Residential Heating With Wood

Presented by Mark Kindred of Axmen
Forestry Mini College, Missoula, MT
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The Options

- Free Standing Wood Stoves
- Wood Fireplace Inserts
- Zero Clearance Wood Fireplace
- Indoor Wood Furnace
- Outdoor Wood Boiler

Fireplace Inserts, Zero Clearance Fireplaces, Wood Stoves

Expectations

- Fireplace Inserts, Zero Clearance Fireplaces, and Free Standing Woodstoves must be sized for the area they are heating. Factors such as home layout, ceiling height, insulation etc. affect the ability of the stove to heat the space to your expectations.
- These units are generally used as zone heating solutions, they take a load off of the whole home heating system by heating the space you are in the most often. You should not expect these units to be your sole source of heat.

Efficient Wood Burning Technology

- There are two main types of advanced technology wood combustions systems:
  - Catalytic Combustion
  - Secondary Combustion

Catalytic Combustion

- A catalyst is a substance that affects a chemical reaction without being consumed in the process. The catalysts used in wood-burning appliances are coated ceramic honeycombs through which the exhaust gas is routed. The catalytic coating lowers the ignition temperature of the gases as they pass through. This allows catalytic appliances to operate at low firing rates while still burning cleanly.

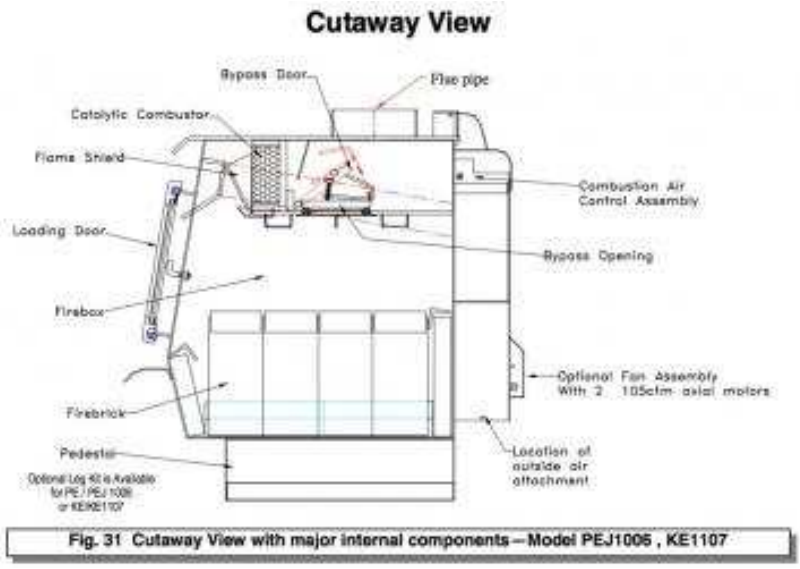


Fig. 31 Cutaway View with major internal components – Model PEJ1005 , KE1107

Secondary Combustion

- Non-Catalytic combustion systems create the conditions necessary to burn the combustible gases without the use of catalysts. The technology has three main characteristics:
  - Firebox insulation to keep temperatures high;
  - Baffle plates to reflect heat back into the firebox, to create the gas turbulence needed for complete combustion and to give the gases a long and hot enough route so they will burn before being cooled;
  - Heated secondary air supply that is usually fed to the fire above the fuel bed through ducts with small holes.

When a non-catalytic stove is burning, you will often see little jets of flame coming from these small air inlet holes. This is because the combustion air is hot enough when it enters the firebox to mix with the gases and produce flames. Non-catalytic combustion has become the dominant advanced technology used in firewood burning appliances.

Combustion Technology Old vs New

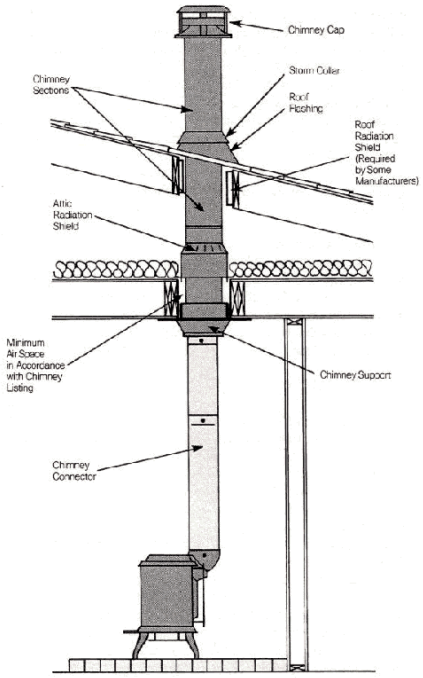
- http://www.youtube.com/watch?v=qzSiQ3dkgiw

Installation and Operation Matter!

- The benefits of a new EPA Rated wood stove will be negated if the stove is not installed properly.
- EPA Rated wood stoves require proper venting for them to operate.
- The most obvious purpose of the chimney or vent is to remove the by-products of combustion, however it serves another purpose. The performance of the venting system plays a critical role in the performance of the hearth system. It must be able to bring in the right amount of air and move it through the combustion chamber in a variety of operational and weather conditions. It is the engine that drives the machine.
- There are some basic rules to be followed to expect a woodstove to vent and draft properly.

10 Steps to the Perfect Chimney

1. The chimney runs inside the building so flue gasses stay warm until they are expelled outside.
2. The chimney penetrates the highest part of the building so the chimney functions better as a chimney than the house does even when no fire is burning
3. The chimney is at least 15 feet tall, and it's top is clear of obstacles such a trees, and other buildings.
4. The chimney is insulated and the correct size for the appliance so the exhaust is kept warm and flowing quickly through the system.
5. The chimney runs straight up, with no offsets, because each change in direction increases resistance to flow.
6. The appliance and venting are reasonably well sealed. Leaks introduce cool air which reduces draft.
7. The appliance is EPA certified, so it is unlikely to smolder, producing a lot of smoke with low flue gas temperatures, which is more likely to spill into the home.
8. The house has a balanced ventilation system, not an exhaust only system.
9. There is no large exhaust ventilator, or if one is present there is a makeup air system interlocked to it's switch.
10. The appliance is operated properly, in compliance with the manufacturer's instructions, using seasoned, dry wood.



Vertical Run and Direction

- The chimney should penetrate the highest part of the building so the chimney functions better as a chimney than the house does, even when no fire is burning.
- The chimney should run as straight as possible, every offset or change in direction increases resistance to flow, decreasing the stoves ability to draft properly

Height, Clearance and Proper Pipe

- The chimney should be at least 15 feet tall
- The top should be clear of obstacles such as the peak of the house, trees and other buildings
- You must use the proper size, and type of pipe for your application in order for the stove to work properly.

Chimney Inside the building

- The chimney should run inside the building if possible, so flue gasses stay warm until they are expelled outside.

Proper Operation and Maintenance

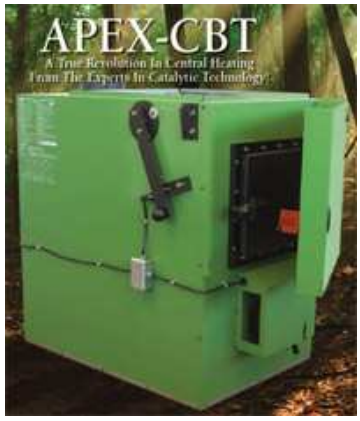
- For an EPA Rated stove to meet your expectations and burn properly you must burn the stove in compliance with manufacturer's instructions, using seasoned, dry cord wood.
- Build a fire properly (refer to the Burn Wise video provided)
- The chimney must be cleaned on a regular schedule.

Burning Wood Properly

- Moisture content of wood greatly effects the performance of any wood appliance.
  - 1 lb of oven dry wood=8,600 btu
  - 1 lb of wood with 20% moisture content= 7,138 btu
  - 1 lb of wood with 40% moisture content= 5,676 btu
  - Example: One load of wood (approximately 40 pounds) with 20% moisture content contains 1 gallon of water. The same load of wood with 40% moisture content contains 2 gallons of water.
  - The energy used to boil the water out of wet wood is energy that could be heating your home.
  - Using wood with a high moisture content is a safety and maintenance concern. It greatly increases the risk of a chimney fire by causing creosote formation.

Indoor Wood Furnace

- Apex by Blaze King.
- Can be added to existing forced air system.
- Uses catalytic combustion technology.



Whole Home Wood Heat Systems

The Central Boiler is an Outdoor Wood Gasification Boiler. It is a hydronic (water) based system and has the ability to provide heat to your home and additional buildings, along with taking over your household water heating demands.

How does a hydronic system work?

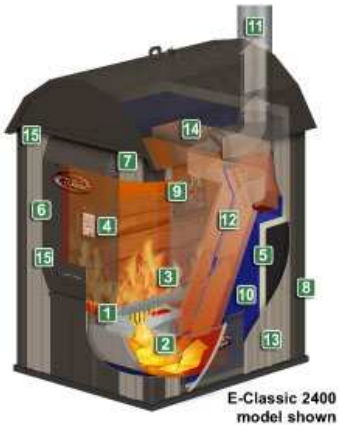
- The Central Boiler outdoor furnace is located outside, typically 30 to 200 feet from the structure.
- A water jacket surrounds the furnace firebox and heat exchanger, and heated water is circulated to your home or building through insulated underground pipes -- an efficient way to move heat over distances.
- The outdoor furnace is designed to work with any existing heating system. Water-to-air or water-to-water heat exchangers or direct circulation conveys the heat into the structure's forced-air furnace, radiant baseboard, or radiant floor heating system. This allows you normal thermostatic temperature control.
- The outdoor furnace can provide heat for all your domestic hot water by adding a water-to-water heat exchanger.
- The outdoor furnace has the ability to heat multiple buildings, such as a garage, workshop, shed, greenhouse, or barn -- without using other heating sources. It can even be used to heat a swimming pool or hot tub.

How does the Central Boiler work?

- Super-heated air is injected and mixed with the hot gases from the primary firebox and starts the secondary combustion process. No catalytic device needed.

Final combustion occurs in the Reaction Chamber where extremely high temperatures aid in complete combustion. The Reaction Chamber features a large, hinged door for easy ash removal.

Transfers the heat from the exhaust to the water during the final combustion phase and before the exhaust exits the chimney.



E-Classic 2400 model shown

Fuel Cost Comparison

OIL	HARDWOOD	SOFTWOOD	ELECTRIC
Cost per gallon of oil in dollars: 2.75	Cost per cord of in dollars: 170	Cost per cord of in dollars: 130	Cost per KWH of in cents: 13
Efficiency: 78 %	Efficiency: 70 %	Efficiency: 70 %	Efficiency: 100 %
WOOD PELLETS or Corn	**NATURAL GAS**	**LP GAS**	**COAL**
Cost per ton of in dollars: 230	Cost per therm in dollars: 1.70	Cost per gallon in dollars: 1.90	Cost per ton in dollars: 255
Efficiency: 70 %	Efficiency: 80 %	Efficiency: 78 %	Efficiency: 70 %