

# DOE Approved SWS Variance



## 2.0201.1 Combustion Appliance Zone (CAZ) Testing

**Topic:** Combustion Safety

**Subtopic:** Combustion Safety Testing-General

**Desired Outcome:** Accurate information about appliance safe operation is gathered

### Single-Family Homes

Title	Specification(s)	Objective(s)
2.0201.1e Depressurization test	Depressurization test will include exhaust fans, interior door closure, or duct leakage, or a combination thereof, and will not be more negative than <del>-3 pascals</del> the CAZ limit of the heating system as defined in section 2.0299.1 accounting for base pressure	Measure combined effect of mechanical system fans on combustion zone
2.0201.1i Combustion safety testing at completion of retrofitting home	At the conclusion of each work day in which <u>envelope</u> or duct sealing measures have been performed, depressurization and spillage testing will be performed when category 1 or 2 appliances are present	Ensure work completed in home has not adversely affected the operation of combustion appliances

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## 2.0702.1 Warranty and Service Agreement

**Topic:** Occupant Education and Access

**Subtopic:** Installed Equipment

**Desired Outcome:** Occupants provided recourse for failures in materials, workmanship, and serviceability and informed of potential hazards

### Single-Family Homes

Title	Specification(s)	Objective(s)
2.0702.1a Warranty	A minimum 1-year warranty for materials, workmanship, and serviceability will be provided to occupants upon completion of work	Provide recourse to occupants for failures in materials, workmanship, and serviceability
<del>2.0702.1b Warranty renewal and service agreement</del>	<del>An option for annual inspection and renewal of warranty and service agreement for up to 10 years will be offered at a cost (requirement for installers)</del>	<del>Provide occupants with an option for extending the warranty and service agreement</del>
2.0702.1e General conditions	At a minimum, the following concerns and warnings will be addressed within the warranty: <ul style="list-style-type: none"><li>• Possible drying and shrinking effects</li><li>• Storage of hazardous and flammable materials</li><li>• Mold</li></ul>	Educate occupants on potential hazards

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## 3.1005.1 Tongue and Groove Ceilings

**Topic:** Attics

**Subtopic:** Other Ceiling Materials

**Desired Outcome:** Tongue and groove ceilings sealed to prevent air leakage and moisture movement between the attic and conditioned space

### Single-Family Homes

Title	Specification(s)	Objective(s)
3.1005.1a Pre-inspection	An inspection will be conducted for mold, water leaks, and water damage before sealing a tongue and groove ceiling  Repairs will be completed before work	Repair moisture-related issues
3.1005.1b Backing	Backing will be installed behind tongue and groove ceilings <b>where access is available and through interior air sealing when there is no access</b>	Prevent air leakage and allow for sealants
3.1005.1c Sealant selection	Sealants will be compatible with their intended surfaces  Sealants will be continuous and meet fire barrier specifications, according to authority having jurisdiction  No sealant will be allowed to be visible in the living space <b>except in case noted in 3.1005.1b where a clear sealant shall be used.</b>	Select permanent sealant  Ensure sealant meets or exceeds the performance characteristics of the surrounding materials  Ensure ceiling remains aesthetically pleasing

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## 4.1003.3 Unvented Flat Roof with Existing Insulation

**Topic:** Attics

**Subtopic:** Attic Ceilings

**Desired Outcome:** Insulation reduces heat flow through unvented roof

Single-Family Homes

Title	Specification(s)	Objective(s)
4.1003.3a Ventilation	Code compliant ventilation will be installed before insulation, <b>except in cases of flat/low-sloped roof assemblies, or where the "attic" space is too confined for human entry.</b>	Reduce possibility of moisture issues
4.1003.3b Installation	Roof cavities will be blown with loose fill insulation (or roof cavities will be dense packed with insulation) without gaps, voids, compressions, misalignments, or wind intrusions  Insulation will be installed to prescribed R-value	Insulate to prescribed R-value
4.1003.3c Occupant education	A dated receipt signed by the installer will be provided that includes: <ul style="list-style-type: none"><li>• Insulation type</li><li>• Coverage area</li><li>• R-value</li><li>• Installed thickness and minimum settled thickness</li><li>• Number of bags installed in accordance with manufacturer specifications</li></ul>	Document job completion to contract specifications  Confirm amount of insulation installed  Ensure ability to match bags required for total area completed  Comply with 16 CFR 460.17

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## 4.1103.2 Additional Exterior Wall Cavities

Topic: Walls

Subtopic: Enclosed Walls

**Desired Outcome:** Properly installed insulation reduces heat flow through walls and framing cavities inaccessible to other treatments

### Single-Family Homes

Title	Specification(s)	Objective(s)
4.1103.2a Location of cavities	Details remaining in or between completed wall sections will be located and accessed	Ensure the last gaps and framing edges in the <i>thermal boundary</i> , roof-wall joints, floor-wall joints, etc., are found and finished
4.1103.2b Sealing	Backing will be provided and all newly uncovered openings will be sealed with air barriers, foam, or mastic, maintaining all required clearances	Ensure the <i>air barriers</i> connected across all accessible house elements
4.1103.2c Dense packing	<p>Using fill tube, 100% of each cavity will be filled to a consistent density:</p> <ul style="list-style-type: none"> <li>Cellulose insulation used in an enclosed cavity will be installed at 3.5 pounds per cubic foot or greater density</li> <li>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 airflow that corresponds to an air permeance value of 3.5 <i>cfm</i>/sq. ft. at 50 pascals, as measured using <i>BPI</i>-102 "Standard for Air Resistance of Thermal Insulation Used in Retrofit Cavity Applications—Material Specification" or <i>ASTM</i>C 522, E 283, or E 2178; the number of bags installed will be confirmed and will match the number required on the coverage chart</li> </ul> <p>Insulation will be verified to prevent visible air movement using chemical smoke at <del>50 pascals of pressure difference</del> 25 pascals of pressure difference at a distance of 1 inch, or by infrared camera used in conjunction with a blower door when weather conditions allow for a greater than 10 degree difference between inside and outside temperatures.</p>	<p>Eliminate voids and settling</p> <p>Minimize framing cavity air flows</p>

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## 4.1601.1 Insulating Flex Ducts

**Topic:** Ducts

**Subtopic:** Insulating Ducts

**Desired Outcome:** Lower conductive heat transfer by ducts and decreased condensation on duct vapor barrier

Single-Family Homes

Title	Specification(s)	Objective(s)
4.1601.1a Removal of existing flexible ducting	All accessible low R-value flexible ducting will be removed from premises <b>when the SIR for replacement is 1.0 or greater as determined by the WA software</b>	Ensure installation of proper R-value ducts

### 5.3001.1 Load Calculation and Equipment Selection

**Topic:** Forced Air

**Subtopic:** Design

**Desired Outcome:** Equipment sized properly and operates efficiently

Single-Family Homes

Title	Specification(s)	Objective(s)
5.3001.1a Load calculation	Load calculation will be performed in accordance with <u>ANSI/ACCA 2 Manual J-2011</u> (Residential Load Calculation) and manufacturer specifications	Properly size equipment for load
5.3001.1b Equipment selection	Equipment selection will be performed in accordance with <u>ANSI/ACCA Manual S</u> or load calculations from the <u>Weatherization Assistant software</u> and manufacturer specifications	Ensure equipment is able to heat, cool, and dehumidify the house
5.3001.1c Air filtration	New central forced air <u>HVAC</u> systems will have minimum <u>MERV6</u> filtration with no air bypass around the filters	Particle removal to protect equipment and help maintain indoor air quality

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## 5.3003.3 Evaluating Air Flow

**Topic:** Forced Air

**Subtopic:** System Assessment and Maintenance

**Desired Outcome:** Air flow is properly tested

### Single-Family Homes

Title	Specification(s)	Objective(s)
5.3003.3a Total air flow	Total system air flow will be measured by:  <b>Required tests:</b> <ul style="list-style-type: none"> <li>• Temperature rise</li> <li>• Heat exchanger integrity test</li> <li>• Client interview</li> </ul> <b>Optional tests:</b> <ul style="list-style-type: none"> <li>• Flow plate</li> <li>• Fan depressurization device (e.g., Duct Blaster, DucTester)</li> </ul>	Ensure equipment is durable, provides comfort, operates efficiently, safely, and as designed
5.3003.3b External static pressure	<del>External static pressure</del> Heat rise will be in accordance with manufacturer specifications	Ensure equipment is durable, provides comfort, operates efficiently, safely, and as designed
5.3003.3c Pressure	<del>Pressure drop across cooling coils</del> Heat rise will be in accordance with manufacturer specifications	Ensure equipment is durable, provides comfort, operates efficiently, safely, and as designed
5.3003.3d Pressure drop: filter	<del>Pressure drop across filter</del> Heat rise will be in accordance with manufacturer specifications	Ensure equipment is durable, provides comfort, operates efficiently, safely, and as designed
5.3003.3e Balancing room flow: new ductwork	<del>Air flow will be measured at each register</del> A temperate rise test, room to room balancing, and client interview will be conducted to ensure proper air flow delivery	Ensure equipment is durable, provides comfort, operates efficiently, safely, and as designed
5.3003.3f Supply <del>wet bulb and</del> dry bulb	Supply <del>wet bulb and</del> dry bulb air temperatures will be recorded	Ensure equipment is durable, provides comfort, operates efficiently, safely, and as designed
5.3003.3g Return <del>wet bulb and</del> dry bulb	Return <del>wet bulb and</del> dry bulb air temperatures will be recorded	Ensure equipment is durable, provides comfort, operates efficiently, safely, and as designed

### 5.3101.1 Heat Load Calculation—Whole House

**Topic:** Hydronic Heating (Hot Water and Steam)

**Subtopic:** Design

**Desired Outcome:** A properly sized heating appliance selected

Single-Family Homes

Title	Specification(s)	Objective(s)
5.3101.1a Heating load calculation	Load calculation will be performed in accordance with <u>ANSI/ACCA 2 Manual J-2011</u> (Residential Load Calculation) and manufacturer specifications	Enable proper sizing of the heating appliance
5.3101.1b Equipment selection	Equipment selection will be performed in accordance with <u>ANSI/ACCA Manual S</u> or load calculations from the <u>Weatherization Assistant software</u> and manufacturer specifications	Ensure equipment is able to heat the house

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## 7.8102.2 Storage-Type Appliance

**Topic:** Water Heating

**Subtopic:** Installation and Replacement

**Desired Outcome:** Safe and reliable hot water source provided that meets occupant needs at lowest possible cost of ownership

### Single-Family Homes

Title	Specification(s)	Objective(s)
7.8102.2e Expansion tank	A potable water expansion tank will be installed on the cold water side <b>when a backflow prevention device is installed between the cold water inlet and the water heater</b>  A direct connection with no valves between the storage tank and expansion tank will be installed in accordance with the 2012 <i>IRC</i> , authority having jurisdiction, and according to manufacturer specifications	Protect the storage tank from expansion
7.8102.2h Backflow prevention	Backflow prevention will be installed ( <b>when required by local code</b> ) in accordance with manufacturer specifications and all applicable codes	Protect water supply from contamination

## 7.8103.1 Storage-Type Appliance

**Topic:** Water Heating

**Subtopic:** Maintenance/Inspection

**Desired Outcome:** Safe, reliable, and efficient operation of the appliance maintained

### Single-Family Homes

Title	Specification(s)	Objective(s)
7.8103.1c Thermal efficiency	<p>Water heater storage tanks shall <del>have a minimum R value of R-24, unless the SIR to add insulation is less than 1.0</del> be evaluated for the addition of an R-11 insulation blanket</p> <p>Added insulation will not obstruct the unit's draft diverter, pressure relief valve, thermostats, <i>hi-limit switch</i>, plumbing pipes or elements, and thermostat access plates</p> <p>The first 6' of inlet and outlet piping will be insulated in accordance with 2012 <i>IRC</i>N1103.4.2 or local requirements, whichever is greater</p>	<p>Reduce standby losses from near tank piping and storage tank</p> <p>Ensure insulation does not make contact with flue gas venting</p>

# DOE Approved SWS Variance

## 7.8103.1 Storage-Type Appliance

**Topic:** Water Heating

**Subtopic:** Maintenance/Inspection

**Desired Outcome:** Safe, reliable, and efficient operation of the appliance maintained

### Single-Family Homes

Title	Specification(s)	Objective(s)
7.8103.1d Potable water expansion tank	<p>A potable water expansion tank will be installed on the cold water side <b>when a backflow prevention device is installed between the cold water inlet and the water heater</b></p> <p>Tanks that leak or have excessive corrosion will be replaced</p> <p>A direct connection with no valves from the expansion tank to the storage tank will be installed</p> <p>Connection will be properly supported with strapping</p> <p>An expansion tank drain will be included in non-bladder tanks</p> <p>Tank will be installed to accepted industry standards, in accordance with the 2012 <u>IRC</u> and according to manufacturer specifications</p> <p>Tanks that are completely full of water will be drained and refilled before being replaced or repaired</p> <p>Expansion tanks with bladders will have air charged to the manufacturer pressure requirements while water is not present in the tank</p> <p>Bladder tanks with water inside of the air bladder will be replaced in accordance with manufacturer specifications</p>	Absorb water expansion of the system

## 4.1006.2 Access Doors and Hatches

**Topic:** Attics

**Subtopic:** Attic Openings

**Desired Outcome:** Attic access door properly sealed and insulated

### Single-Family Homes

Title	Specification(s)	Objective(s)
4.1006.2a Installation	<p>Hatches will be insulated to the maximum R-value structurally allowable up to the R-value of the adjoining insulated assembly</p> <p>Attic hatches rough opening will be surrounded with a durable protective baffle that is higher than the level of the surrounding attic floor insulation</p>	<p>Achieve uniform R-value on the attic door or hatch</p> <p>Achieve uniform R-value on the attic floor</p> <p>Prevent loose attic floor insulation from entering the living area</p>
4.1006.2b Sealing	<p><del>Access hatch frames will be sealed using caulk, gasket, weatherstrip, or otherwise sealed with an air barrier—material, suitable film, or solid material</del></p> <p><del>Options will include installing a latch or lock or frictionally engaged components of a pre-fabricated unit above the opening that do not require a latch</del></p> <p><del>The measure must include a protective baffle or insulation barrier</del></p> <p>Horizontal and vertical access hatches, weather constructed or a prefabricated assembly will be sealed using caulk, gasket, weatherstrip, latch, or otherwise sealed with an air barrier material, suitable film, or solid material.</p>	Prevent air leakage
4.1006.2c Attachment	Insulation will be permanently attached and in complete contact with the air barrier	Insulate to prescribed R-value
4.1006.2d Durability	Completed measure will meet a minimum expected service life of 20 years	Ensure a minimum expected service life
4.1006.2e Occupant education	<p>A dated receipt signed by the installer will be provided that includes:</p> <ul style="list-style-type: none"> <li>• Coverage area</li> <li>• Thickness</li> <li>• R-value</li> </ul>	<p>Document job completion to contract specifications</p> <p>Confirm amount of insulation installed</p> <p>Comply with 16 CFR 460.17</p>

## 7.8102.2 Storage-Type Appliance

**Topic:** Water Heating

**Subtopic:** Installation and Replacement

**Desired Outcome:** Safe and reliable hot water source provided that meets occupant needs at lowest possible cost of ownership

### Single-Family Homes

Title	Specification(s)	Objective(s)
7.8102.2a- 7.8102.2h	No changes	No changes
7.8102.2i Thermal efficiency	<p>If additional tank insulation is installed, it will be rated a minimum of R-11 and will be installed to manufacturer specifications</p> <p>If additional insulation is installed, it will be installed based on fuel type, making sure not to obstruct draft diverter, pressure relief valve, thermostats, hi-limit switch , plumbing pipes or elements, and thermostat access plates</p> <p>The first 6' of inlet and outlet piping will be insulated in accordance with manufacturer specifications</p> <p>Pipe insulation must remain 3" from gas water heater vent, <b>except in cases of water heaters with PVC exhaust venting.</b></p> <p>Heat traps will be installed on the inlet and outlet piping where not provided by manufacturer</p>	<p>Reduce standby loss from near tank piping and storage tank</p> <p>Ensure insulation does not make contact with flue gas venting</p>
7.8102.2j- 7.8102.2n	No changes	No changes