

## APPENDIX G – HEATING SYSTEM INSTALLATION STANDARDS

### Heating Unit Installation

#### *WX Worker*

No used furnaces may be installed.

All new units shall carry a minimum one-year (1) warranty on workmanship. Each customer shall receive the manufacturer's product warranty information, clear maintenance instructions, and a phone number of who to contact for warranty problems. Furnace specifications must also be left with client.

When installing a new furnace, it must be installed at least  $\frac{3}{4}$ " off the floor on blocks or a plastic pad. Concrete pads and wood blocks are not acceptable. Concrete blocks may be used but air must be able to circulate between the bottom of the furnace and the concrete. The return air drop also needs to be off the floor with the same specifications as the furnace.

All furnaces must have a filter rack outside the cabinet with a cover.

New forced air furnaces must be a minimum of 95% or higher AFUE except in cases of attic or garage installation. A minimum of 80% is required in those cases. A two-pipe system is required. Condensate lines must terminate to a drain or drain line or according to local codes.

If the furnace panel of a high efficiency furnace is being used as combustion air chamber, there must be a rubber gasket around the panel to seal the combustion chamber. Grommets and/or rubber gaskets must be installed to seal openings in the furnace cabinet.

Ensure thermostats are working properly, replace if defective. When possible the thermostat must be wired for "fan only" function.

For new furnace installation, wiring from ceiling down to appliance must be secured at the top and bottom and in rigid or flexible metal conduit or non-metallic (gray) electrical PVC. Repair or replace any unsafe power supply and install a properly sized and fused switch on the appliance or within 24". By code, all new furnaces must be on a dedicated electrical circuit. This will not be enforced in cases where this causes excessive work (inaccessible panel, finished ceiling in furnace area, breaker/fuse box can't handle another circuit, etc.) unless required by local jurisdiction.

For gas line specifications, refer to [Section 2021](#) of the *Iowa Weatherization Work Standards* or the NFPA 54-2009. Drip legs (sediment traps) need to be installed to code. When installing a new appliance (furnace or water heater) fuel lines coming down from the ceiling to the appliance gas valve must be hard pipe. Corrugated stainless steel tubing (CSST) will not be used to drop to the appliance. When used for other purposes, it must be installed in accordance with manufacturer guidelines and the National Electrical Code.

All venting shall be completed according to the manufacturer's specifications. Combustion and exhaust air (only applies to heating systems) must terminate outside (not under decks, in crawlspaces, or attics). They must both draw air from the same location. This applies to both new and existing terminations. Support for the PVC piping need to be installed per the manufacturers' specifications or a maximum of four feet apart.

If an atmospheric appliance (water heater) shares a chimney with a draft-induced appliance, the draft of the atmospheric appliance must be checked to ensure no drafting problems. Call the State LIHEAP Office if there are drafting issues.

Perform a temperature rise and total external static pressure test to ensure they are within the manufacturer's guidelines. Call the State LIHEAP Office if there are static pressure issues.

Perform CO testing to ensure it does not exceed 100 PPM, without any alterations to the furnace, lowering gas pressure below manufacturer recommendations, or changing orifice size.

All condensate lines must be 3/4" line (unless using a condensate pump) and terminate to a drain line or according to local code. They cannot terminate outside the envelope of the house or to a sump pump unless required by local code. Condensate pumps must be installed at the same level as the furnace (if the furnace is raised because of flooding issues, the pump must be raised also). Drain lines from a condensate pump must be 3/8" line. Condensate pump cord must have original plug, it cannot be cut and hard wired into the unit. There must be a single outlet receptacle for the pump. Ensure the condensate line does not present a trip hazard for the client. No copper piping may be used as a condensate line. High efficiency boiler condensate discharge will be an acceptable pH level in accordance with local code.

Contractor must record information from the equipment data plate for future service work.

Contractors must remove and dispose of equipment being replaced unless otherwise directed by the agency.

### ***Manufactured Homes***

- Furnaces installed in manufactured homes must be for that purpose or a sealed combustion high efficiency furnace may be installed with proper modifications per manufacturer's instructions.
- Condensate lines installed with high efficiency furnaces must go to a drain line and not through the bottom of the home because it could freeze.
- Adjust the heating anticipator in the thermostat to match the amp draw of the system control.
- Repair or replace any unsafe power supply.
- All gas piping must be installed according to the American Gas Association (AGA) specification and any other appropriate codes. Hard pipe must be used to go into the furnace closet. Flexible gas line connector or hard gas pipe may be used to go through the wall of the furnace cabinet.
- All venting shall be completed according to the manufacturer's specifications. A collar should be installed at the ceiling around the flue pipe. Where the venting exits through the ceiling, it must be air sealed.

Older style shut off valves (see photo below) must be replaced when replacing appliances.



### ***Energy Inspector***

All furnace work shall be performed by a qualified, furnace technician, or trained agency personnel. Load calculation will be performed in accordance with the manufacturer's specifications. Furnace repair shall be performed in conformance with **ANSI Z223.1-1999 (same as NFPA 54-2009) including Appendix H** and shall be done in accordance with program spending limits. All furnace work must be in compliance with:

International Residential Code (IRC)  
The Uniform Mechanical Code  
National Fire Prevention Association (NFPA)  
Local Codes adopted by the authority having jurisdiction (where they exist)  
The Furnace Manufacturer's Specifications (must be left in the home)

Electrical service must be inspected to determine if it will handle the unit to be installed.

If a new non-portable space heater is installed it must be vented.

Perform a temperature rise and total external static pressure test to ensure they are within the manufacturer's guidelines.

Perform CO testing to ensure it does not exceed 100 PPM, without any alterations to the furnace, lowering gas pressure below manufacturer recommendations, or changing orifice size.

### ***Fuel Lines***

Check gas piping that was disturbed during the heating system replacement, for leaks. Use a combustible gas leak detector to check all gas lines, including flexible brass and flexible copper, for leaks. If checking natural gas lines, test above the lines. If propane, the probe must be placed under the lines because propane is heavier and will sink. Gas line connections must be tested by moving the probe around the connections at a rate of 1" per second. Gas leaks must be verified by soapy or bubbling solution to eliminate false positives. Copper piping on natural gas appliances is not to be replaced unless leaking or required by local code or the appliance is being replaced with ECIP funds. All gas piping must be installed according to the American Gas Association (AGA) specifications and any other appropriate codes. Flexible brass fuel lines must be replaced on all appliances. Flexible connectors manufactured before 1973 must be replaced. These can be identified by the manufacturer's tag on the connector.

The client must be informed of any other fuel leaks discovered during inspection and must be noted on the inspection form.

The client must be informed of any CSST line that is not bonded and must be noted on the inspection form.

Basic operation of the new equipment will be explained to the occupant including:

- Efficiency measures
- Proper operation of controls
- Electrical and fuel disconnects or shut offs
- Location of combustion air intake including importance of not blocking the intake
- Importance of cleaning dust and debris from return grilles
- Importance of not blocking return or supply registers
- Importance of proper filter selection and how to change the filter
- Importance of routine maintenance

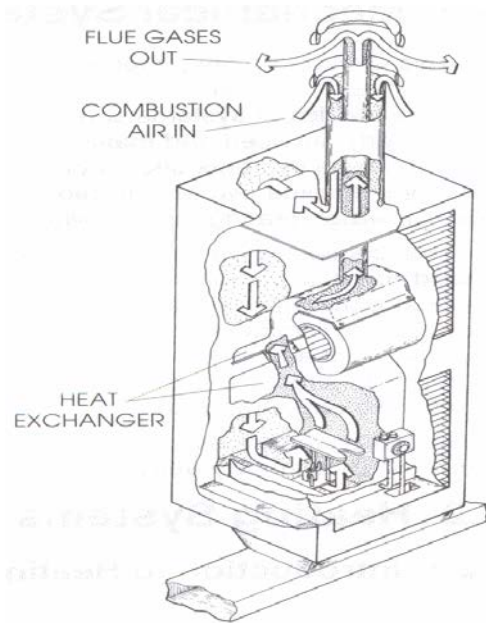
### ***Manufactured Homes***

All units shall be sealed combustion.

### ***Furnace Types***

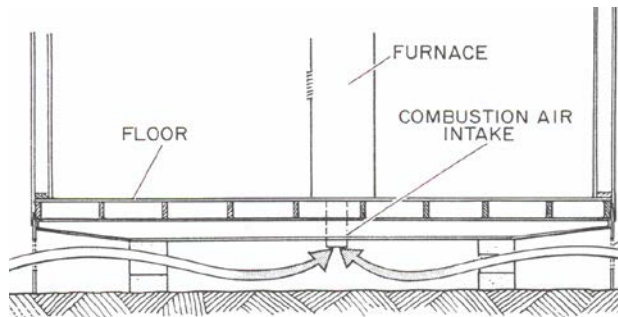
- Concentric Pipe Combustion Air  
Combustion air from the roof comes down the outside of the flue pipe, around the furnace cabinet, and into the heat exchanger where it mixes with gas during combustion. (See Figure 1)

FIGURE 1



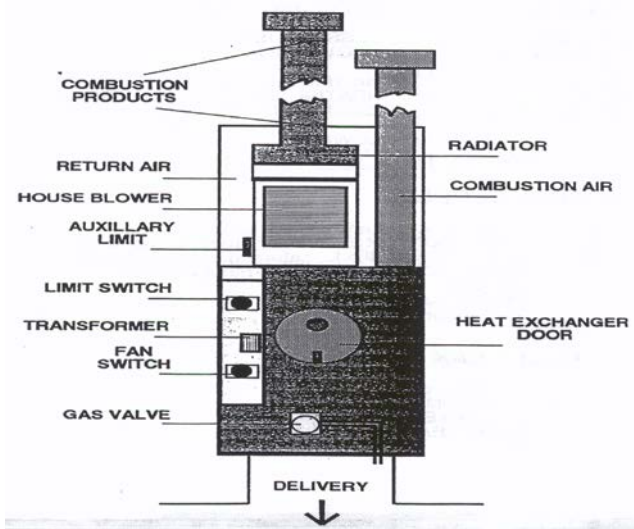
- Floor Supply Combustion Air  
A floor supply, sealed combustion air system supplies combustion air directly to the heat exchanger through a duct from under the manufactured home. (See Figure 2)

FIGURE 2



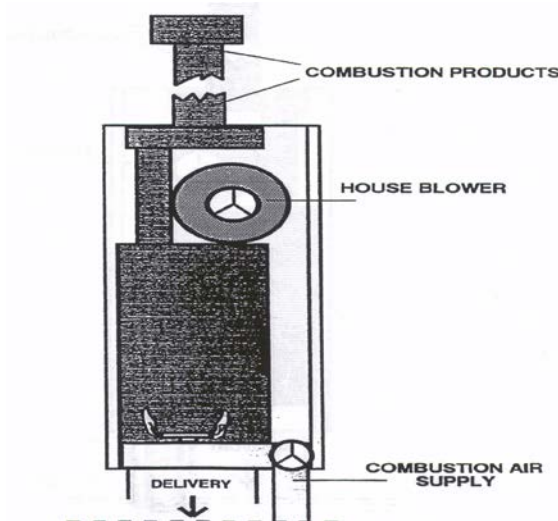
- Dual Pipe Combustion Air  
A dual pipe, sealed combustion air system supplies combustion air to the heat exchanger from above the manufactured home through a separate pipe. (See Figure 3)

FIGURE 3  
**Induced Combustion Air**



An induced combustion air, sealed combustion air system supplies combustion air to the heat exchanger using a small blower. An induced system may bring the air in from above or below the manufactured home. (See Figure 4)

FIGURE 4



**Attic Furnace, Heat Pump, Electric Baseboard**

Because these types of heating systems are not normally replaced by ECIP, refer to the *Iowa Weatherization Work Standards* if needed.

## Thermostats

### *Energy Auditor/Inspector*

Document the location of the thermostat. Ensure it is not on an outside wall or near an outside door or over a heat supply/return duct. Thermostats should not be installed on a marriage wall of the manufactured home. If a thermostat is located in these areas, the thermostat may be moved using program funds and within program expenditure limits.

Compatibility will be verified (e.g., voltage, wiring condition, location) and documented. Location of existing thermostat will be assessed for appropriateness (e.g., central to the house, out of direct sunlight, away from supply air, protected from abnormal radiant surface temperatures).

Ensure the thermostat is level and dirt free. Relocate if necessary. Ensure thermostats are working properly, replace if defective. When possible the thermostat must be wired for “fan only” function.

Mercury containing thermostats should be replaced (only when the heating unit is replaced).

### *WX Worker*

All thermostats must be installed according to the manufacturer’s instructions. When possible the thermostat must be wired for “fan only” function.

If being replaced, mercury containing thermostats will be disposed of properly.

The client will be taught how to use the thermostat and written manufacturer’s instructions are to be left with the client.