### 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

<table>
<thead>
<tr>
<th>Title</th>
<th>Specification(s)</th>
<th>Objective(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.0201.1e Depressurization test</td>
<td>Depressurization test will include exhaust fans, interior door closure, or duct leakage, or a combination thereof, and will not be more negative than -3 pascals the CAZ limit of the heating system as defined in section 2.0299.1 accounting for base pressure</td>
<td>Measure combined effect of mechanical system fans on combustion zone</td>
</tr>
</tbody>
</table>

At the conclusion of each work day in which envelope 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

**Updates to Minnesota’s approved SWS variances are found in the blue text below. 12/04/2018**

*The 2017 version of the SWS, adopted by Minnesota, does not include a -3 pascal limit per the BPI 1200 standard. Minnesota will continue to use this SWS as it is written until it adopts the BPI 1200 standard.*

This standard is not in the 2017 version of the SWS. However this is still a policy requirement of Minnesota WAP. Details are found in section 4.5.3.1 and 4.5.3.2.
### 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

<table>
<thead>
<tr>
<th>Title</th>
<th>Specification(s)</th>
<th>Objective(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.0702.1a Warranty</td>
<td>A minimum 1-year warranty for materials, workmanship, and serviceability will be provided to occupants upon completion of work</td>
<td>Provide recourse to occupants for failures in materials, workmanship, and serviceability</td>
</tr>
<tr>
<td>2.0702.1b Warranty renewal and service agreement</td>
<td>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)</td>
<td>Provide occupants with an option for extending the warranty and service agreement&lt;br&gt;&lt;br&gt;The 2017 version of the SWS, adopted by Minnesota does not include this requirement.</td>
</tr>
<tr>
<td>2.0702.1c General conditions</td>
<td>At a minimum, the following concerns and warnings will be addressed within the warranty:&lt;br&gt;▲ Possible drying and shrinking effects&lt;br&gt;▲ Storage of hazardous and flammable materials&lt;br&gt;▲ Mold</td>
<td>Educate occupants on potential hazards&lt;br&gt;&lt;br&gt;Minnesota will continue to use this variance as written here.</td>
</tr>
</tbody>
</table>
### 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

<table>
<thead>
<tr>
<th>Title</th>
<th>Specification(s)</th>
<th>Objective(s)</th>
</tr>
</thead>
</table>
| 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 *where access is available and through interior air sealing when there is no access*                                                                    | Prevent air leakage and allow for sealants  
*Minnesota will continue to use this variance as written here.*                                                                                                        |
| 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 *except in case noted in 3.1005.1b where a clear sealant shall be used.* | Select permanent sealant  
Ensure sealant meets or exceeds the performance characteristics of the surrounding materials  
Ensure ceiling remains aesthetically pleasing  
*Minnesota will continue to use this variance as written here.*                                                                                                      |
**4.1003.3 Unvented Flat Roof with Existing Insulation**

**Topic:** Attics  
**Subtopic:** Attic Ceilings

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

<table>
<thead>
<tr>
<th>Title</th>
<th>Specification(s)</th>
<th>Objective(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1003.3a Ventilation</td>
<td>Code compliant ventilation will be installed before insulation, except in cases of flat/low-sloped roof assemblies, or where the &quot;attic&quot; space is too confined for human entry.</td>
<td>Reduce possibility of moisture issues</td>
</tr>
</tbody>
</table>
| 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:  
- Insulation type  
- Coverage area  
- R-value  
- Installed thickness and minimum settled thickness  
- Number of bags installed in accordance with manufacturer specifications | 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 |
**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

<table>
<thead>
<tr>
<th>Title</th>
<th>Specification(s)</th>
<th>Objective(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1103.2a Location of cavities</td>
<td>Details remaining in or between completed wall sections will be located and accessed to ensure the last gaps and framing edges in the thermal boundary, roof-wall joints, floor-wall joints, etc., are found and finished.</td>
<td>Ensure the last gaps and framing edges in the thermal boundary, roof-wall joints, floor-wall joints, etc., are found and finished.</td>
</tr>
<tr>
<td>4.1103.2b Sealing</td>
<td>Backing will be provided and all newly uncovered openings will be sealed with air barriers, foam, or mastic, maintaining all required clearances.</td>
<td>Ensure the air barriers connected across all accessible house elements.</td>
</tr>
</tbody>
</table>
| 4.1103.2c Dense packing | Using fill tube, 100% of each cavity will be filled to a consistent density:  
  - Cellulose insulation used in an enclosed cavity will be installed at 3.5 pounds per cubic foot or greater density  
  - 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 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; the number of bags installed will be confirmed and will match the number required on the coverage chart  
  - Insulation will be verified to prevent visible air movement using chemical smoke at 50 pascals of pressure difference + 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. | Eliminate voids and settling  
  Minimize framing cavity air flows.                                                                                                                                                                                                                                                |
### 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**

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

*Minnesota Will continue to use this variance as written here.*
### 5.3001.1 Load Calculation and Equipment Selection

**Topic:** Forced Air  
**Subtopic:** Design

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

<table>
<thead>
<tr>
<th>Title</th>
<th>Specification(s)</th>
<th>Objective(s)</th>
</tr>
</thead>
</table>
| 5.3001.1a Load calculation | Load calculation will be performed in accordance with ANSI/ACCA 2 Manual J-2011 (Residential Load Calculation) and manufacturer specifications | Properly size equipment for load.  
*Minnesota Will continue to use this variance as written here.* |
| 5.3001.1b Equipment selection | Equipment selection will be performed in accordance with ANSI/ACCA Manual S or load calculations from the Weatherization Assistant software and manufacturer specifications | Ensure equipment is able to heat, cool, and dehumidify the house.  
*Minnesota Will continue to use this variance as written here.* |
| 5.3001.1c Air filtration | New central forced air HVAC systems will have minimum MERV6 filtration with no air bypass around the filters | Particle removal to protect equipment and help maintain indoor air quality |
5.3003.3 Evaluating Air Flow

**Topic:** Forced Air

**Subtopic:** System Assessment and Maintenance

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

<table>
<thead>
<tr>
<th>Title</th>
<th>Specification(s)</th>
<th>Objective(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.3003.3a Total air flow</td>
<td>Total system air flow will be measured by:</td>
<td>Ensure equipment is durable, provides comfort, operates efficiently, safely, and as designed</td>
</tr>
<tr>
<td></td>
<td>Required tests:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Temperature rise</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Heat exchanger integrity test</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Client interview</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Optional tests:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Flow plate</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Fan depressurization device (e.g., Duct Blaster, DucTester)</td>
<td></td>
</tr>
</tbody>
</table>

5.3003.3b External static pressure

**External static pressure Heat rise** will be in accordance with manufacturer specifications

Ensure equipment is durable, provides comfort, operates efficiently, safely, and as designed

**The 2017 version of the SWS, adopted by Minnesota, adds the language “one of the following methods.” Temperature Rise, Flow Plate, Fan depressurization device. This variance is no longer necessary.**

5.3003.3c Pressure

**Pressure drop across cooling coils Heat rise** will be in accordance with manufacturer specifications

Ensure equipment is durable, provides comfort, operates efficiently, safely, and as designed

**Minnesota Will continue to use this variance as written here.**

5.3003.3d Pressure drop: filter

**Pressure drop across filter Heat rise** will be in accordance with manufacturer specifications

Ensure equipment is durable, provides comfort, operates efficiently, safely, and as designed

**The 2017 version of the SWS, adopted by Minnesota, does not require a static pressure test. Continue to perform heat rise test.**

5.3003.3e Balancing room flow: new ductwork

**Air flow will be measured at each register 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

**The 2017 version of the SWS, adopted by Minnesota, does not include the requirement to measure airflow at each register.**

5.3003.3f Supply wet bulb and dry bulb

Supply wet bulb and dry bulb air temperatures will be recorded

Ensure equipment is durable, provides comfort, operates efficiently, safely, and as designed

**Minnesota Will continue to use this variance as written here.**

5.3003.3g Return wet bulb and dry bulb

Return wet bulb and dry bulb air temperatures will be recorded

Ensure equipment is durable, provides comfort, operates efficiently, safely, and as designed

**The 2017 version of the SWS, adopted by Minnesota, does not include this requirement.**

5.3003.14a is the SWS for gas pressure tests for gas fired appliances. Minnesota's approved variance says that if no contractor is needed, no gas pressure test is needed because auditors and inspectors are not required to perform gas pressure tests.
**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

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

The 2017 version of the SWS says "or state equivalent." Minnesota policy requires that equipment be selected based of the heating and cooling load calculations from the Manual J and the Weatherization Assistant software.
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

<table>
<thead>
<tr>
<th>Title</th>
<th>Specification(s)</th>
<th>Objective(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.8102.2e Expansion tank</td>
<td>A potable water expansion tank will be installed on the cold water side when a backflow prevention devise is installed between the cold water inlet and the water heater. A direct connection with no valves between the storage tank and expansion tank will be installed in accordance with the 2012 <em>IRC</em>, authority having jurisdiction, and according to manufacturer specifications.</td>
<td>Protect the storage tank from expansion. The 2017 version of the SWS, adopted by Minnesota, says the following: “expansion tanks will be installed where required and in accordance with the authority having jurisdiction.” The variance as written here is still policy requirement of Minnesota WAP and will moved to another part of the policy manual January 2019.</td>
</tr>
<tr>
<td>7.8102.2h Backflow prevention</td>
<td>Backflow prevention will be installed <em>(when required by local code)</em> in accordance with manufacturer specifications and all applicable codes.</td>
<td>Protect water supply from contamination. The 2017 version of the SWS, adopted by Minnesota, says the following: “Backflow prevention will be installed in accordance with manufacturer specifications and all applicable codes.” The variance as written here is still policy requirement of Minnesota WAP and will moved to another part of the policy manual January 2019.</td>
</tr>
</tbody>
</table>
7.8103.1 Storage-Type Appliance

**Topic:** Water Heating  
**Subtopic:** Maintenance/Inspection  
**Desired Outcome:** Safe, reliable, and efficient operation of the appliance maintained

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

<table>
<thead>
<tr>
<th>Title</th>
<th>Specification(s)</th>
<th>Objective(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.8103.1d Potable water expansion tank</td>
<td>A potable water expansion tank will be installed on the cold water side when a backflow prevention devise is installed between the cold water inlet and the water heater. Tanks that leak or have excessive corrosion will be replaced. A direct connection with no valves from the expansion tank to the storage tank will be installed. Connection will be properly supported with strapping. An expansion tank drain will be included in non-bladder tanks. Tank will be installed to accepted industry standards, in accordance with the 2012 IRC and according to manufacturer specifications. Tanks that are completely full of water will be drained and refilled before being replaced or repaired. Expansion tanks with bladders will have air charged to the manufacturer pressure requirements while water is not present in the tank. Bladder tanks with water inside of the air bladder will be replaced in accordance with manufacturer specifications.</td>
<td>Absorb water expansion of the system. The 2017 version of the SWS, adopted by Minnesota, does not include 7.8103.1d. See 7.8102.2e &quot;Installation and Replacement&quot; for policy around expansion tanks, &quot;expansion tanks will be installed where required and in accordance with the authority having jurisdiction.&quot;</td>
</tr>
</tbody>
</table>
## 4.1006.2 Access Doors and Hatches

**Topic:** Attics  
**Subtopic:** Attic Openings  
**Desired Outcome:** Attic access door properly sealed and insulated

### Single-Family Homes

<table>
<thead>
<tr>
<th>Title</th>
<th>Specification(s)</th>
<th>Objective(s)</th>
</tr>
</thead>
</table>
| 4.1006.2a Installation | Hatches will be insulated to the maximum R-value structurally allowable up to the R-value of the adjoining insulated assembly  
Attic hatches rough opening will be surrounded with a durable protective baffle that is higher than the level of the surrounding attic floor insulation | Achieve uniform R-value on the attic door or hatch  
Achieve uniform R-value on the attic floor  
Prevent loose attic floor insulation from entering the living area |
| 4.1006.2b Sealing | Access hatch frames will be sealed using caulk, gasket, weatherstrip, or otherwise sealed with an air barrier material, suitable film, or solid material  
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  
The measure must include a protective baffle or insulation barrier  
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. | Prevent air leakage  
**Minneapolis Will continue to use this variance as written here.** |
| 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 | A dated receipt signed by the installer will be provided that includes:  
- Coverage area  
- Thickness  
- R-value | Document job completion to contract specifications  
Confirm amount of insulation installed  
Comply with 16 CFR 460.17 |
**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

<table>
<thead>
<tr>
<th>Title</th>
<th>Specification(s)</th>
<th>Objective(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.8102.2a-7.8102.2h</td>
<td>No changes</td>
<td>No changes</td>
</tr>
<tr>
<td>7.8102.2i</td>
<td><strong>Thermal efficiency</strong>&lt;br&gt; If additional tank insulation is installed, it will be rated a minimum of R-11 and will be installed to manufacturer specifications&lt;br&gt;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&lt;br&gt;The first 6' of inlet and outlet piping will be insulated in accordance with manufacturer specifications</td>
<td>Reduce standby loss from near tank piping and storage tank&lt;br&gt;Ensure insulation does not make contact with flue gas venting</td>
</tr>
<tr>
<td>7.8102.2j-7.8102.2n</td>
<td>No changes</td>
<td>No changes</td>
</tr>
</tbody>
</table>

*The 2017 version of the SWS, adopted by Minnesota, specifies pipe wrap to manufacturer's specifications, except for single wall metal exhaust venting and atmospheric draft hood which must be 6” from pipe wrap.*