

 <p>State of Ohio Weatherization Program Standards</p>	Section	MOBILE HOME MECHANICAL SYSTEMS INSPECTION
	Subject	Heating Units

APPROVED MOBILE HOME HEATING UNITS 601-1.1

Determine whether the existing heating unit is approved for use in mobile homes.

approved unit
601-1.1a

The inspection process may not proceed if the heating unit in use is not approved for mobile home use.



NON-OPERATIONAL UNITS 601-1.2

A mobile home may not be weatherized until the primary non-operational heating unit is repaired or replaced.

repair/replace
601-1.2a

FUEL SUPPLY 601-1.3

Fuel must be available (except for solid fuel units) to begin the inspection process.

fuel availability
601-1.3a

When no fuel is available for solid fuel units, check for:

solid fuel
601-1.3b

- i. heat exchanger leakage or corrosion
- ii. unsafe and/or improper wiring, if applicable
- iii. unsafe and/or improper venting and clearances

Use a combustible gas leak detector to check for propane or natural gas leaks from all accessible gas supply lines and gas-fired appliances. Verify every suspected leak with soap bubble solution. Determine the source and severity of the problem. Determine corrective actions.

fuel leakage - gas
601-1.3c

If the gas leak is major (see 1504 Abbreviations and Definitions), immediately inform the customer and leave the building. Contact the fuel vendor, and have the problem corrected. Document all actions taken in the customer file.

major gas leaks
601-1.3d



Weatherization work shall not begin until major gas leaks are corrected.



If the gas leak is minor (see 1504 Abbreviations and Definitions), inform the customer and have the problem corrected.

minor gas leaks
601-1.3e

fuel leakage, oil
601-1.3f

Visually check for fuel leakage from kerosene and fuel oil heating units. Visually inspect fuel oil storage tank for leaks.



Weatherization work shall not begin until oil or kerosene leaks are corrected.

Btu input
601-1.3g

When appropriate, test to determine if the heating unit is over- or under-fired by clocking the meter on natural gas units and calculating the actual Btu input. On propane units, take a gas pressure test, measure the orifice, and calculate the actual Btu input. Determine corrective actions.

ELECTRICAL POWER SUPPLY 601-1.4

main power safety
601-1.4a

Inspect the main electric power supply to the heating unit and determine whether it is safe.

dedicated circuit
601-1.4b

Inspect the wiring to the heating unit. Determine whether the electrical line to the heating unit is a dedicated circuit that is properly sized and fused in accordance with NFPA 54, Section 5.6.4.

If no dedicated circuit exists, it is not necessary to have one installed unless the wiring is in poor condition or there is a history of circuit failure or a new heating unit is to be installed.

hazardous wiring
601-1.4c



If the mobile home has aluminum wiring, be aware that it can be a fire hazard if it is corroded, loose, or exposed. Take special care when working in a mobile home with this type of wiring. Visually inspect all wiring at or in the heating unit to locate charred, frayed or missing wire insulation, or any improper or loose connections.



If the wiring is hazardous, inform the customer of the problem, and have it corrected prior to beginning weatherization work.

HEATING UNIT CLEARANCES 601-1.5

unit clearances
601-1.5a

Inspect the unit to determine whether clearances from combustibles are in accordance with applicable NFPA codes listed in Table 601-1.5 or PMI.

Table 601-1.5 NFPA Heating Unit Clearances

NFPA Fuel Type	NFPA Manual	NFPA Code Section #	Table #
Natural Gas Propane	54 "	6 "	6.2.3(a) 6.2.3(b)
Oil	31	4, 5	4-4.1.1 4-4.1.2 5-5.1
Solid Fuel	211	6, 9	6-5.1.1 6-5.1.2 9-6.1 9-6.2.1

VENT SYSTEM VISUAL INSPECTION 601-1.6

Determine whether the vent system extends from the heating unit to the outside of the mobile home. Look for corrosion, rust, cracks, holes, or loose, unsealed or disconnected sections. Determine whether the venting is approved for mobile home use. Inspect the venting to ensure that it is in compliance with the manufacturer's instructions.

vent system visual inspection
601-1.6a

Determine whether the sealed combustion unit has properly installed venting which functions as designed.

proper installation
601-1.6b

Determine whether the mobile home venting system has any elbows.

elbows
601-1.6c

DRAFT TESTING 601-1.7

If the mobile home does not have a sealed combustion unit, set up for the worst case draft test (see 1506-4).

draft, "worst case"
601-1.7a

Start the unit and insert the probe in the appropriate location listed in Table 601-1.7. Measure the draft at two minutes and determine whether the draft reading is within the acceptable ranges identified in Table 601-1.7.

draft
601-1.7b

Table 601-1.7 Draft Test Locations and Acceptable Readings

Heating Unit Type	Draft Gauge Probe Placement	Worst Case Acceptable Draft Readings at Listed Outdoor Temperatures (F)				
		<20	21-40	41-69	61-80	>80
Gas Atmospheric Appliances (Furnace, Space Heater, Boiler Floor Furnace)	Flue (after diverter)	-5 Pa -.02 wc'	-4 Pa -.016 wc''	-3 Pa -.012 wc'	-2 Pa -.008 wc''	-1 Pa -.004 wc''
		-5 Pa -.02 wc'	-4 Pa -.016 wc''	-3 Pa -.012 wc'	-2 Pa -.008 wc''	-1 Pa -.004 wc''
Gas Fan-Assisted	Flue (1 1/2 times the diameter of the flue from the flue collar or elbow)	-5 Pa -.02 wc'	-4 Pa -.016 wc''	-3 Pa -.012 wc'	-2 Pa -.008 wc''	-1 Pa -.004 wc''
Oil Burners	Flue (before Barometric Damper)	-15 Pa -.06 wc'	-13 Pa -.053 wc''	-11 Pa -.045 wc'	-9 Pa -.038 wc''	-7 Pa -.03 wc''
Gas 90+ Furnace	Exhaust Pipe	PMI	PMI	PMI	PMI	PMI

COMBUSTION SAFETY & EFFICIENCY TESTING
601-1.8

carbon monoxide (CO) 601-1.8a

With the heating unit operating, insert the probe into the appropriate location identified in Table 601-1.8a. Measure and record the amount of CO in the flue gasses. The CO reading must be at 100 ppm or less.

Table 601-1.8a CO and Combustion Analyzer Probe Placement Locations

Heating Unit Types	Probe Location
Gas-fired Central Furnaces and Direct Heating Equipment	Each heat exchanger port
Oil-fired Central Furnaces and Direct Heating Equipment	Vent pipe before barometric damper
Sealed Combustion Units	Exhaust vent pipe

combustion analysis 601-1.8b

With the heating unit operating in winter operating condition, insert the sampling probe of a calibrated digital combustion analyzer into the appropriate location listed in Table 601-1.8a.

After the stack temperature stabilizes, measure and record the O₂ and the net stack temperature readings. Determine whether the readings are within the acceptable limits listed in Table 601-1.8b or PMI.

Table 601-1.8b Acceptable Combustion Test Analysis Measurements

Heating Unit Type	(O ₂) Oxygen	Stack Temp.	Smoke Test	(CO) Carbon Monoxide Max. ppm
GAS (Natural Gas, Propane) Atmospheric	4-9%	300-600 F	N/A	100
Fan-assisted	4-9%	300-480 F	N/A	100
Condensing	PMI	PMI	N/A	100
Space Heaters	5-15%	300-650 F	N/A	100
Standard Power Burner	4-9%	275-550 F	N/A	100
OIL				
Standard Oil Burner	4-9%	325-600 F	1 or less	100
Flame Retention	4-7%	325-600 F	1 or less	100
Condensing	PMI	PMI	1 or less	100

When necessary, determine whether the combustion air requirements are in accordance with those listed in Table 601-1.8c. Determine whether combustion air openings are free of obstructions and operating as designed. In non-sealed combustion units, check for carbon deposits around the draft diverter, and inspect for proper venting and backdraft potential.

combustion air
601-1.8c

Table 601-1.8c Applicable NFPA Combustion Air Codes

Fuel Type	NFPA Manual	Code #
Natural Gas/Propane	54	5.3
Oil	31	1-9
Solid Fuels	211	9-3

HEAT EXCHANGER INTEGRITY 601-1.9

- visual inspection**
601-1.9a  Visually inspect the heat exchanger for evidence of deterioration, cracks or holes.
- carbon monoxide (CO)**
601-1.9b With the heating unit operating, use a CO tester sensitive to at least 10 parts per million to test for CO in the distribution system and in the ambient air. If the source of CO is not the heating unit, then look for other possible sources of CO.
- oxygen fluctuation, forced air systems**
601-1.9c During the combustion efficiency tests on forced-air systems, measure and record any change in the O₂ reading when the furnace blower motor comes on. If there is a change in the reading, reinspect the heat exchanger. Other industry accepted tests may be performed to confirm the problem.
- verified crack**
601-1.9d If a crack in the heat exchanger is verified, then the heat exchanger or the heating unit must be replaced.

TEMPERATURE RISE 601-1.10

- measurements**
601-1.10a Furnace filter must be clean or be removed. With the heating unit and blower operating, measure the temperature in a register that is the closest to the supply plenum. Return temperature may be taken in the return plenum or at the filter compartment. Determine whether the temperature rise is within the acceptable range of 60° F and 90° F, or PMI.

CONTROLS 601-1.11

- fan control, forced-air units**
601-1.11a Determine whether the fan is properly activated by the fan control.
- high limit control, forced-air units**
601-1.11b Check the high limit setting on forced-air units. Determine whether it is working correctly.
- blower operation/condition**
601-1.11c Determine whether the blower motor, belt, and fan are clean, properly lubricated, and operating properly. Determine if the blower motor needs lubrication.

Locate the thermostat and determine whether it is functioning correctly. If it is not, determine whether the problem is due to the location or type of thermostat. Determine if the thermostat will properly activate the heating system. Determine if the thermostat is a magnetically-controlled or the mercury bulb type.

thermostat
601-1.11d