



DAKA 521FB Supplemental Furnace FAQ's

©2007 DAKA Corporation. All Rights Reserved.



A. Chimneys

What Are Some Chimney Basics?

How Do I Design A Chimney System?

What Are Some Typical Chimney Problems and Solutions?

How Do I Preheat My Chimney?

B. Installation/Operation

What Should I Consider Before Installing A DAKA Furnace?

How Do I Operate My DAKA Furnace Properly?

How Do I Control Wood Smoke?

C. Wood and Wood Burning

How Do I Buy and Prepare Good Firewood?

How Do I Build and Maintain a Safe, Efficient Wood Fire?

Is There Anything I Shouldn't Burn?

D. Maintenance

What Maintenance Does My DAKA Furnace & Chimney Require?

Do I Operate My DAKA Furnace Differently in Cold vs Warm Weather?

What Are Some Other Good Maintenance Tips?

E. Troubleshooting

Why Won't My Auto Damper Control Hold Its Setting?

Why Does Smoke Puff Back Out of the Door When Loading?

Why Do I Have Poor Home Heat Circulation While Burning Wood?

Why Is My Furnace Exterior Discolored (Whitish Appearance)?

Helpful Links



A. Chimneys

What Are Some Chimney Basics?"

The chimney is the “engine” that drives a wood heat system. No wood burning furnace can function properly without one. A good chimney is:

- The correct type for your furnace, installed with the proper options for your home
- The correct size for your furnace, usually the size of the appliance outlet collar
- Properly located, up through the heated space/environment of your home
- Properly installed, following building codes exactly

A well-designed wood furnace and chimney system produces these desired performance characteristics (hint: it’s really the chimney that’s doing the performing):

- When kindling fire is lit, the smoke immediately flows up the chimney, not into room
- Your kindling fire burns bright and hot very quickly
- All fires are easy to light and draft builds quickly
- There is no smoke spillage when you open the door to tend the fire
- When no fire is burning and you open the furnace door, air flows into the furnace, not out.
- There are no foul odors or cold air from the hearth when it is not in use

Note: If you are careful, you can run the furnace so that you never smell wood smoke in the house.

How Does A Chimney Work? The chimney works with the furnace in a kind of feedback loop. Think of its fuel as heat. Think of the power it puts out as draft. The more fuel (heat) you give this engine (chimney), the more power (draft) it will deliver. So, the hotter the exhaust gases, the more draft is produced. (Draft, by the way, is good. It’s the suction that keeps the smoke from coming into the room.) Chimney insulation is important because it helps keep the exhaust hot until it is expelled outside, and so, increases draft. An insulated chimney makes more draft with less heat.

In winter, a well-designed and properly-installed chimney produces some draft and flows some air upwards, even when no fire is burning. When you build a fire in a furnace connected to this chimney, the kindling ignites easily, draft increases rapidly and you have a nice bright, hot fire right away – and no smoking. This is the kind of system you want in your house.

Understanding Your Home’s Air Circulation. When it is cold outside, the warm air inside the house wants to rise, producing a pressure difference: low pressure “low” in the house and high pressure “high” in the house. The pressure difference is called “stack effect.” The colder it is outside, the greater the temperature difference is and the stronger the stack effect. A chimney installed in the middle of a home naturally overcomes stack effect by being as warm, as but taller than, the home.

Newer homes are being built more tightly sealed for increased comfort and lower energy costs. Doors and windows are installed with gaskets and walls have a continuous air barrier, usually plastic film. (If you turned on a powerful range hood or downdraft kitchen exhaust in a relatively small, tightly-sealed house, it might suck so much air out of the house that the pressure inside would fall enough to overcome chimney draft and suck the smoke out of the furnace. It’s not that common, yet it can happen.)

“How Do I Design A Good Chimney System?”

When planning a wood burning system, you need reliable advice on matching your furnace to the right type and size of chimney. Most chimney sweeps can guide you and there also may be government agencies and publications you can obtain locally. Unless you have previous installation experience, we also strongly recommend that you have your chimney professionally installed by someone whose references you have checked.



Climate and Altitude. If you live in an area that has a “real winter” – the ground freezes and you get some snow – or if you live at a high altitude – more than 4,000 feet – you’ll need to follow these design guidelines exactly in order to get optimum performance.

Design Guidelines Summary:

- Put the chimney inside the warm building environment;
- Match the flue size to your furnace flue.
- Go straight up - no elbows or offsets;
- Insulate around the flue liner

“What Are Some Typical Chimney Problems and Solutions?”

- Cold hearths and odors when no fire is burning. The air in a chimney that runs up the outside of the house gets chilled, so the draft in the chimney is less than the stack effect of the house. The chimney back drafts, making the hearth cold and causing unpleasant odors.
- Install the chimney inside the building, keep it as warm and as tall as the building and it will make draft, even when no fire burns.
- Open door smoke spillage: when you reload, smoke rolls out the door. When you open the door, a lot of dilution air must flow through the opening to keep the smoke inside; if the exhaust flow is restricted, smoke will roll out into the room.
- Open door to first notch and hold for a short time to allow air flow to draw in.
- Sluggish performance: smoky fire, hard to get a hot fire burning. Your chimney may be a large, cold chimney, like the old brick ones, that will suck up the heat from the exhaust, causing slow draft build up.
- Size the flue to match the furnace and use an insulated chimney to keep exhaust hot and moving quickly; never use and air-cooled chimney

“How Do I Pre-Heat My Chimney?”

At startup, remove all but a thin layer of ashes from your firebox. Insert five or six crumpled individual pieces of newspaper and dry finely-split kindling or a firelighter. Open the air supply (damper) to the furnace and ignite the paper on all sides. You may find it necessary to leave the furnace door slightly ajar during the first few moment of the fire. After the first load ignites, add more kindling until the chimney is preheated. The fire should burn briskly and full of flame during the startup if you are operating the furnace properly.

When reloading, place finely-split pieces of wood on the charcoal bed and fully open the air supply. Using smaller pieces of wood during reloading encourages rapid reheating of the chimney.

You will know the chimney is preheated when each large piece of wood you add to the fire burns vigorously, without a loss in intensity of the fire. Keep listening to the sound of the air entering the furnace. A constant and rising movement of air signals that good drafting conditions have been achieved.

Typically, chimney connector temperatures must reach 500-600 degrees F. before the chimney is fully primed.B. Installation/Operation

“What Should I Consider Before Installing a DAKA Furnace?”

Your wood furnace and chimney should work together as a system. It is important for the furnace’s chimney system be sized



properly, according to manufacturer's instructions. Whether venting into a masonry or metal system, make sure the diameter of the chimney matches loosely, but never smaller than, the size of the furnace's flue outlet. Doing anything else adversely impacts emissions and safety.

"How Do I Operate My DAKA Furnace Properly?"

Check the exhaust coming out of your wood furnace chimney. The smoke is your operational barometer. If your fire is burning properly, you should only see the white transparent steam of evaporating water, darker and opaque smoke will only be slightly visible. The darker the color of the exhaust, the less efficiently you are operating the appliance. It may be necessary to adjust the operation of your wood furnace to decrease the exhaust opacity/smoke density. A 15% opacity level indicates efficient operations, while a 90% level reflects unacceptable polluting conditions.

Remove a small amount of ash frequently. During 24-hour heating in cold weather, remove a small amount of ash each morning before the new fire is kindled to make raking coals and kindling loads throughout the day more convenient.

Check the ash pan every few days and safely dispose of ashes. Keep ashes from building up on the grate and interfering with combustion airflow from below.

Ashes often contain "live coals" which can stay hot and give off carbon monoxide for days. Put ashes in a metal container with a lid and place the container outside the house and away from combustible material.

At the end of the heating season, clean out all residual ashes and soot from furnace. Note: The moisture they contain could rust your furnace over the summer months. This could shorten the life of the unit.

Some ash is used as a lawn and garden fertilizer to provide soil nutrients and reduce acidity. It also can be used on compost piles to maintain neutral acidity levels. Some people use ashes to provide traction on icy driveways and sidewalks. Excess wood ash also may be taken to garbage disposal sites.

"Do I Operate My Furnace Differently In Cold vs. Warm Weather?"

Yes. During the warmer seasons of spring and fall, control the total heat output by limiting the amount of fuel (wood), rather than by closing down the air supply. Make shorter, hot fires using more finely-split wood. The actual air supply setting will vary, but the fuel loading will be consistently smaller. Let the fire burn out rather than smolder at low air supply setting. When your home requires more heat, restart the fire with kindling as always, but add smaller fuel loads. This allows your furnace to operate at maximum efficiency and with minimum emissions. Avoid the temptation of building a big fire and then starving it for air.

"How Do I Control Wood Smoke?"

Smoke, in the form of solid particles ("particulates") and volatile gases, is unburned fuel. Proper operation achieves the high combustion temperatures necessary to burn the particulates and ignite the gases. These gases and particulates contain half the heating potential of your firewood. The loss of this fuel up the chimney amounts to a loss of efficiency. Improperly-operated furnaces also can adversely affect air quality.

There are two periods in the operation of a wood burning furnace most vulnerable to creating smoky emissions – during startup and during refueling. However, these smoky periods can be dramatically minimized by proper operation.

Create the drafting conditions necessary to maintain clean combustion. "Good drafting condition" occurs when your chimney consistently draws air into the furnace at a high enough rate to provide adequate oxygen for complete burning. To create this draft, you must "pre-heat the chimney." Some chimneys require longer pre-heating periods than others, depending upon their height, outside exposure and construction. Typically, pre-heating requires 5-15 minutes of vigorous firing.



C. Wood and Wood Burning Tips.

“How Do I Buy and Prepare Good Firewood?”

Softwoods Are Ideal For Kindling and Starting Your Fires. Softwoods (pine, fir, cedar, spruce) are generally low in density, ignite easily, burn fast & hot and will heat the firebox and flue quickly. Softer woods like poplar, aspen, willow, spruce and pine are better when heat demand is low because they light easily, burn quickly and don't leave a long lasting charcoal bed. They form creosote easily though, due to the high resin (sap) content, so do not use them for long-term fires.

Hardwoods Burn Longer and Cleaner. Hardwoods (oak, cherry) are denser and take longer to ignite. They burn more slowly and evenly than softwoods, producing less smoke. They also provide more heat energy than softwood logs of the same size. Very hard woods like oak and maple are not good fuel for the relatively mild weather in spring and fall because their high density makes controlling heat output more difficult.

Burn Only “Seasoned” Firewood. The “seasoning” or drying process allows most of the natural moisture found in wood to evaporate, making it easier to burn. A properly-seasoned log will have 20% to 30% moisture content.

Plan Your Seasoning Period: Firewood should dry, or “season” a minimum of 6 to 12 months after splitting. It should be processed in early spring to be ready for burning that fall (Exceptions: large pieces of hardwood, like oak, may take more than the summer months to season; drying in damp maritime climates also can take longer.) Humidity and temperature levels also impact drying time.

Split Logs to a Variety of Sizes. Logs dry from the outside in, so split big logs right away for faster drying. Keep your diameters from 3” to 6” at the largest cross-section. The larger the furnace, the larger the pieces can be, but never larger than 8” in diameter. Tree tops and windfalls can be used for firewood if cut down to less than a 2” diameter. Log length should be at least 3” shorter than the firebox. Shorter pieces are easier to handle and make fire maintenance easier; 14” to 16” is a good length. Note: Most commercial firewood is not split small enough for convenient fire management.

Stack Your Wood Properly. Wood dries faster in a warm storage area with adequate air circulation. Store high & dry on rails at least a foot or more above the ground. Keep away from buildings in a sunny, well-ventilated area. (Green wood will not season properly in a wood shed or in deep shade.) To speed dry, stack logs loosely in a crosswise fashion to get good air circulation. The triangular shape of split pieces wedge the logs together and help make your pile more stable. Avoid stacking more than four feet high because tall piles become unstable. Shorter firewood pieces (12” – 14”) make for narrow, tippy stacks; use sticks propped against each side of the piles so the wind doesn't blow them over. Use an elevated top cover to keep dew and rain off the wood, but leave the sides open to breezes.

Note: Never leave firewood in a pile on the ground for more than a couple of days. Wet wood on the ground quickly attracts bugs and mold.

Storage Is Important. When seasoned, usually by late September, the wood can be moved to winter bulk storage where it should be fully sheltered from rain and snow. The ideal winter storage is close to, but not inside, your home. Bring the wood in to warm up before burning, but only one or two week's supply at a time. Avoid storing large amounts of wood in the house because mold spores and moisture can affect indoor air quality, a potential problem for people with asthma and other lung diseases.

How Do I Build and Maintain a Safe, Efficient Wood Fire?

Ensure Safety First and then Higher Efficiency Is Possible. To operate your wood heating system efficiently, you must have confidence that it is safe. Efficient operation means burning each load of wood hot for a short period. Safety worries can force you to keep temperatures too low. This may lead to low efficiency, high pollution and the potential for chimney fires.

About 20% of the heat from the burning wood should be given to the chimney to produce a strong, stable draft, the pres-



sure difference that drives the system. Efforts to prevent heat “loss” to the chimney are counterproductive because they lead to wasteful and dangerous smoldering.

Have your system inspected by a qualified technician and upgrade it to meet safety codes before using the tips provided here.

The Objective in Maintaining Wood Fires is to prevent the wood from smoldering. Any smoke that passes out of the firebox will condense as creosote in the chimney and/or be emitted outdoors as air pollution. Smoke is not a normal byproduct of wood combustion. Smoke is waste resulting from poor combustion. There should be no visible smoke from your chimney if the wood burns with bright, active flames.

Your Actions Determine How Efficiently Your Furnace Will Operate. A good wood furnace is designed to burn cleanly and efficiently and will do its job right if you cooperate. Complete wood combustion requires wood (fuel), temperature (heat), and oxygen (air) to burn completely and cleanly. Wood burns best in cycles. A cycle begins when a new load of wood is placed on and behind a coal bed and ends when that wood is reduced to a similar-sized coal bed. Long burn times are not efficient or effective. In fact, peak efficiency and heating effectiveness are usually achieved with burn cycles of eight hours or less. Avoid adding a log each hour in an attempt to produce a steady heat output.

Follow your DAKA Furnace Instructions Carefully. Be sure that anyone who operates it is also familiar with these instructions.

Before You Build Your Fire: Remove excess ash from the firebox. Never let ash build up more than two inches. After an overnight fire you will find remaining coals at the back of the firebox, furthest from the combustion air inlet. This is a good time to remove a small amount of ash.

Find where the combustion air enters the firebox; generally, at the front loading door. Rake the coals toward the air inlet. Place the wood on and behind the coals. Avoid spreading the charcoal out evenly and placing the new load of wood on top because this can lead to extended smoldering before the wood ignites.

When rekindling from coals, rake the coals towards the air inlet, place wood behind the coals and always place the smallest, driest piece of firewood directly on the coal to act as the ‘igniter’. Your igniter should begin flaming immediately, and as it burns, it will ignite the larger pieces.

A rake is the best stoking tool for heating furnaces. A simple rake can be made from 3/8” steel rod 20” – 25” long with a 1/8” thick steel rectangle measuring 1 1/2” x 3 1/2” welded to the end.

Start Your Kindling Fire. The function of the kindling fire is to quickly heat up the chimney and also the brick and steel of the firebox to create the environment for a stable, brightly-burning fire. The edges of firewood pieces heat up and ignite first. The more edges that are close together in your kindling fire, the faster it will ignite. You shouldn’t have to open the loading door several times to adjust it. Two popular approaches for arranging kindling fires are:

1. **Two parallel logs:** Place two split logs parallel to each other in the firebox with a space between. Fill the space with newspaper and fine kindling and place several larger kindling pieces crosswise on top. Light the paper.
2. **Top down fire:** Place standard-size pieces in first, a few pieces of heavy kindling next and finally, fine kindling. Roll up single sheets of newspaper, tie a knot in each and place four or five on top of or in front of the kindling. Light the paper. This type of kindling fire can provide two or more hours of effective heating without having to open the door to add wood or adjust the fire.

Load Wood into Your Firebox. Your firebox floor is roughly square. You can load the wood east-west so the combustion air reaches the side of the logs, or north-south so the air approaches ends of the logs. An east-west load breaks down more slowly, so is a good orientation for overnight in spring and fall when heat demand is low. A north-south load can be larger, but breaks down more quickly, so it is good for high output, long-lasting fires in cold weather. Vary the position of the wood in the firebox to maximize the exposed surface area of each piece of wood. Avoid placing pieces of wood in parallel direc-



tions where they may stack too closely. Only use wood that is the proper size for your furnace's fire chamber.

[Open the air control(s) fully and open the bypass damper if the appliance has one.]

Do Not Close the Damper or Air Inlets Too Tightly. The fire will smoke from lack of air. Leave the air control wide open until the firebox is full of flame, the new wood is charred black and the edges are glowing red. Turn down in two or three stages.

Watch for Smoke Signals! Get into the habit of glancing out at your chimney top every so often. Apart from the first half hour after lighting and refueling, a properly burning fire should give off only a thin wisp of white steam. If you see smoke, adjust your dampers or air inlets to let more air in. Dark smoke is an indication of pollution and you are wasting fuel.

“Is There Anything I Shouldn't Burn?”

Never burn garbage, plastic, foil, or any kind of chemically-treated or painted wood. They all produce noxious fumes that are dangerous and highly polluting.

D. Maintenance

“What Maintenance Does My DAKA Furnace and Chimney Require?”

Inspection and Upkeep – For Safety's Sake. Periodic inspection of your wood furnace is essential to ensuring its continued safe and clean-burning operation. Keep in mind the following inspection points:

- Chimneys should be cleaned professionally at least once a year to remove creosote buildup. Remember – Creosote can fuel a chimney fire that can burn down your home!
- Oil blower motor(s) twice a year. See furnace instruction manual for details.
- Clean blower fan and blower motor using compressed air at least twice a year. Note: Accumulating dust and dirt on fan, squirrel cage, and blower motor is the No. 1 cause of premature blower failure.
- Inspect your furnace firebox for cracks on a regular basis. Remove all air jacket sides and top for better access to all sides of the firebox. If you discover any cracks, immediately stop operation and seek qualified repair service.
- Replace gaskets on the furnace fire door and ash door need replacement every few years.
- Check seams on furnaces sealed with furnace cement; eventually the cement dries out, becomes brittle, and may fall out.
- Replace firebricks that are broken or have large pieces missing need to be replaced.
- Replace grates that are broken or cracked.

Chimney Maintenance and Cleaning. Frequent use may require monthly chimney inspection and cleanings. Fireplace connectors (furnace pipes) should be checked as often as every 2-4 weeks.

Smoke rising through your chimney may condense and build up on the cooler inside walls forming a substance known as creosote. This volatile substance can ignite and burn in the chimney. Many chimneys and installations are unable to withstand these dangerous creosote fires; the results can be tragic. Chimneys and vents also perform the necessary function of directly venting the hot gases from a fire away from the house. If the chimneys or vents are obstructed by debris or animals, the hot gases can be forced back into the home.



A CSIA-certified Chimney Sweep can show you the proper methods for inspections and can provide valuable insight into the proper working of your chimney and/or vents. For more information about chimney safety, go to their website at www.csia.org or call 1-800-536-0118.

The HEARTH Education Foundation manuals recommend at least annual inspection/service/maintenance for solid fuel appliances and venting systems. The basis for that recommendation for solid fuel appliances is the National Fire Protection Association standard NFPA 211.

“What Are Some Other Good Furnace Maintenance Tips?”

Door Seal

Test the loading door seal with paper money. Open the door on a cold furnace, place the bill across a gasket area of the door, then close and latch the door. Try to remove the bill by pulling. The bill should not pull out easily. The door seal may need adjustment if there is an area where the bill slips out easily. Try adjusting the door latch first.

Door Gaskets

The fire door has a rope gasket and the ash pan door has a sheet gasket. Fire door gasket material has evolved through the years from asbestos rope to fiberglass ropes in various sizes and density. The usual gaskets are 3/8" to 1" thick. If in doubt about what size and density to use, remove the door and take it to a hardware store to test a variety of gaskets in the groove. The right gasket may be cut to length from a large reel for your furnace. Cement to hold the gasket in place is often included in kits.

Firebrick

Firebrick is used to protect steel or cast iron while increasing firebox temperatures for better combustion. Modern EPA-certified wood heaters often use a lighter, lower density brick for higher performance. When replacing brick, it is important to replace with the same brick type to maintain your furnace's efficiency.

Cracked firebricks that remain in position do not have to be replaced immediately. The bricks in most furnaces are a standard size – about half the size of a normal house brick. They measure about 4 1/2" x 9" x 1 1/4" inches, and are referred to as firebrick 'splits'. Standard splits can be purchased at some building supply stores, but the special low density bricks found in some EPA-certified furnaces must be purchased from a wood furnace dealer.

Steel Parts

Interior steel parts in a furnace may warp over time. In some cases this distortion is acceptable because it does not affect performance.

Warped structural welded steel plates, (such as sides, back and top,) may be unsightly, but if there is no leakage, the appliance can continue to be used. These parts are not replaceable so if they crack or are badly distorted, it means the body is unstable and should be recycled.

Paint

Furnaces have been painted with high temperature paint since the 1970s. Good furnace spray paint is widely available and will withstand high temperatures. Let the furnace cool down first. Mask those parts not to be painted and protect everything around the furnace from over-spray. Most furnace paint dries to the touch in about fifteen minutes.



E. Troubleshooting

“Why Won’t My Auto Damper Hold Its Setting?”

The auto damper most likely needs adjustment. Adjust tension on shaft by tightening only the shaft nut closest to the coil spring. Using a 7/16” open end or adjustable wrench, turn tension nut counter-clockwise moving it only a quarter of a turn at a time, then checking tension on knob. Do not over tighten.

“Why Does Smoke Puff Back Out The Door When Loading Wood?”

You may have insufficient draft. Debris or creosote could be blocking the flue. Inadequate chimney height or design could be causing downdrafts. Check chimney connector for air leaks and seal with furnace cement. Adjust barometric regulator to higher setting.

Your home could be so well insulated that infiltration air is not getting in to replace air used in combustion. Open a window slightly in furnace room or install a vent to the outside in furnace area.

“Why Do I Have Poor Home Heat Circulation Throughout My House While Burning Wood?”

- You could be burning poor-quality wood. Burn only wood that has been air dried for at least six months, preferably a year or more. Use hardwoods such as hickory, oak, maple, etc. for highest heat value per load.
- Your cold air return is closed or blocked. Check to insure that all cold air return vents are open and not blocked with furniture, etc.
- Your duct joints are leaking air. Make sure that all duct joints are airtight; apply duct tape to seal.
- Check flue gas temperature. Normal operating range is 300-600 F. A lower temperature indicates insufficient draft or inadequate combustion air. To check flue gas temperature, we recommend you use a smoke pipe surface thermometer or probe-type thermometer.
- The fan control may be out of adjustment. Insure that your primary furnace blower is turning on to distribute heat effectively. Lower “FAN ON” settings on primary furnace fan control to start circulation earlier.

“Why Is My Furnace Exterior Discolored (Whitish Appearance?)”

This is due to overheating. Paint is rated for 900 F surfaces and overheating of your furnace will cause a whitish appearance on the outside of combustion chamber surfaces. Reduce chimney draft to control overheating. To cover discoloration, obtain a high-combustion flat black spray paint from hardware store or fireplace shop.

Helpful Links

US Department of Energy
Consumer Information

www.eere.energy.gov/consumer

Wood Heating Organization
Nonprofit, nongovernmental agency dedicated
to the responsible use of wood as a home heating fuel.

www.woodheating.org

Chimney Safety Institute of America

www.csia.org