified or weatherstripped, except as prescribed and allowed by the manufacturer and local code.
- d. Replacement doors shall be fire-rated in conformance with local code (e.g., for doors transferring from kitchen to garage in homes with attached garage, and in multi-family units).
- e. Non-Metallic Veneer for Wood Doors
  - Minimum 1/8" thick, hardboard veneer acceptable; exterior grade glue.

3.5. Door Jamb Replacement Material

- a. Shall be exterior grade only and 3/4" minimum stock.

3.6. Doors with Glazing

- b. Safety glazing shall be permanently labeled and installed per the 2016 CRC, §R308.4.
- c. Safety glass is required when door has glazing that occupies more than 50% of the total area, and for sliding glass doors.
- d. U-Factor and Solar Heat Gain Coefficient (SHGC) shall be in compliance with the table below.

**Glazed Door Performance Requirements**

EFFICIENCY FACTOR	CLIMATE ZONE	MAXIMUM VALUE
U-Factor	All	0.32
Solar Heat Gain Coefficient (SHGC)	1, 3 & 5	No Requirement
	2 &, 6 – 14	0.25

3.7. Door Stops

- a. Shall be made of wood with 5/16" x 1-1/4" minimum dimensions.
- b. Paint grade is acceptable, unless existing jamb has natural finish.

3.8. Finish/Sealant

- a. Doors must be sealed (painted or primed) to prevent moisture intrusion, including those that are cut to fit on-site. Pre-hung doors must be already sealed (primed or painted) to be in compliance.
- b. Exterior grade material shall be used in exterior locations.
- c. Wood Doors: Acceptable sealers are paint, urethane, and varnish (clear "water seal" products are not allowed).
- d. Metal Doors: Acceptable sealers are oil base or epoxy paint only.
- e. Jamb and Casing/Trim: See "Wood Doors".

3.9. Hinge Requirements for Exterior Doors: Conform to ANSI/BHMA A156.1.

- a. Be constructed of brass or stainless steel, minimum 0.120" thick.
- b. Be loose-pin type, unless mounted toward exterior (fixed-pin not required on middle hinge).
- c. 1-3/8" Doors: Minimum hinge size 3-1/2" x 3-1/2".
- d. 1-3/4" Doors: Minimum hinge size 4" x 4".
- e. Screws to Attach Hinges:
  - Wood and Metal Jambs: Brass or stainless steel flathead screws shall be used, or as specified/supplied by manufacturer.
  - Pre-hung Units and Replacement Jambs: Screws shall penetrate trimmer stud at least 5/8".

3.10. Mobile Home Exterior Doors

	<ul style="list-style-type: none"> <li>a. All Swinging Replacement Doors <ul style="list-style-type: none"> <li>- Rigid stiles and rails (e.g., channel steel and/or wood).</li> <li>- Permanently-finished skin (e.g., fiberglass or vinyl-clad metal).</li> </ul> </li> <li>b. Out-Swinging Replacement Doors <ul style="list-style-type: none"> <li>- Pre-hung entrance door manufactured for mobile homes.</li> <li>- Flanged metal frame (jambs, header and sill) with integral weather seals (e.g., extruded flap vinyl, bulb seal, etc.).</li> </ul> </li> </ul> <p>3.11. Threshold Shims/Elevators</p> <ul style="list-style-type: none"> <li>a. Non-wood: Aluminum and Plastic (e.g., Vinyl).</li> <li>b. Solid Wood: Redwood, Cedar, Pressure-treated Fir, or Solid Hardwood (i.e., must be degradation-resistant and exterior grade).</li> </ul>
<p><b>4. GLASS REPLACEMENT / WINDOW REPAIR</b></p>	<p>4.1. Fully Tempered Glass</p> <ul style="list-style-type: none"> <li>a. When fully tempered glass is installed, the maximum size also increases. Multiply the "Glass Materials" sizes by 4.</li> </ul> <p>4.2. Standard Glass Materials</p> <ul style="list-style-type: none"> <li>a. Single Strength (SS): Maximum pane size: 16 sq. ft.</li> <li>b. Double Strength (DS): Maximum pane size: 24 sq. ft.</li> <li>c. 3/16" Plate Glass: Maximum pane size: 45 sq. ft.</li> <li>d. 1/4" Plate Glass: Maximum pane size: 65 sq. ft.</li> </ul> <p>4.3. Mobile Home Glass Materials</p> <ul style="list-style-type: none"> <li>a. Single Strength (SS): Maximum pane size: 11 sq. ft.</li> <li>b. Double Strength (DS): Maximum pane size: 15 sq. ft.</li> <li>c. 3/16" Plate Glass: Maximum pane size: 30 sq. ft.</li> <li>d. 1/4" Plate Glass: Maximum pane size: 43 sq. ft.</li> </ul> <p>4.4. Heat-Strengthened Glass</p> <ul style="list-style-type: none"> <li>a. When heat-strengthened glass is installed, the maximum size also increases. Multiply the "Glass Materials" sizes by 2.</li> </ul> <p>4.5. Glazing Compound Requirements</p> <ul style="list-style-type: none"> <li>a. Conformance to ASTM C669 for metal sashes. Must be the type which remains pliable.</li> </ul> <p>4.6. Plastic Window Glazing</p> <ul style="list-style-type: none"> <li>a. UV treated polycarbonate, minimum of 1/8" thick</li> <li>b. Acrylic sheets and plastic film are not allowed.</li> </ul> <p>4.7. Safety Glazing Requirements</p> <ul style="list-style-type: none"> <li>a. Safety glazing shall be permanently marked and meet specifications of ANSI Z97.1, and be permanently labeled per the California Residential Code, §R308.1.</li> </ul> <p>4.8. Jalousie Windows</p> <ul style="list-style-type: none"> <li>a. Minimum 3/16" glass shall be installed using one of the following types: Regular, patterned, frosted, tempered, and heat strengthened glass allowed.</li> <li>b. Wired, laminated, and sandblasted glass <u>not</u> allowed.</li> </ul>
<p><b>5. MINOR ENVELOPE REPAIRS</b></p>	<p>5.1. Wall or Shell Patching</p> <ul style="list-style-type: none"> <li>a. Mesh Plumbing Patches: 28-30 gage non-corrosive metal with self-adhesive backing. <ul style="list-style-type: none"> <li>- Backing shall be a strong pressure-sensitive adhesive film.</li> <li>- Backing shall be reinforced with fiberglass mesh or equivalent.</li> <li>- Patches shall be cut to fit snugly around pipes (e.g., pre-cut for installation around 2", 1-1/2", 3/4" and 1/2" pipes).</li> </ul> </li> <li>b. Finishing Compound <ul style="list-style-type: none"> <li>- Lightweight, non-shrinking spackling compound, or</li> </ul> </li> </ul>

- Drywall joint compound, or equivalent.
- c. Sheet Metal:
  - Aluminum or galvanized sheet metal; minimum 0.007" thick.
- d. Radiant Barrier Material
  - Commercially available foil/bubble/foil.
  - Class A/Class 1; minimum thickness 5/16".
- e. Foam Board
- f. Polyisocyanurate foil clad both sides; ASTM C 1289 or FS HH-I-1972.

5.2. Attic Access Cover—Horizontal

- a. Cover Material
  - Field-fabricated Access Door: Gypsum (drywall), minimum 5/8" thick
  - Prefabricated access door assembly: Commercially available
- b. Framing Material (Joist Blocking)
  - Same dimension as joist (e.g., 2"x4" or 2"x6")
  - No. 2 Hem fir or better
- c. Trim Material
  - Window/door trim/molding (interior or exterior grade)
  - Adequate thickness and width to attach to ceiling joists and extend into the opening far enough to support the cover (e.g., 5/8"x3½")
  - Spackle or wood putty (to cover recessed nails)
- d. Attachments
  - Minimum 3" nails for blocking
  - Finish nails for attaching trim (long enough to penetrate joist at least ½", e.g., 1-5/8" long)
- e. Access Panel Weatherstripping
  - Open cell or closed cell (when exposed to sunlight) foam tape.
- f. Access Panel Insulation
  - Flexible or rigid insulation, with an R-value equal to the R-value of insulation on the attic floor.

5.3. Attic Access Cover—Vertical

- a. Cover Material
  - Gypsum (drywall), minimum ½" thick; or
  - Plywood
    - o Minimum 5/8" plywood (interior or exterior grade, CCX or better), for wood-only cover/door.
    - o Minimum ½" plywood (interior or exterior grade, CDX or better), to serve as backing for gypsum-clad cover/door.
- b. Framing Material
  - Same dimension as studs (e.g., 2"x4")
  - No. 2 Hem fir or better
- c. Trim Material
  - Window/door trim/molding (interior or exterior grade), minimum 2" wide
  - Spackle or wood putty (to cover recessed nails)
- d. Hinges in Firewall Applications
  - Minimum 3½"x3½" spring-loaded with adjustable tension
  - Adequate spring tension to make access cover self-closing
- e. Attachments
  - Minimum 3" nails for blocking
  - Finish nails for attaching trim (long enough to penetrate joist at least ½", e.g., 1-5/8" long)
  - Corrosion-resistant screws for hinges
    - o Sized per hinge manufacturers specifications, and
    - o Long enough to penetrate framing at least ½"
  - Heavy duty construction adhesive (to glue plywood to gypsum)
- f. Access Cover Weatherstripping

- Open cell or closed cell (when exposed to sunlight) foam tape.
- g. Access Cover Insulation
  - Flexible or rigid insulation, with an R-value equal to knee walls.
- 5.4. Crawlspace Access Cover—Horizontal (Indoors)
  - a. Cover Material
    - Prefabricated access door assembly (commercially available); or
    - Field-fabricated access door
      - o Substrate of 3/4" plywood, CCX or better
      - o Finish lumber: No. 2 or better
  - b. Framing Material (Joist Blocking)
    - Same dimension as joist (e.g., 2"x4" or 2"x6")
    - No. 2 Hem fir or better
  - c. Attachments
    - Minimum 3-inch nails for blocking
    - Corrosion-resistant screws for hinges
      - o Sized in accordance with hinge manufacturers specifications, and
      - o Long enough to penetrate framing at least 5/8".
  - d. Access Cover Weatherstripping:
    - Open cell or closed cell (when exposed to sunlight) foam tape.
  - e. Access Cover Insulation
    - Flexible or rigid insulation, with R-value equal to the R-value of insulation on the floor insulation.
- 5.5. Crawlspace Access Cover—Vertical (Outdoors)
  - a. Cover Material
    - Metal: Screened metal vent or solid access cover, (commercially available or shop fabricated of minimum 20 gage material.
      - o Screen: 1/4" metal mesh or expanded metal, or equivalent
      - o Wood: Minimum 1/2" exterior grade plywood, CCX or better
  - b. Framing Material (Box Frame)
    - Minimum 1"x2" redwood or pressure-treated fir, no. 2 or better
  - c. Hinges and Latches
    - Corrosion-resistant; Cabinet hinges/latches or better
  - d. Attachments
    - Box Frame and Metal Frame
      - o Concrete nails or corrosion-resistant screws and anchors
      - o Sized for 1/2" penetration into concrete
    - Corrosion-resistant screws for hinges
      - o Sized in accordance with hinge manufacturers specifications, and
      - o Long enough to penetrate framing at least 5/8".
- 5.6. Fireplace Chimney Damper
  - a. Factory-built (Zero Clearance) Fireplaces: As specified by the fireplace manufacturer.
  - b. Masonry Fireplaces
    - Commercially available top-sealing (chimney top) dampers.
    - Sized to fit the chimney termination.
    - Controllable from indoors (e.g., with a control cable inside the fireplace).
- 5.7. Fireplace Glass Doors
  - a. Shall fit smallest dimensions of the fireplace opening.
  - b. Shall seal against the fireplace surface (e.g., with gasket or strips of fiberglass insulation).
  - c. Shall meet the requirements listed below, based on Fireplace Type.
  - d. Factory-built (Zero Clearance) Fireplaces
    - Commercially available glass doors.
    - Designed for use with zero clearance fireplaces.

	<ul style="list-style-type: none"> <li>- Sized and shaped to fit against and seal off the fireplace opening.</li> </ul> <p>e. Masonry Fireplaces</p> <ul style="list-style-type: none"> <li>- Commercially available glass doors.</li> <li>- Designed for use with masonry fireplaces.</li> <li>- Sized and shaped to fit against and seal off the fireplace opening.</li> </ul>
<p><b>6. VENT COVERS- INTERIOR</b></p>	<p>6.1. Vent Cover Materials</p> <p>a. Covers shall be for interior vents for Evaporative Coolers and Window/Wall Air Conditioner vents only. Maximum perm rating shall be 1.0.</p> <p>b. Exterior Window/Wall AC Outdoor Covers</p> <ul style="list-style-type: none"> <li>- Installed by programmatic waiver only when an existing unit is missing or does not have a damper.</li> <li>- Shall be a heavy duty, commercial grade, water-repellant canvas with secure attachment (e.g., integral rope tie in the open end hem).</li> <li>- Vinyl covers shall <u>not</u> be allowed.</li> </ul> <p>c. Magnetic Sheeting Vent Covers</p> <ul style="list-style-type: none"> <li>- Minimum 30 mil flexible magnetic sheeting with vinyl face (white, or colored to blend with surrounding material).</li> </ul> <p>d. Metal Vent Covers</p> <ul style="list-style-type: none"> <li>- Shall be aluminum, galvanized, or painted metal only.</li> </ul> <p>e. Plastic Film as a Vent Cover</p> <ul style="list-style-type: none"> <li>- Minimum 12-mil film.</li> <li>- Film shall be framed with aluminum, rigid plastic or finished hardwood.</li> </ul> <p>f. Rigid Plastic Vent Cover</p> <ul style="list-style-type: none"> <li>- Shall be one-piece or multi-piece adjustable.</li> <li>- Adjustable cover must consist of pieces that bond together to form the equivalent of a one-piece cover.</li> </ul> <p>g. Window/Wall AC Finished Wood Covers</p> <ul style="list-style-type: none"> <li>- Requires CSD waiver, replace only when an existing unit is missing or does not have a damper.</li> <li>- Bare wood shall be sealed/finished with paint, urethane, varnish, or stain.</li> </ul>
<p><b>7. WEATHERSTRIPPING, EXTERIOR DOOR AND OTHER</b></p>	<p>7.1. Weatherstripping Materials</p> <p>a. Rigid Gasket Jamb Materials (Aluminum Carrier)</p> <ul style="list-style-type: none"> <li>- Solid extruded aluminum carrier 0.05" minimum nominal thickness.</li> <li>- Pliable gasket of vinyl, thermoplastic elastomer (TPE), silicone, or equivalent.</li> <li>- Carrier shall have elongated mounting holes, 9" OC maximum.</li> <li>- Secondary seal between carrier and mounting surface shall be a minimum of 1/8" wide and extend the full length of the carrier.</li> </ul> <p>b. Spring and Cushion Metal</p> <ul style="list-style-type: none"> <li>- Brass, bronze, or stainless steel only; aluminum <u>not</u> allowed.</li> </ul> <p>c. Cushion Synthetic Pressure Sensitive Door Gasketing</p> <ul style="list-style-type: none"> <li>- Polypropylene, TPE, silicone, or equivalent.</li> <li>- L-shaped stabilizer with self-adhesive backing.</li> </ul> <p>d. Flanged Bulb (Compression Bulb)</p> <ul style="list-style-type: none"> <li>- Pliable gasket of TPE or silicone (e.g., teardrop-shaped Seal).</li> <li>- Minimum 3/8" wide with self-adhesive stabilizer flange.</li> </ul> <p>e. Round Tube</p> <ul style="list-style-type: none"> <li>- Pliable gasket of TPE, silicone, or equivalent.</li> </ul> <p>f. Foam Tape</p> <ul style="list-style-type: none"> <li>- Color shall be compatible with surrounding materials (i.e., light color foam for light color surfaces).</li> <li>- Closed Cell Foam Tape: Shall be UV-resistant with adhesive backing.</li> <li>- Open Cell Foam Tape: Shall have self-adhesive backing.</li> </ul> <p>g. V-shape Fin Seal</p> <ul style="list-style-type: none"> <li>- Durable V-seal of silicone or equivalent material, with stabilizer flange and</li> </ul>

	<p>adhesive backing, (different from “Vinyl V-Strip”).</p> <ul style="list-style-type: none"> <li>h. Replacement Kerf-in Bulb and Foam <ul style="list-style-type: none"> <li>- Shall be sized to retain channel.</li> </ul> </li> <li>i. Replacement Pile <ul style="list-style-type: none"> <li>- Shall be fin seal type, whenever feasible, and sized to retain channel.</li> </ul> </li> <li>j. Corner Pads <ul style="list-style-type: none"> <li>- Pile pad with self-adhesive backing.</li> </ul> </li> <li>k. Mechanical Attachments <ul style="list-style-type: none"> <li>- All screws, nails, staples, and other fasteners shall be metal and non-corrosive, and properly sized for each application.</li> </ul> </li> <li>l. Pressure-Sensitive Adhesive <ul style="list-style-type: none"> <li>- Minimum adhesion strength of 65 oz./in. on all self-adhesive products.</li> <li>- Required on all self-adhesive products.</li> </ul> </li> <li>m. Door Shoe, Automatic Door Bottom, Stationary Sweep, Metal Saddle Threshold, and Bumper Threshold <ul style="list-style-type: none"> <li>- Solid aluminum extrusions.</li> <li>- Gaskets shall be pliable vinyl, TPE, silicone, or equivalent.</li> <li>- Solid aluminum carrier 0.05" nominal thickness minimum, with elongated mounting holes 9" OC maximum.</li> <li>- Shoes: <ul style="list-style-type: none"> <li>o Shall have rain drip in exposed outdoor locations.</li> <li>o Tall (e.g. 3" high) U-Shoe may be used when door bottom is cut too short or is too worn/weak to accept a standard (1-1/2" high) U-Shoe.</li> </ul> </li> <li>- Stationary sweeps shall have pliable gasket of vinyl or silicone.</li> </ul> </li> <li>n. Automatic Door Bottom <ul style="list-style-type: none"> <li>- Retractable type only; flip sweep <u>not</u> allowed.</li> </ul> </li> <li>o. Metal Saddle Threshold <ul style="list-style-type: none"> <li>- Solid aluminum only; “gasket saddle” with vinyl top gasket not allowed.</li> <li>- Shall have floor-sealer gasket of vinyl, TPE, silicone, or equivalent.</li> </ul> </li> <li>p. Wooden Saddle Threshold <ul style="list-style-type: none"> <li>- Shall be hardwood only; “gasket saddle” with vinyl top gasket <u>not</u> allowed.</li> </ul> </li> </ul>
<p><b>8. WINDOW/SLIDING/ GLASS DOOR REPLACEMENT (CASTASTROPHIC LEAKS ONLY)</b></p>	<ul style="list-style-type: none"> <li>8.1. See the LIWP Standards for Window Replacement for material specifications.</li> <li>8.2. <i>Note:</i> Feasibility criteria included in the Window Replacement standard pertains to window energy efficiency upgrades only.</li> </ul>



# CSD LIWP STANDARDS

FOR

## REFRIGERANT CHARGE WITH COIL CLEANING – DRAFT

Category	Criteria
<b>1. MEASURE</b>	<p>1.1. Evaluation of refrigerant coolant charge and adjustment as needed for best performance of an air-cooled central air conditioner (A/C) or air-source heat pump.</p> <p>1.2. This measure also includes:</p> <ol style="list-style-type: none"> <li>a. Airflow measurement.</li> <li>b. Cleaning of the condenser and evaporator coil.</li> <li>c. Repair or replacement of defective A/C service valve(s) (Schrader-type).</li> <li>d. Installation of A/C service valve locks on ground mounted systems.</li> <li>e. Air filter cleaning/replacement.</li> </ol> <p>1.3. This measure is classified as an Enhanced Measure <u>NOT</u> requiring an energy audit</p> <p>1.4. The following requirements are in addition to all applicable requirements found in the General Installation Guidelines.</p>
<b>2. LICENSING</b>	<p>2.1. This measure requires a Class C-20 Warm-Air Heating, Ventilating and Air-Conditioning Contractor license for purposes of LIWP.</p> <p>2.2. Airflow and refrigerant charge shall be performed only by EPA-approved Type II or Universal Technicians.</p>
<b>3. FEASIBILITY CRITERIA</b>	<p>3.1. Install this measure when the home (<u>ALL</u> of the following shall apply):</p> <ol style="list-style-type: none"> <li>a. Has a functional central A/C system.</li> <li>b. Is located in CEC Climate Zones 8 - 16.</li> <li>c. Will <u>not</u> receive a replacement air conditioner.</li> </ol> <p>3.2. Do <u>NOT</u> install this measure when:</p> <ol style="list-style-type: none"> <li>a. System airflow is &lt;300 cfm.</li> <li>b. The existing HVAC unit:             <ul style="list-style-type: none"> <li>- Has a refrigerant leak.</li> <li>- Is <u>not</u> an air-cooled central air conditioner or air-source heat pump.</li> </ul> </li> <li>c. The condition or location of the A/C or condenser makes it unsafe to perform one or more of the refrigerant charge procedures.</li> <li>d. Evaporator Coil Cleaning: Removable access panels are not present or coil cannot be properly accessed for cleaning.</li> </ol>
<b>4. ADDITIONAL ASSESSMENT CRITERIA</b>	<p>4.1. Attic access and clearances shall be adequate.</p>
<b>5. MINIMUM INSTALLATION GUIDELINES</b>	<p>5.1. Measure shall be installed in accordance with manufacturer's instructions and specifications, local building codes, and 2016 Title 24 requirements.</p> <p>5.2. Verification of System Operation and Preparation for Refrigerant Charge</p> <ol style="list-style-type: none"> <li>a. Verify complete system operation, including:             <ul style="list-style-type: none"> <li>- Temperature of supply air (unit must be cooling), and</li> <li>- Temperature of suction line (must be cold).</li> </ul> </li> <li>b. Open all register dampers, duct dampers, and zone dampers.</li> <li>c. Verify thermostat functions properly.</li> <li>d. Ensure air filter is clean or replaced:</li> </ol>

	<ul style="list-style-type: none"> <li>- Replaceable filters shall be replaced.</li> <li>- Washable filters shall be cleaned or replaced.</li> <li>- Electrostatic filters shall be cleaned but not replaced.</li> </ul> <p>5.3. Condenser Service</p> <ol style="list-style-type: none"> <li>a. Trim/clear foliage away from the condenser unit.</li> <li>b. Coil shall be checked and cleaned using a brush, vacuum, and/or air pressure. <ul style="list-style-type: none"> <li>- Water or a biodegradable foaming cleaner mixed with water shall also be used when allowed by manufacturer.</li> </ul> </li> <li>c. Condenser coil lubrication ports shall be oiled, if present.</li> <li>d. Accessible coil fins shall be checked for damage and combed as needed.</li> </ol> <p>5.4. Evaporator Coil Service</p> <ol style="list-style-type: none"> <li>a. Evaporator coils shall be checked and cleaned, when accessible through removable panels. <ul style="list-style-type: none"> <li>- Evaporator coil condensate drain system/pump shall be checked and cleaned as needed.</li> <li>- Accessible coil fins shall be checked for damage and combed as needed.</li> </ul> </li> </ol> <p>5.5. A/C service valves (Schrader-type) shall be fitted with locking caps, when AC system is ground mounted or requested by the client.</p>
<p><b>6. POST-INSTALLATION GUIDELINES</b></p>	<p>6.1. Operational Checks</p> <ol style="list-style-type: none"> <li>a. Following service, the system shall be tested for proper operation.</li> </ol>
<p><b>7. MATERIAL SPECIFICATIONS</b></p>	<p>7.1. Refrigerant</p> <ol style="list-style-type: none"> <li>a. New (used refrigerant shall <u>not</u> be installed), and</li> <li>b. The type specified on the unit's ID label.</li> </ol> <p>7.2. A/C Service (Schrader) Valves and Caps</p> <ol style="list-style-type: none"> <li>a. Valves: brass, steel, or aluminum body; conformance to SAE standards.</li> <li>b. Caps: precision cap with rubber inner seal.</li> </ol> <p>7.3. Locking Caps</p> <ol style="list-style-type: none"> <li>a. Brass locking-type, tamper- and corrosion-resistant.</li> </ol>
<p><b>8. WARRANTY</b></p>	<p>8.1. Manufacturer Warranty – 1 year</p> <p>8.2. Contractor Labor Warranty – 90 days</p>



# CSD LIWP STANDARDS

FOR

## REFRIGERATOR REPLACEMENT - DRAFT

Category	Criteria										
<b>1. MEASURE</b>	1.1. Installation of a high efficiency refrigerator to replace older unit with much lower power factor greatly reduces energy use. 1.2. This measure is classified as an Enhanced Measure <u>NOT</u> requiring an energy audit 1.3. This measure quantity is limited to one per dwelling. 1.4. The following requirements are in addition to all applicable requirements found in the General Installation Guidelines.										
<b>2. LICENSING</b>	2.1. This measure requires a Class B General Building Contractor license for purposes of the LIWP program.										
<b>3. FEASIBILITY CRITERIA</b>	3.1. Install this measure when: <ul style="list-style-type: none"> <li>a. Existing refrigerator has a manufacturing date of 1998 or older.</li> </ul> 3.2. Do <u>NOT</u> install this measure when: <ul style="list-style-type: none"> <li>a. Existing unit is inoperable/defective or there is no refrigerator, or the.</li> <li>b. Refrigerator is on-loan to the weatherization client or it is a rental.</li> <li>c. Hazardous electrical conditions exist at the outlet used by the existing refrigerator, and repair is not feasible.</li> <li>d. No appropriate location is available, including one or more of these criteria:               <ul style="list-style-type: none"> <li>- Inadequate access is available to facilitate installation.</li> <li>- Flooring is structurally inadequate to support the weight of the unit.</li> <li>- Clearance requirements cannot be met.</li> <li>- Refrigerator cannot be installed in a level, plumb, and stable condition.</li> </ul> </li> </ul>										
<b>4. ADDITIONAL ASSESSMENT CRITERIA</b>	4.1. Client file shall document the manufacturer, make, model, and age of replaced refrigerator on the LIWP Dwelling Assessment (CSD 540). 4.2. Refrigerator Sizing <ul style="list-style-type: none"> <li>a. The table below is a sizing guide that shall be followed as closely as is possible and when reasonable for the clients served.               <table border="1" data-bbox="565 1318 1474 1528" style="margin-left: 40px;"> <thead> <tr> <th colspan="2" style="text-align: center;">REPLACEMENT SIZE CRITERIA</th> </tr> </thead> <tbody> <tr> <td style="width: 50%;">15 to 17 cubic feet (cu. ft.)</td> <td>1 or 2 bedrooms with up to 3 residents</td> </tr> <tr> <td rowspan="2">18 to 20 cu. ft.</td> <td>3 bedrooms with up to 5 residents, or</td> </tr> <tr> <td>2 bedrooms with 4 residents</td> </tr> <tr> <td rowspan="2">21 to 23 cu. ft.</td> <td>4 or more bedrooms, or</td> </tr> <tr> <td>5 or more residents</td> </tr> </tbody> </table> </li> <li>b. A replacement refrigerator shall be no more than 2 cubic feet larger than the storage capacity of the existing unit, and up to 23 cu. ft.</li> <li>c. Access route to the refrigerator location shall be adequate to be negotiated without causing damage.</li> </ul>	REPLACEMENT SIZE CRITERIA		15 to 17 cubic feet (cu. ft.)	1 or 2 bedrooms with up to 3 residents	18 to 20 cu. ft.	3 bedrooms with up to 5 residents, or	2 bedrooms with 4 residents	21 to 23 cu. ft.	4 or more bedrooms, or	5 or more residents
REPLACEMENT SIZE CRITERIA											
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	5 or more residents										
<b>5. MINIMUM INSTALLATION GUIDELINES</b>	5.1. Measure shall be installed in accordance with manufacturer's instructions and specifications, local building code, and 2016 CEC Title 20 requirements. 5.2. Access, Location, and Fit <ul style="list-style-type: none"> <li>a. The floor shall be structurally adequate to safely support the refrigerator</li> <li>b. Appliance shall fit in the available space without blocking access to light switches, cabinets, etc.</li> </ul>										

	<ul style="list-style-type: none"> <li>c. Clearances shall meet manufacturer’s specifications.</li> <li>d. The refrigerator shall be installed in a level, plumb, and stable position. <ul style="list-style-type: none"> <li>- Adjust leveling devices on the refrigerator accordingly.</li> <li>- Supplementary supports (e.g., shims) shall be used as needed.</li> </ul> </li> </ul> <p>5.3. Grounded Receptacles</p> <ul style="list-style-type: none"> <li>a. Refrigerators shall <u>not</u> be connected to 2-prong outlets.</li> <li>b. A 2-prong receptacle may be replaced with a new properly-grounded 3-prong receptacle when cost-effective. <ul style="list-style-type: none"> <li>- Replaced receptacle shall be properly grounded in conformance with the California Electrical Code (CEC) and local code.</li> </ul> </li> </ul> <p>5.4. Electrical Considerations</p> <ul style="list-style-type: none"> <li>a. Wiring must be safe, intact, and properly-sized with adequate overcurrent protection to support the refrigerator installation. <ul style="list-style-type: none"> <li>- A GFCI-protected circuit or receptacle, or outlet operated by a switch shall <u>not</u> be used for a refrigerator installation.</li> </ul> </li> <li>b. Broken or missing receptacle or outlet shall be replaced before the refrigerator may be installed.</li> <li>c. Refrigerator shall be plugged directly into a single-plug or duplex receptacle (multi-plug or 3-prong adapters shall <u>not</u> be used to connect refrigerator).</li> <li>d. If a duplex receptacle is used, a maximum of <u>one</u> other appliance may be plugged into the other outlet. <ul style="list-style-type: none"> <li>- The second outlet shall <u>not</u> be used by a high-wattage appliance.</li> </ul> </li> <li>e. Maximum amp draw of the refrigerator plus the other appliance shall <u>not</u> exceed 80% of circuit capacity (determined by conductor gage and overcurrent protection rating, i.e., 14 AWG wires with 15 amp breaker).</li> </ul>
<p><b>6. POST-INSTALLATION GUIDELINES</b></p>	<p>6.1. Operational Checks:</p> <ul style="list-style-type: none"> <li>a. Verify that refrigerator is cooling and operating properly.</li> <li>b. Clean-up and Disposal: Appliances infested with pests shall be enclosed before removing.</li> </ul> <p>6.2. Client Education</p> <ul style="list-style-type: none"> <li>a. Demonstrate for clients how to set temperature controls.</li> </ul>
<p><b>7. MATERIAL SPECIFICATIONS</b></p>	<p>7.1. All replacement refrigerators shall be:</p> <ul style="list-style-type: none"> <li>a. UL-Listed and ENERGY STAR® certified.</li> <li>b. Frost free without specialty features (i.e., ice makers or water dispensers are not allowed).</li> <li>c. Sized in accordance with the sizing guide in Item 4.2.</li> <li>d. White in color. Client-requested color is allowed if no cost increase is created.</li> <li>e. With freezer on top. <ul style="list-style-type: none"> <li>- <i>Note:</i> Side-by-side type may be allowed in larger sizes when top freezer is not available or bottom freezer costs more.</li> </ul> </li> </ul> <p>7.2. Minimum 14 AWG and a maximum 6' in length.</p>
<p><b>8. WARRANTY</b></p>	<p>8.1. Manufacturer Warranty – 1 year</p>



# CSD LIWP STANDARDS

FOR

## SMART THERMOSTAT - DRAFT

Category	Criteria
<b>1. MEASURE</b>	<p>1.1. Installation of a smart thermostat saves energy by automatically changing the temperature according to learned behavioral patterns.</p> <p>1.2. This measure is classified as an Enhanced Measure <u>NOT</u> requiring an energy audit.</p> <p>1.3. The following requirements are in addition to all applicable requirements found in the General Installation Guidelines.</p>
<b>2. LICENSING</b>	<p>2.1. This measure requires a Class B General Building Contractor or C-20 Warm-Air Heating, Ventilating and Air-Conditioning Contractor license for purposes of the LIWP program.</p>
<b>3. FEASIBILITY CRITERIA</b>	<p>3.1. Install this measure when:</p> <ul style="list-style-type: none"> <li>a. Dwelling has an existing FAU with central air conditioning; <u>AND</u> <ul style="list-style-type: none"> <li>- Dwelling is located in climate zones 1, 11, 13 or 15; <u>AND</u></li> <li>- The HVAC system:               <ul style="list-style-type: none"> <li>o Is controlled by a 24V thermostat; and</li> <li>o A "C" (common) wire is present and in good condition (<i>Exception:</i> When a "C" wire is not present, an appropriate Smart Thermostat with a compensating accessory will be installed); <u>AND</u></li> </ul> </li> <li>- Uses a wall-mount HVAC thermostat, even if not functional or missing, <u>OR</u></li> </ul> </li> <li>b. New heating system or new cooling system is installed.</li> </ul> <p>3.2. Do <u>NOT</u> install this measure when:</p> <ul style="list-style-type: none"> <li>a. A Smart Thermostat is already present and operational.</li> <li>b. The HVAC system uses a thermostat that is:           <ul style="list-style-type: none"> <li>- Millivolt type, or</li> <li>- Labeled for 120V or 240V (line voltage wiring is present).</li> <li>- HVAC system is inoperable, and repair/replacement is not feasible.</li> </ul> </li> </ul>
<b>4. ADDITIONAL ASSESSMENT CRITERIA</b>	<p>4.1. Thermostat Location</p> <ul style="list-style-type: none"> <li>a. Thermostat should be in a room with frequent use.</li> </ul> <p>4.2. Electrical Safety Requirements</p> <ul style="list-style-type: none"> <li>a. If it is not feasible to fix the identified electrical issue(s), then installation of the Smart Thermostat shall be deferred.</li> </ul>
<b>5. MINIMUM INSTALLATION GUIDELINES</b>	<p>5.1. General Requirements</p> <ul style="list-style-type: none"> <li>a. Manufacturer's instructions for installation shall be followed.</li> <li>b. Replacement unit shall be compatible with the <u>forced air</u> unit it controls.</li> <li>c. New thermostat shall be installed at existing location, <i>unless</i> affected by drafts, heat from direct sun, or adjacent appliances.</li> <li>d. If a new location is required, the thermostat shall be mounted according to manufacturer specifications, or at a minimum it must be:           <ul style="list-style-type: none"> <li>- Installed in the HVAC zone to control the temperature for that zone.</li> <li>- On a partitioning interior wall in a location of average temperature, away from: direct sunlight, entrance doors, windows, corners, area behind interior doors, and supply air registers, water pipes, heat-producing appliances, or sources of electrical interference.</li> <li>- Surrounding area must be free of shelves, pictures, and other wall decor that may impede the airflow around the thermostat.</li> </ul> </li> <li>e. When manufacturer specification is different than the minimum described above,</li> </ul>

	<p>a copy of the manufacturer specification shall be kept on file.</p> <p>5.2. Electrical Requirements</p> <p>a. Voltage Check:</p> <ul style="list-style-type: none"> <li>- Determine if thermostat wiring is line voltage, as indicated by: <ul style="list-style-type: none"> <li>• Thermostat being labeled 120V or 240V, and/or</li> <li>• Presence of line voltage wires (e.g., thick conductors with wire nuts), and/or</li> <li>• Voltage measurement with test instrument.</li> </ul> </li> <li>- Proceed only if existing thermostat control system is 24V.</li> </ul> <p>b. Wiring: Install according to manufacturer’s instructions.</p> <p>5.3. Mounting</p> <p>a. The hole where wires come through the wall must be very small or sealed (e.g., with spackle) to prevent drafts from affecting thermostat accuracy.</p> <p>b. Any holes/damage to wall from installation or removal of a thermostat shall be: <ul style="list-style-type: none"> <li>- Covered with the supplied trim plate, or</li> <li>- Repaired and patched to match the existing finish (when necessary, and within the program scope).</li> </ul> </p> <p>5.4. Programming</p> <p>a. Set-up Smart Thermostat in accordance with manufacturer’s instructions.</p> <p>b. Blower speed shall be set for equipment in accordance with manufacturer specifications.</p> <p>c. The installer options will be set to match the thermostat to the equipment and control board settings.</p> <p>d. Time delay for equipment will be set in accordance with manufacturer specifications and as appropriate for the climate zone.</p>
<p><b>6. POST-INSTALLATION GUIDELINES</b></p>	<p>6.1. Operational Checks</p> <p>a. The Smart Thermostat shall be checked to confirm proper operation with the client present to observe the procedure. <ul style="list-style-type: none"> <li>- Operational checks shall be performed as prescribed by the manufacturer.</li> <li>- If the unit does not operate as designed, recommended troubleshooting procedures shall be followed.</li> </ul> </p> <p>b. Programming Check <ul style="list-style-type: none"> <li>- Thermostat shall be programmed with client present in accordance with manufacturer’s instructions, considering a client’s wishes.</li> </ul> </p> <p>6.2. Additional Clean-up and Disposal: Old thermostats <u>containing mercury</u> shall be disposed of in accordance with Universal Waste Regulations, as set forth by DTSC at: <a href="http://www.dtsc.ca.gov/HazardousWaste/Mercury_Therm_Act.cfm">http://www.dtsc.ca.gov/HazardousWaste/Mercury_Therm_Act.cfm</a></p>
<p><b>7. MATERIAL SPECIFICATIONS</b></p>	<p>7.1. Smart Thermostat shall be classified as a “Smart” or “Learning” thermostat (may communicate to, or be controlled by a “smart phone”).</p> <p>a. Must be compatible with the HVAC equipment it will control.</p> <p>b. Thermostat must be capable of making decisions based on data received. <ul style="list-style-type: none"> <li>- Utilizes algorithms that enable it to optimize HVAC settings.</li> <li>- Has at least three of the following features: <ul style="list-style-type: none"> <li>• Occupancy detection</li> <li>• Heat pump lockout temperature control</li> <li>• Upstaging and downstaging optimization</li> <li>• Optimal humidity control</li> <li>• AC overcooling</li> <li>• Fan dissipation</li> <li>• Behavioral features</li> <li>• Free cooling/economizer capabilities</li> </ul> </li> </ul> </p> <p>c. Must include a trim plate to cover holes from the previous installation.</p>

	<p>d. When a “C” wire in good condition is not present at the old thermostat location, the selected thermostat manufacturer must provide a compensating accessory or work-around for installation of the Smart Thermostat.</p> <p>7.2. Thermostats for Heat Pumps</p> <p>a. Shall prevent supplementary electric resistance heater operation when the heat pump alone can meet the heating load.</p> <p>b. A thermostat shall be selected with a supplementary heat lockout that will interface with an outside temperature sensor.</p>
<b>8. WARRANTY</b>	8.1. Manufacturer Warranty – 1 year



# CSD LIWP STANDARDS FOR WALL INSULATION - DRAFT

Category	Criteria
<b>1. MEASURE</b>	<p>1.1. Installation of pressure-fill insulation in conventional homes and flexible mineral fiber batts in mobile homes to reduce unwanted heat loss or gain that can increase energy demands on heating and cooling systems.</p> <p>1.2. This measure is classified as an Enhanced Measure <u>NOT</u> requiring an energy audit.</p> <p>1.3. The following requirements are in addition to all applicable requirements found in the General Installation Guidelines.</p>
<b>2. LICENSING</b>	<p>2.1. This measure requires a Class B General Building Contractor or C-2 Insulation and Acoustical Contractor license for purposes of the LIWP program.</p>
<b>3. FEASIBILITY CRITERIA</b>	<p>3.1. Install this measure when (<u>ALL</u> of the following shall apply):</p> <ol style="list-style-type: none"> <li>a. The wall separates conditioned and unconditioned space.</li> <li>b. At least 200 square feet of uninsulated wall area is required (net area, excluding doors and windows) to be insulated.</li> </ol> <p>3.2. Do <u>NOT</u> install this measure when:</p> <ol style="list-style-type: none"> <li>a. Any existing insulation is present within the wall cavity.</li> <li>b. Unsafe electrical conditions are present and correction is not feasible.</li> <li>c. Knob-and-tube (K&amp;T) wiring is present and energized.</li> <li>d. Dwelling defects are present that prohibit safe installation Including conditions that cannot safely withstand pressure of blown insulation.</li> <li>e. Wall cavity contains any of the following:               <ul style="list-style-type: none"> <li>- Gas wall furnace.</li> <li>- Electric wall heater or other heat producing device without full dimensional blocking and 3" clearance zone or sealed protective pan.</li> <li>- Exhaust fan housing which is not a sealed unit.</li> <li>- Recessed light fixture without a solid barrier and 3" clearance zone.</li> <li>- Metal chimney or flue without a solid barrier and 3" clearance zone.</li> </ul> </li> <li>f. Wall cavity is:               <ul style="list-style-type: none"> <li>- Used as, or contains, an HVAC duct.</li> <li>- Open to an uninsulated soffit with a recessed light fixture which cannot be properly blocked.</li> <li>- Adjacent to a masonry fireplace or chimney with less than 3" clearance between cellulose and masonry.</li> <li>- Connected to an unprotected pocket door cavity.</li> <li>- Open on interior (e.g., incomplete sheathing in cabinets, under sink, etc.).</li> </ul> </li> </ol>
<b>4. ADDITIONAL ASSESSMENT CRITERIA</b>	<p>4.1. Walls with exterior asbestos, vinyl, or aluminum siding shall <u>not</u> be drilled. Insulation shall be installed <i>only if</i>:</p> <ol style="list-style-type: none"> <li>a. Siding can be removed carefully before insulating and re-installed after insulation is completed; or</li> <li>b. Cavities are drilled and filled from indoors.</li> </ol>
<b>5. MINIMUM INSTALLATION GUIDELINES</b>	<p>5.1. Measure shall be installed in accordance with manufacturer's instructions and specifications, local building code, the 2016 Title 24 requirements and the LIWP CAS Protocol.</p> <ol style="list-style-type: none"> <li>a. All cutting of mineral fiber batts for blocking or baffling purposes shall occur <u>outside</u> the living space.</li> <li>b. Cavities that will be insulated must be blocked at the top and bottom, and the bottom plate shall be mechanically-secured.</li> </ol>

	<ul style="list-style-type: none"> <li>c. In locations with freezing temperatures, insulation shall be placed between pipes and the cold-side.</li> <li>d. Only gypsum (drywall), stucco, and wooden wall sheathing shall be drilled.</li> <li>e. Holes shall be drilled above and below all fire blocks and cross braces to ensure that all cavities are filled.</li> </ul> <p>5.2. Holes and Patching</p> <ul style="list-style-type: none"> <li>a. Installed in conformance with manufacturer's instructions and finished to blend with the surrounding wall surface.</li> <li>b. All hole plug and filler materials shall be appropriate to the application and compatible with surrounding material.</li> <li>c. Plugs shall be resistant to shrinkage and expansion.</li> <li>d. Appropriate filler/patch shall be sealed with an appropriate primer. <ul style="list-style-type: none"> <li>- <i>Note:</i> Application of a separate primer is <u>not</u> required when an appropriate self-priming filler is used.</li> </ul> </li> <li>e. Breaches in moisture barrier shall be sealed.</li> <li>f. Flush mount plastic plugs are allowed, when approved by the owner.</li> </ul>
<p><b>6. POST-INSTALLATION</b></p>	<p>6.1. Operational Checks</p> <ul style="list-style-type: none"> <li>a. Interior of the home shall be checked for wall damage and loose insulation. <ul style="list-style-type: none"> <li>- All damage, interior and exterior, shall be repaired and loose fill material accidentally blown into the home shall be removed.</li> </ul> </li> <li>b. During and after installation, a sample of utility switch/outlet boxes shall be checked for loose fill. If insulation is found, it shall be removed from boxes.</li> <li>c. Electrical cover plates removed for inspection shall be reinstalled.</li> </ul>
<p><b>7. MATERIAL SPECIFICATIONS</b></p>	<p>7.1. Flexible and Loose Fill Insulation Materials</p> <ul style="list-style-type: none"> <li>a. All insulation shall be certified to comply with the CCR, Title 24, Part 12, Chapter 12-13, "Standards for Insulating Material".</li> <li>b. Facing shall meet applicable code requirements.</li> <li>c. A non-absorbent, fire-rated insulation will be used with a minimum life expectancy of 10 years. <ul style="list-style-type: none"> <li>- Mineral Fiber <ul style="list-style-type: none"> <li>• Flexible: Conformance to ASTM C665.</li> <li>• Loose Fill: Conformance to ASTM C764.</li> </ul> </li> <li>- Cellulose, Loose Fill <ul style="list-style-type: none"> <li>• Shall be licensed for sale in California.</li> <li>• Listed in the Department of Consumer Affairs "Directory of Certified Insulation Materials".</li> </ul> </li> </ul> </li> </ul> <p>7.2. Installation Density</p> <ul style="list-style-type: none"> <li>a. Blown fiberglass, mineral fiber, or rock and slag wool used in an enclosed cavity will be installed at or above the manufacturer recommended density to limit air flow that corresponds to an air permeance value of 3.5 cfm/sq. ft. at 50 pascals, as measured using BPI- 102 "Standard for Air Resistance of Thermal Insulation Used in Retrofit Cavity Applications – Material Specification" or ASTM C 522, E 283, or E 2178.</li> <li>b. The number of bags installed will be confirmed and will match the number required on the coverage chart.</li> </ul> <p>7.3. R-Value for Flexible and Loose Fill Mineral Fiber: R-value shall be determined in accordance with the insulation manufacturer and in conformance with Title 24:</p> <ul style="list-style-type: none"> <li>a. 2-by-6 walls: R-19</li> <li>b. 2-by-4 walls: R-13 for cellulose or for fiberglass material.</li> </ul> <p>7.4. Vapor Barrier (when required by the local jurisdiction): Maximum of 1 perm.</p>
<p><b>8. WARRANTY</b></p>	<p>8.1. Manufacturer Warranty – 1 year</p>



# CSD LIWP STANDARDS

FOR

## WATER HEATER BLANKET - DRAFT

Category	Criteria
<b>1. MEASURE</b>	1.1. Installation of water heater insulation is intended to prevent standby heat loss. 1.2. This measure is classified as an Enhanced Measure <u>NOT</u> requiring an energy audit. 1.3. The following requirements are in addition to all applicable requirements found in the General Installation Guidelines.
<b>2. LICENSING</b>	2.1. This measure requires a Class B General Building Contractor license for purposes of the LIWP program
<b>3. FEASIBILITY CRITERIA</b>	3.1. Install this measure when ( <u>ALL</u> of the following shall apply): a. No external insulation is present, or insulation is substantially damaged and not effectively insulating the heater. b. External insulation is allowed by the manufacturer and the internal R-value is: - R-12 or less for a gas water heater; or - R-15 or less for an electric water heater. 3.2. Do <u>NOT</u> install this measure when: a. Existing external water heater insulation is installed and operable. b. Water heater is the tankless type. c. A water or gas leak is present that cannot be corrected. d. Water heater does not meet clearance requirements. e. Temperature and Pressure Relief Valve (T&P) or Automatic Gas Shut-off Valve (AGSV) is nonconforming, or will be obstructed by the insulation. f. Plastic piping is present in the cold or hot water line to/from the tank. - <i>Note:</i> Plastic pipe is code-compliant PEX that starts $\geq 18$ " from the tank. g. Platform or enclosure floor is structurally unsound. h. Tank is not located within a weather-protected location or enclosure. i. There is evidence of improper combustion or appliance modification, such as: - Soot accumulation near draft hood or on floor underneath tank - Scorching/smoke at draft hood - Both access covers are missing
<b>4. ADDITIONAL ASSESSMENT CRITERIA</b>	4.1. Clearance Requirements a. All Water Heaters: Tank shall be 12" or more from a cooking appliance. b. Multi-Family Central: Tank shall be more than 12" from an oil furnace. c. Gas-Fueled: Front clearance shall be at least 4". 4.2. Potential Fire Hazard a. If existing water heater insulation or pipe insulation causes a potential fire hazard, client must be informed of non-conforming condition. b. If the client is physically unable to correct the issues, minor fire hazards shall be removed by assessor or crew. 4.3. Water Heater R-Value: a. Assessors shall attempt to establish R-value of internal insulation to determine measure feasibility. b. Measure is not feasible only when the tank manufacturer's label expressly states that external insulation must not be installed
<b>5. MINIMUM</b>	5.1. Measure shall be installed in accordance with manufacturer's instructions and

<b>INSTALLATION GUIDELINES</b>	<p>specifications, local building code and the LIWP CAS Protocol.</p> <p>5.2. Insulation Coverage</p> <p>a. Earthquake Straps and Bracing Devices</p> <ul style="list-style-type: none"> <li>- Seismic straps and braces shall <u>not</u> be installed over insulation.</li> <li>- The blanket shall be slit to fit around straps and braces, and securely taped.</li> </ul> <p>b. Gas and Electric Water Heaters</p> <ul style="list-style-type: none"> <li>- Gas Water Heaters - Top of tank shall <u>not</u> be insulated on natural draft units.</li> <li>- Electric Water Heaters - Top of tank be completely covered with insulation.</li> <li>- Side insulation shall: <ul style="list-style-type: none"> <li>• Completely surround tank to provide 100% coverage</li> <li>• Extend from top of tank to bottom of drain valve neck.</li> </ul> </li> </ul> <p>5.3. Straps and Buckles</p> <p>a. Straps shall <u>not</u> be placed over thermostat cover plates, controls, valves, thermostat control valve, or burner access door, with minimum compression.</p> <p>5.4. Temperature and Pressure Protection</p> <p>a. T&amp;P valve shall <u>not</u> be covered by the blanket. Minimum 1/2" clearance is required between the blanket and the valve. The termination of the drain line shall not be obstructed (not capped or plugged).</p> <p>b. Automatic Gas Shutoff Valve, and line to/from the AGSV, shall <u>not</u> be covered.</p> <p>5.5. Additional Criteria for Gas Water Heaters</p> <p>a. Burner Access and Draft Hood Clearances</p> <ul style="list-style-type: none"> <li>- Minimum 3" clearance from blanket and tape to edge of burner access and draft hood openings.</li> </ul> <p>b. Combustion Air Supply Clearances</p> <ul style="list-style-type: none"> <li>- On Flammable Vapor Ignition Resistant (FVIR) water heaters, combustion air inlets shall be identified, and shall <u>not</u> be covered.</li> <li>- When unit is located in attic, blocking (insulation dams) shall be present.</li> </ul> <p>5.6. Operation and Safety Instructions</p> <p>a. Appliance identification label, safety information, lighting instructions, and thermostats shall be made easily accessible.</p> <p>b. Labeled flaps shall be cut into the water heater blanket for access to lighting and safety instructions, and shall be held closed with a single piece of tape.</p>
<b>6. POST-INSTALLATION</b>	<p>6.1. Operational Checks</p> <p>a. Blankets shall be installed in conformance with the manufacturer's guidelines.</p> <p>b. Installation shall not cause a hazard for combustibles, or prevent proper operation of the water heater or its component parts.</p>
<b>7. MATERIAL SPECIFICATIONS</b>	<p>7.1. Insulation/Blanket Material</p> <p>a. Maximum flame-spread 25, and maximum smoke-developed 50, per ASTM E84.</p> <p>b. R-6 minimum, mineral fiber only, with vinyl or fiber-reinforced foil facing.</p> <p>7.2. Straps and Buckles</p> <p>a. Maximum flame-spread index of 25 and maximum smoke-developed index of 50, per ASTM E84, or UL 723, or NFPA 255.</p> <p>b. Polypropylene blanket straps and compatible buckles or other mechanical strap locks; tying of straps is not allowed.</p> <p>7.3. Tape</p> <p>a. Maximum flame-spread 25, and maximum smoke-developed 50, per ASTM E84.</p> <p>b. Vinyl or fiber-reinforced foil compatible with, or the same material as, facing.</p> <p>c. Minimum width 3".</p> <p>d. Duct tape is not allowed.</p>
<b>8. WARRANTY</b>	<p>8.1. Manufacturer Warranty – 1 year</p>



# CSD LIWP STANDARDS

FOR

## WHOLE HOUSE FAN - DRAFT

Category	Criteria
<b>1. MEASURE</b>	1.1. Installation of a whole house ventilation fan in the interior of a house brings in outside air through door and/or window openings to cool the living space. 1.2. This measure is classified as an Enhanced Measure <u>NOT</u> requiring an energy audit 1.3. This measure quantity is limited to one per dwelling. 1.4. The following requirements are in addition to all applicable requirements found in the General Installation Guidelines.
<b>2. LICENSING</b>	2.1. This measure requires a Class B General Building Contractor or C-10 Electrical Contractor license for purposes of the LIWP program
<b>3. FEASIBILITY CRITERIA</b>	3.1. Install this measure when the home ( <u>ALL</u> of the following shall apply): a. Has a functional central air conditioning system. b. Is located in CEC Climate Zones 9 – 13. 3.2. Do <u>NOT</u> install this measure when: a. Whole house fan is in place and operational. b. Attic access or clearance is not adequate. c. No feasible location is available with sound framing. d. Required inlet ventilation (open doors/windows) and/or outlet ventilation (attic venting NFVA) cannot be provided. e. An open combustion gas appliance with standing pilot is in the attic. f. Cutting of truss chord(s) is required for the installation. g. A proper grounded electrical circuit is not present and cannot be installed, when required by manufacturer.
<b>4. ADDITIONAL ASSESSMENT CRITERIA</b>	4.1. Determine appropriate fan CFM, based on living space volume or desired effect, using: a. WHF manufacturer’s sizing guidelines, <u>or</u> b. 1.5 cfm per square foot of conditioned floor area (per Title 24). 4.2. Assess attic venting for exhaust NFVA. a. Determine whether required NFVA is present or can feasibly be provided. b. Exhaust NFVA shall conform to: - WHF manufacturer’s specifications, <u>or</u> - 1 sq. ft. per 750 cfm of WHF rated airflow (per Title 24). 4.3. Location Assessment a. Installation location shall be in conformance with manufacturer specifications and: - Be in a hallway or central location that is an adequate distance away from CO and smoke alarms (as described in the LIWP standards for “Carbon Monoxide Alarms” and “Smoke Alarms”). - <u>Not</u> be in a bedroom, kitchen, utility room, or anywhere its air movement can adversely affect operation of an open combustion appliance (cause spillage or blow out a standing pilot). - Be free of obstructions (e.g., pipes, wires, ducts). - Have adequate clearance above the WHF. b. Access to an acceptable electrical circuit is feasible. The circuit shall:

	<ul style="list-style-type: none"> <li>- Provide constant power (must <u>not</u> be a switch leg).</li> <li>- Be grounded and have adequate overcurrent protection.</li> </ul> <p>c. Assessor shall check to ensure there is a satisfactory location to install the whole house fan.</p>
<p><b>5. MINIMUM INSTALLATION GUIDELINES</b></p>	<p>5.1. Measure shall be installed in accordance with manufacturer's instructions and specifications, applicable building codes, 2016 Title 24 requirements, and the LIWP CAS Protocol.</p> <p>a. Combustion appliances that may be affected by the whole house fan shall be tested in accordance with the LIWP CAS Protocol to ensure proper operation.</p> <p>5.2. Safety Disconnections</p> <p>a. A thermostatic safety switch to disconnect power to the fan in case of fire shall be installed, when available.</p> <ul style="list-style-type: none"> <li>- It shall be located above the fan in the air path (e.g., on a roof rafter).</li> <li>- The hot lead to the fan shall be run through the safety switch, so motor will stop when the attic reaches the temperature that opens the switch.</li> </ul> <p>b. A manual disconnect shall be installed for belt-drive models.</p> <ul style="list-style-type: none"> <li>- An on-off switch shall be wired into the fan circuit so the unit can be disabled during maintenance.</li> <li>- The switch shall be installed in the attic near the fan.</li> </ul> <p>5.3. Fan Controls</p> <p>a. Fan operation shall be controlled by:</p> <ul style="list-style-type: none"> <li>- An on-off switch (remote control is an additional option) <u>and</u></li> <li>- A timer, with minimum 8-hour capacity to un automatically.</li> </ul> <p>b. The WHF shall <u>not</u> be controlled by a device that turns it on <i>automatically</i> at a pre-set room temperature (<i>manual</i> activation is required).</p> <ul style="list-style-type: none"> <li>- <u>Note</u>: Automatic-on feature is allowed when a pressure interlock device is present that turns off the WHF when the living space is excessively depressurized (e.g., when windows and doors are closed).</li> </ul> <p>5.4. Wall-Mounted Controls</p> <p>a. To be distinguishable, speed switch/control, timer, and other fan controls shall be installed higher than light switches (e.g., 5' above the floor).</p> <p>b. Controls shall be installed in electrical boxes.</p> <p>c. Wiring shall be enclosed within a wall cavity, when possible.</p> <ul style="list-style-type: none"> <li>- <u>Exception</u>: Raceway may be used when: <ul style="list-style-type: none"> <li>• The wall is solid (e.g., masonry) or densely insulated.</li> <li>• The top plate is inaccessible.</li> </ul> </li> </ul> <p>d. When the WHF has a pull-chain control (but no remote control), a wall-mount location is required for the on-off switch and timer.</p> <p>5.5. Fan Installation</p> <p>a. Structural Framing</p> <ul style="list-style-type: none"> <li>- Framing/blocks shall be installed between joists when required to: <ul style="list-style-type: none"> <li>• Stabilize and/or straighten ceiling joists.</li> <li>• Provide proper mounting surfaces for the fan.</li> </ul> </li> </ul> <p>b. Plenum and Ducts</p> <ul style="list-style-type: none"> <li>- The air path between the attic floor and fan housing shall be enclosed to form a plenum, and sealed to prevent infiltration of attic air.</li> <li>- Plenum and duct sizing shall comply with criteria in Item 7.3(b).</li> </ul> <p>5.6. Perimeter Blocking</p> <p>a. Perimeter blocking shall be installed around the WHF, when loose-fill insulation is present.</p> <p>b. Unfaced flexible mineral fiber batts shall extend at least 14-1/2" away from the fan on all sides.</p> <p>5.7. Exhaust Ventilation</p>

	<ul style="list-style-type: none"> <li>a. Exhaust ventilation NFVA shall be in conformance with Item 4.2(a).</li> <li>b. Existing vents screened with #16 mesh (insect screen) shall be re-screened with 1/4" weave (#4) mesh, when included in the NFVA calculation.</li> <li>c. New screened vents shall have #4 mesh.</li> <li>d. All vents shall be unobstructed and properly blocked from loose fill insulation.</li> </ul> <p>5.8. Louvered Shutter Installation</p> <ul style="list-style-type: none"> <li>a. When a louvered shutter is used, it shall be installed and secured against the ceiling per manufacturer's instructions.</li> <li>b. Shutter frame/flange shall fit snugly against the ceiling, and be sealed at the ceiling with caulk or gasketing.</li> </ul>
<p><b>6. POST-INSTALLATION</b></p>	<p>6.1. Operational Checks</p> <ul style="list-style-type: none"> <li>a. Installation shall be examined for: <ul style="list-style-type: none"> <li>- Proper, secure attachment</li> <li>- Correct blocking of loose fill (when applicable)</li> <li>- Safe electrical wiring</li> </ul> </li> <li>b. The unit shall be tested for proper operation, including: <ul style="list-style-type: none"> <li>- Power switch, speed control, timer.</li> <li>- Hinged insulated lid, backdraft damper, shutter louvers and separate winter cover shall operate without binding or misalignment, when present.</li> </ul> </li> </ul>
<p><b>7. MATERIAL SPECIFICATIONS</b></p>	<p>7.1. All whole house fans shall have:</p> <ul style="list-style-type: none"> <li>a. UL Listing (or equivalent) and compliant with UL 507.</li> <li>b. Thermally-protected motor rated for 120V AC.</li> <li>c. Power Control: Wall-mount power switch and speed control <u>or</u> a remote device for controlling power, speed, and run-time.</li> </ul> <p>7.2. Accessories:</p> <ul style="list-style-type: none"> <li>a. Timer: Manual-on, automatic-off timer or controller that allows timed operation for up to at least 8 hours (wall-mounted or remote-controlled).</li> <li>b. Thermal Transfer Resistance <ul style="list-style-type: none"> <li>- Winter cover for ceiling mount louvered shutters is required when available. Not required for: <ul style="list-style-type: none"> <li>• WHFs with actuated hinged insulated top cover(s).</li> <li>• In-line WHFs that have a barometric damper in the intake plenum.</li> </ul> </li> </ul> </li> <li>c. Attic-mounted thermostatic safety limit switch that turns off the WHF when attic temperature is elevated above 185 °F in response to a fire. <ul style="list-style-type: none"> <li>- Created at the job site using a thermostat bimetal limit "switch" placed in the attic and wired into the "hot" conductor to the fan motor.</li> <li>- Examples include (a) Supco SHL190, and (b) White Rodgers 3L11-190.</li> </ul> </li> </ul> <p>7.3. Fan System Design</p> <ul style="list-style-type: none"> <li>a. Insulated Door Fan: WHF with actuated insulated top cover(s) that close completely when fan is off to seal and insulate the fan unit.</li> <li>b. Inline Fan: <ul style="list-style-type: none"> <li>- Remote fan connected with a flexible duct to a damper-equipped ceiling-mount intake assembly/plenum and grille. <ul style="list-style-type: none"> <li>• Duct shall be UL181 metallic flexible duct, <u>or</u> duct supplied with fan.</li> <li>• Plenum and duct shall be sized in accordance with the Building in CA "Field Duct Sizing Chart" (available at <a href="http://buildingincalifornia.com/wp-content/uploads/2014/03/duct-sizing-chart.pdf">http://buildingincalifornia.com/wp-content/uploads/2014/03/duct-sizing-chart.pdf</a>).</li> </ul> </li> </ul> </li> <li>c. Standard Fan: Traditional ceiling mount fan with barometric shutter below.</li> </ul>
<p><b>8. WARRANTY</b></p>	<p>8.1. Manufacturer Warranty – 3 years</p>