



State of Ohio  
Weatherization Program  
Standards

Section	<b>DIAGNOSTIC TESTING METHODS</b>
Subject	<b>Worst Case Draft Test</b>

*PURPOSE 1506-4.1*

The purpose of backdraft testing is to insure the proper venting of all combustion devices in the home.

**purpose**  
1506-4.1

*PROCEDURE 1506-4.2*

The procedure for backdraft testing must measure the difference in pressure between outside and inside the house at the combustion device and measure the draft at all combustion appliances. If multiple devices are located in different areas of the house, a test must be performed for each area. A pressure reading of -5 Pa or above in houses with non-sealed combustion appliances, woodstoves or fireplaces, a pressure reading of -10 Pa or above with all draft induced appliances and mobile home furnaces, or an insufficient draft measurement in the flue of any combustion appliance requires corrective action. Negative pressures caused by furnace distribution fans shall be eliminated no matter what the pressure is. There are two methods applicable to testing the direction of air flow. The first is the cautious use of a smoke generator. The second is the use of a pressure differential gauge. The decision on which method to use is up to the auditor/inspector.

**procedure**  
1506-4.2

*EXCEPTIONS 1506-4.3*

Backdraft testing must be done on all units weatherized with the following exceptions:

**exceptions**  
1506-4.3

The house is all electric with no combustion appliances, woodstoves or fireplaces, or the house has combustion appliances that are all sealed combustion.

**no combustion  
appliances**  
1506-4.3a

A house without a furnace (forced-air distribution system) and no exhaust equipment. Exhaust equipment includes vented dryers, vented bath and kitchen fans, vented central vacuums, fireplace or woodstove, etc.

**no furnace/no exhaust  
equipment**  
1506-4.3b

**apartment/no  
combustion appliance**  
1506-4.3c

Apartments with no combustion appliances.

*WHEN TO TEST 1506-4.4*

**when to test**  
1506-4.4

Backdraft testing must be done after all other work is completed, or at the end of each work day when work has affected the holes in the house or ducts or the exhaust potential, i.e. venting a dryer or exhaust fan.

*CONFIGURATION 1506-4.5*

**configuration**  
1506-4.5

Determine the configuration of the house (interior doors open or closed) and which exhaust devices should be activated on a site-by-site basis. In every case, the draft test should be done with the house in its worst case situation.

**worst case**  
1506-4.5a

Worst case is defined as the configuration of the house that results in the greatest negative pressure being developed in the area of the vented combustion appliances or fireplace (CAZ).

**considerations**  
1506-4.5b

Consideration must be given to the following:

- i. The types and locations of the heating systems.
- ii. The location and strength of all exhausting equipment (bath fans, dryers, kitchen exhaust devices, etc.).
- iii. The location of wood stoves, fireplaces and water heaters.
- iv. The volume of the area where the combustion devices are located.
- v. The location of the forced-air system returns.

*CERTIFICATION 1506-4.6*

**certified tester**  
1506-4.6

Backdraft testing must be performed by certified provider personnel or a contractor who has been certified.

*EXHAUST FANS ONLY 1506-4.7*

**winter mode**  
1506-4.7

Place the home in the winter operating mode with all windows and doors closed. If the blower door is set up, make sure the cover is on or the fan is closed off. Deactivate all combustion appliances. Open all interior doors.

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Zero the pressure gauge to 30 Pa if using a magnahelic gauge.	<b>zero gauge</b> 1506-4.7a
Run a hose from the exterior (outside) to the reference tap (bottom tap) on the pressure differential gauge.	<b>exterior hose</b> 1506-4.7b
Run a hose from the combustion appliance zone(s) to the input tap (top tap) on the pressure differential gauge. Multiple CAZ may require running more than one hose.	<b>CAZ hose</b> 1506-4.7c
Record the pressure(s) from the CAZ(s) WRT the outside. This is the baseline pressure.	<b>measure baseline</b> 1506-4.7d
Activate all exhaust equipment in the house (this does not include the furnace or DHW).	<b>start exhaust equipment</b> 1506-4.7e
Close down each interior door and cautiously using smoke, determine the required door position. If the smoke is pulled into the room, leave the door open [the room is negative WRT the main body]. If the smoke is blown out of the room, close the door [the room is more positive WRT the main body].	<b>determine interior door position</b> 1506-4.7f
Close down each CAZ door. Cautiously using smoke, determine the required position. If the smoke is pulled into the CAZ, close the door [the CAZ is more negative WRT the main body]. If the smoke is blown out of the CAZ, leave the door open [the CAZ is more positive WRT the main body].	<b>determine CAZ door(s) position(s)</b> 1506-4.7g
Measure and record the CAZ pressures with reference to outside. Repeat for each CAZ.	<b>record CAZ pressure</b> 1506-4.7h
<i>Exhaust Fans and Airhandler Fans On</i>	
Open all doors and leave all exhaust fans on. Start blower motor (air handler).	<b>start furnace blower</b> 1506-4.7i
<b>Caution: If the only way to activate the blower is to fire the furnace, extreme caution must be used due to the potential of combustion backdrafting or flame rollout. Test for ambient CO levels in the combustion appliance zone during the test. If ambient levels exceed 20 PPM, abort the test.</b>	

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<b>determine interior door position(s)</b> 1506-4.7j	Close down each interior door and cautiously using smoke, determine the required door position. If the smoke is pulled into the room, leave the door open [the room is negative WRT the main body]. If the smoke is blown out of the room, close the door [the room is more positive WRT the main body].
<b>determine CAZ door position</b> 1506-4.7k	Close down each CAZ door. Cautiously using smoke, determine the required position. If the smoke is pulled into the CAZ, close the door [the CAZ is more negative WRT the main body]. If the smoke is blown out of the CAZ, leave the door open [the CAZ is more positive WRT the main body].
<b>measure CAZ pressures</b> 1506-4.7l	Measure the CAZ pressures with reference to outside. Repeat for each CAZ.
<b>subtract baseline</b> 1506-4.7m	Subtract the baseline CAZ measurements from the recorded CAZ pressures. The result is the actual pressure differential.
<b>review test results</b> 1506-4.7n	Review the results of the testing and determine the configuration of the building that results in the greatest negative pressure being developed in the combustion appliance zone
<b>recreate configuration</b> 1506-4.7o	Recreate the configuration that results in the greatest negative pressure in the combustion appliance zone. <b>Caution: If depressurization in the zone exceeds -5 Pa with atmospheric combustion appliances or -10 Pa with induced draft appliances or mobile home furnace, it would be prudent to monitor ambient CO levels while performing draft tests. If ambient levels exceed 20 PPM, abort the test.</b>
<b>measure draft</b> 1506-4.7p	Fire the combustion appliance with the lowest Btu output first if multiple appliances are located in the zone. Measure the draft at the appliance. Acceptable draft must be established at two (2) minutes. Shut down the appliance. Fire all remaining appliances, one at a time in order of output, testing each one for draft.  If the appliances vent into the same chimney or vent connector, test each one individually. If the appliances vent into different chimneys or vents, test with each successive unit running. All appliances must achieve acceptable draft at two (2) minutes of firing.

Turn off all exhaust equipment and/or furnace blower and return combustion appliances to their normal settings.

**normal settings**  
1506-4.7q

*MULTIPLE CAZ, ONE WITH FIREPLACE 1506-4.8*

*All exhaust fans on.*

Place the home in the winter operating mode, all windows and doors closed. If the blower door is set up, make sure the cover is on or the fan is closed off. Deactivate all combustion appliances. Open all interior doors.

**winter mode**  
1506-4.8

Zero the pressure gauge to 30 Pa if using a magnahelic gauge.

**zero gauge**  
1506-4.8a

Run a hose from the exterior (outside) to the reference tap (bottom) on the pressure differential gauge.

**exterior hose**  
1506-4.8b

Run a hose from the combustion appliance zone to the input tap (top) on the pressure differential gauge.

**CAZ hose**  
1506-4.8c

Record the pressure reading WRT the outside for each CAZ. This is the baseline pressure.

**record baseline pressure**  
1506-4.8d

Activate all exhaust equipment in the house (this does not include the furnace or DHW).

**start exhaust equipment**  
1506-4.8e

Close down each interior door and cautiously using smoke, determine the required door position. If the smoke is pulled into the room, leave the door open [the room is negative WRT the main body]. If the smoke is blown out of the room, close the door [the room is more positive WRT the main body].

**determine interior door position(s)**  
1506-4.8f

Close down each CAZ door. Cautiously using smoke, determine the required position. If the smoke is pulled into the CAZ, close the door [the CAZ is more negative WRT the main body]. If the smoke is blown out of the CAZ, leave the door open [the CAZ is more positive WRT the main body].

**determine CAZ door positions**  
1506-4.8g

Measure and record the CAZ pressures with reference to outside. Repeat for each CAZ.

**measure and record pressures**  
1506-4.8h

*All Exhaust Fans and Blower Door (Fireplace) On*

Activate all exhausting equipment in the house.

**activate exhaust fans**  
1506-4.8i

<b>simulate fireplace</b> 1506-4.8j	To simulate an active fireplace that draws combustion air from the dwelling, configure the blower door to exhaust 300 CFM.
<b>determine interior door position(s)</b> 1506-4.8k	Close down each interior door and cautiously using smoke, determine the required door position. If the smoke is pulled into the room, leave the door open [the room is negative WRT the main body]. If the smoke is blown out of the room, close the door [the room is more positive WRT the main body].
<b>determine CAZ door position</b> 1506-4.8l	Close down each CAZ door. Cautiously using smoke, determine the required position. If the smoke is pulled into the CAZ, close the door [the CAZ is more negative WRT the main body]. If the smoke is blown out of the CAZ, leave the door open [the CAZ is more positive WRT the main body].
<b>measure and record pressures</b> 1506-4.8m	Measure and record the CAZ pressures with reference to outside. Repeat for each CAZ.  <i>All Exhaust Fans, Blower Door (fireplace), and Airhandler Fans On.</i>
<b>activate air handler fan</b> 1506-4.8n	With exhaust fans and blower door on, start the air handler fan. <b>Caution: If the only way to activate the blower is to fire the furnace, extreme caution must be used due to the potential of combustion backdrafting or flame rollout. It would be prudent to test for ambient CO levels in the combustion appliance zone during the test. If ambient levels exceed 20 PPM, abort the test.</b>
<b>determine interior door position(s)</b> 1506-4.8o	Close down each interior door and cautiously using smoke, determine the required door position. If the smoke is pulled into the room, leave the door open [the room is negative WRT the main body]. If the smoke is blown out of the room, close the door [the room is more positive WRT the main body].
<b>determine CAZ door position</b> 1506-4.8p	Close down each CAZ door. Cautiously using smoke, determine the required position. If the smoke is pulled into the CAZ, close the door [the CAZ is more negative WRT the main body]. If the smoke is blown out of the CAZ, leave the door open [the CAZ is more positive WRT the main body].
<b>measure and record pressures</b> 1506-4.8q	Measure and record the CAZ pressures with reference to outside. Repeat for each CAZ.

Subtract the baseline CAZ measurements from the recorded CAZ pressures. The result is the actual pressure differential.

**subtract baseline**  
1506-4.8r

Review the results of the testing and determine the configuration of the building that results in the greatest negative pressure being developed in the combustion appliance zones.

**review results**  
1506-4.8s

Recreate the configuration that results in the greatest negative pressure in the combustion appliance zones.

**recreate configuration**  
1506-4.8t

**Caution: If depressurization in the zone exceeds -5 Pa with atmospheric combustion appliances or -10 Pa with induced draft appliances or mobile home furnace, it would be prudent to monitor ambient CO levels while performing draft tests. If ambient levels exceed 20 PPM, abort the test.**

Fire the combustion appliance with the lowest Btu output first if multiple appliances are located in the zone. Measure the draft at the appliance. Acceptable draft must be established within two (2) minutes. Fire all remaining appliances, one at a time in order of output, testing each one for draft. If the appliances vent into the same chimney or vent connector, test each one individually. If the appliances vent into different chimneys or vents, test with each successive unit running. All appliances must achieve acceptable draft within two (2) minutes of firing.

**measure draft**  
1506-4.8u

In the case of a fireplace, only pressure readings can be used to determine if the depressurization potential can cause problems. Action is required if the CAZ containing the fireplace is depressurized to -5Pa or greater.

**measure pressure**  
1506-4.8v

Turn off all exhaust fans and return combustion appliances to normal settings.

**normal settings**  
1506-4.8w