



# MANUAL

Installation, Use, & Maintenance

[TINYWOODSTOVE.COM](http://TINYWOODSTOVE.COM)



# THANKS FOR YOUR PURCHASE!

**We are excited that you chose a Dwarf Stove for your space and can't wait to see it installed!**

Before installing and using your stove please take some time to read this manual cover-to-cover. It contains the most important information you need to successfully install and enjoy your new Dwarf Stove. If you have questions about your installation please get in touch!

Cheers!

*- The Tiny Wood Stove Team*



## **TINY WOOD STOVE LLC**

1329 Biztown Loop

Hayden, ID 83835

(208) 352-3417

[support@tinywoodstove.com](mailto:support@tinywoodstove.com)

## **Dwarf Stove Models:**

*Dwarf 3kW LITE*

*Dwarf 3kW Standard*

*Dwarf 4kW*

*Dwarf 5kW*

**SAFETY NOTICE: IF THIS STOVE IS NOT PROPERLY INSTALLED, A STRUCTURE FIRE MAY RESULT. FOR YOUR SAFETY, FOLLOW THE INSTALLATION DIRECTIONS. CONTACT LOCAL BUILDING OR FIRE OFFICIALS ABOUT RESTRICTIONS AND INSTALLATION INSPECTION REQUIREMENTS IN YOUR AREA.**

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## WARNINGS

Improper use or installation of a wood-burning stove can cause fire, injury, or death. Use only solid fuel rated stove pipe and chimney pipe, observe proper clearances, burn only approved fuels in your stove, and maintain smoke and carbon monoxide alarms at all times. Regularly inspect and clean the flue system to prevent blockages and creosote buildup.

Local laws and building codes vary, and applicable codes should be strictly followed if they differ from the information included in this manual. If you are attempting a DIY installation where installation by an unlicensed installer is permitted, an inspection of the completed installation by a professional is highly recommended.

If you have any doubts about your small stove installation, please ask for help from a professional installer!

### **Warning: California Proposition 65**

Use of this product can expose you to chemicals including soot, creosote, wood dust, and wood smoke containing carbon monoxide, which are known to the State of California to cause cancer, birth defects, or other reproductive harm. For more information, visit [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

### **Warning**

The factory coating applied to your Dwarf stove is not food grade. When using your stove for cooking, always place your food in appropriate cookware, and never directly on the painted stovetop.

### **SAFETY NOTICE**

IF THIS STOVE IS NOT PROPERLY INSTALLED, A HOUSE FIRE MAY RESULT. FOR YOUR SAFETY, FOLLOW THE INSTALLATION DIRECTIONS. CONTACT LOCAL BUILDING OR FIRE OFFICIALS ABOUT RESTRICTIONS AND INSTALLATION INSPECTION REQUIREMENTS IN YOUR AREA.

## APPLICATIONS

Our Dwarf stoves are designed specifically for small recreational and temporary spaces less than 500 square feet like tents, yurts, RVs, buses, vans, boats, and tiny homes on wheels. The Dwarf stove is not certified (UL/CSA) or approved (EPA) for residential or commercial heating and is intended for recreational, portable, or temporary use only.

### **U.S. ENVIRONMENTAL PROTECTION AGENCY**

**This unit is not a certified residential wood heater. For portable and temporary use only.**

# WARRANTY

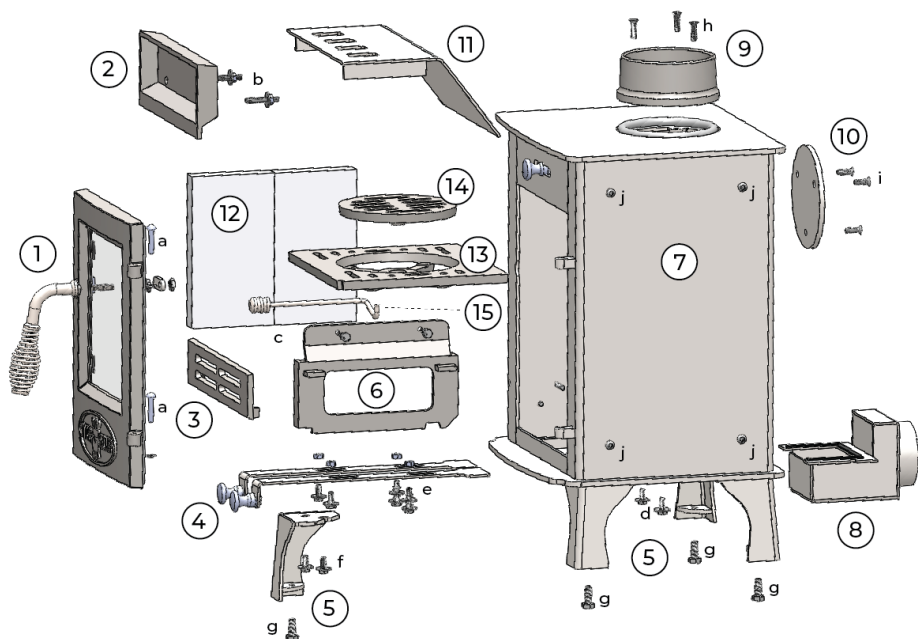
We created the Dwarf stove with quality, efficiency, and affordability in mind. With proper operation and maintenance, your stove should give you many years of trouble-free use. We stand behind our stove with a 5-year warranty on defective materials or workmanship.

If you have any issues with the stove, or to make a warranty claim, please contact us at [support@tinywoodstove.com](mailto:support@tinywoodstove.com).

For any defects covered under this warranty, we will, at our discretion, repair or replace your item, or refund your money up to the full purchase price of the defective item. This warranty does not cover malfunction due to misuse, abuse, or improper installation or maintenance; does not cover wear and tear on consumables like gaskets, firebricks, and glass; does not cover the cost of shipping; does not cover incidental, consequential, or indirect damages; and is limited in value to the original purchase price of the defective item.

Please note that shipping damage is not a warranty claim. If your stove was damaged in shipping, please contact us right away so that we can repair or replace it. **Please inspect your stove for shipping damage immediately upon receipt. Claims for shipping damage must be made within 30 days of the date your stove shipped.**

# DIAGRAM AND TECHNICAL DATA



## Parts

1. Door Assembly (door handle may be packed separately)
2. Air Wash Manifold / Tertiary Air Valve
3. Coal Bar
4. Primary and Secondary Air Valves
5. Legs
6. Fire Grate Support
7. Stove Body
8. Direct-Air Box (optional accessory)
9. Flue Flange
10. Cover Plate
11. Baffle
12. Fire Bricks
13. Fire Grate
14. Riddling Grate
15. Riddling Grate Handle

## Hardware

- a. Door Pins (2)
- b. Air Wash Manifold Mounting Bolt M6 (2)
- c. Firebrick Bolt M6 (4)
- d. Fire Grate Support Bolt M6 (2)
- e. Air Valve Mounting Hardware - Bolt M6 (4) Washer (4) and Spring (2)
- f. Leg Mounting Bolt M6 (8)
- g. Stove Leveling Bolt M8 (4)
- h. Flue Flange Bolt M6 x 30mm (3)
- i. Cover Plate Bolt M6 x 20mm (3)
- j. Accessory Mounting Bolt M6 (10)

# PRECAUTIONS

- All parts of the stove are very hot during operation. Do not leave young children in the room with the stove unsupervised. Do not allow flammable items like upholstery, curtains, firewood baskets, etc. to violate clearances while the stove is in operation.
- The stove handle and air control knobs can get very hot during operation. Take care when operating the spring handle, and use a tool or a heat-resistant glove to operate your stove's air controls.
- Keep a functioning smoke and carbon monoxide detector in the same room as the stove, and test them at least once a month.
- Do not use exhaust fans in the same room as the stove while it is operating. A powerful exhaust fan can pull combustion gases out of the stove into the living space by changing ambient pressure. HRVs or ERVs (Heat/Energy Recovery Ventilators used in super-efficient construction) that switch to “exhaust only” mode in sub-freezing temperatures can cause draft problems in relatively airtight spaces. Be sure to consult your operations manual if you are using an HRV or ERV, and switch it off while the stove is operating if necessary.
- Never use liquid fuel to start or freshen a fire in a wood stove. It could cause an explosion inside the stove or the flue system.
- Never use water to put out a fire in a wood stove. Water can explosively flash to steam, which can cause severe scalding burns.
- Avoid overfiring or underfiring the stove. We recommend monitoring the flue temperatures with a flue thermometer. Underfiring can cause excessive creosote formation and increase the risk of a chimney fire. Overfiring can cause damage to the stove and surrounding materials. If any part of the stove or flue system starts to glow red, close the air controls nearly all the way until the stove cools down.
- Your stove is designed to operate with the door closed. Don't leave the door open for longer than is necessary to stoke the fire.
- Your stove requires regular maintenance to function properly. Failure to adequately maintain your stove can result in poor stove performance or chimney fires. See the *Maintaining Your Stove and Flue System* section of this manual.

# RECEIVING YOUR STOVE

Your stove is heavy. It's best to have two people move and install your stove.

Once the stove is delivered, please unpack it right away. Claims for shipping damage must be reported within 30 days of the ship date. If you find any damage or blemishes on your stove, please snap a few pictures and email them to us at [support@tinywoodstove.com](mailto:support@tinywoodstove.com).



# ASSEMBLING YOUR STOVE

For a detailed stove unboxing video check out our videos page on our website:

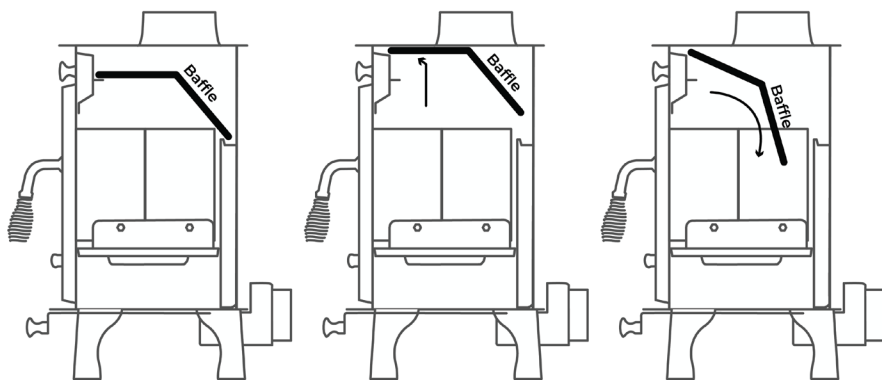
[www.tinywoodstove.com/videos/](http://www.tinywoodstove.com/videos/)

*Required tools: Phillips Screwdriver, 10mm Socket or Adjustable Wrench, Utility Knife*

1. To unbox the stove, sit the stove crate upright on its legs and cut the outer straps. Remove the 2 screws from each leg with a Phillips screwdriver. Some stoves may have additional packing material that needs to be removed before you can access both screws. Lift off the crate and the box. Cut the inner straps to release the stove. Remove plastic and paper wrap.
2. Open the door, remove the air controls, coal bar, baffle, wrapped flue flange, legs, and ash pan from inside the firebox. Remove the baffle last: lift up and forward until the bottom is free from the rear air plate. Allow the rear of the baffle to drop below the rear air plate, then lower the baffle into the firebox. Remove the baffle from the firebox by turning it 90 degrees so it fits through the door. See figure 2.1.

**NOTE:** Due to shipping weight restrictions, the door glass, firebricks, baffle, coal bar, legs, flue flange, and air-controls ship in a separate box for the Dwarf 5kW.

3. **INSTALL THE DOOR HANDLE** (if not already installed): For some models, the door handle is shipped inside of the stove to protect both the handle and the door from damage in transit. Locate your door handle and remove the outer jam nut, cam latch, inner jam nut, and lock washer. Open your stove's door and insert the threaded end of the spring handle through the door handle hole. First install the lock washer and then the inner nut on the threaded end of the spring handle, inside of the door. Tighten the inner jam nut fairly snug against the lock washer. Turn the door handle back and forth to test the fit of the jam nut. Operation should be smooth with a bit of resistance, not wobbly.



**Figure 2.1: Procedure to Remove Baffle**



Turn the spring handle to face straight down. Place the cam latch on the threaded end of the handle inside of the door with the long end protruding past the left edge of the door. Then thread the outer nut against the cam latch. Grasp the door handle with your right hand, and use your right thumb to press the cam latch upward to prevent it from turning. Use a crescent wrench in your left hand to tighten the outer jam nut firmly against the cam latch to lock the handle in place.

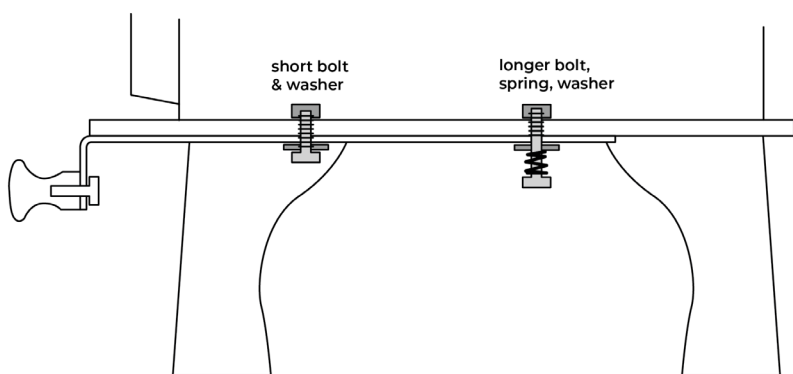
Close and latch your stove door to test its fit. The door should feel snug against your stove's body, not wobbly, and your handle should operate smoothly and easily. Test several points around your door gasket by closing a dollar bill between the door and the stove. You should feel some resistance when you pull the bill out. If the bill cannot be pulled out easily, your door is too tight. If the bill falls out with no resistance, then your door is not tight enough. If your door needs to be adjusted, remove the outer jam nut and the cam latch. Tighten the inner jam nut to tighten the door against the stove body, or loosen it to loosen the door. Install the cam latch and outer jam nut as before, and retest your door's fit.

If you'd like a video walkthrough, watch our Door Maintenance video at [tinywoodstove.com/videos](http://tinywoodstove.com/videos)

Close the door and gently set the stove on its back.

*TIP: Use the cardboard that the stove arrived in to cover your floor and protect the stove's paint and your floor from being scratched as you flip the stove.*

4. Verify that the two fire grate support bolts are in place, one on each side between the leg mounting holes.
5. **INSTALL THE AIR CONTROLS:** Unwrap & bolt on the (2) air controls to the bottom of your stove (the 3kW LITE model has only 1 air control). Install a washer on the short bolt, and install the spring and then a washer on the long bolt. There are two slots on each control arm. The slot toward the front of the stove (closer to the handle) is secured with a short bolt and a washer. The rear slot (see figure 2.2) is secured with the spring, the longer bolt, and a washer. Tighten these bolts enough to hold the air valves against the stove body, but not so tightly that they restrict the movement of the air control. Verify that the controls move smoothly. **Ensure the paddles seal flat over the air intake with no gaps.** If needed, remove the air control and gently bend it to ensure a good seal. Once you're satisfied, open the stove's door, remove the ash pan, and install a nut on each of the air control bolts protruding into the bottom of your stove to lock them into place. If you are using the Direct-Air Intake Box, bolt this on next. Install the direct-air box over the primary & secondary air gate valve on the rear underside of your stove, with the round flange pointing to the wall behind your stove.



**Figure 2.2: Air Control Valve Installation**

6. **INSTALL THE LEGS:** Unwrap the stove's legs and use the provided bolts (M6) and washers to secure the legs to the bottom of the stove. If you are installing the Tall Legs or the Wood Storage Stand, install them instead of the stock short legs. Carefully stand the stove up on its legs or storage stand.
7. **INSTALL THE FLUE FLANGE:** Using a Phillips screwdriver, install the flue flange on either the top or rear exit of the stove, whichever you are planning on using. Thread bolts from inside the stove toward the outside for best fit. Install the flue flange cover plate on whichever opening the flue flange is not installed on.
8. **REINSTALL THE BAFFLE:** The baffle must be turned sideways to fit through the stove door, then realigned horizontally once inside the stove. Position the holes in the baffle at the top front of the stove. Lift the baffle up and pull it forward until the top front of the baffle hits the very top front of the stove, above the door. Then, swing the bottom of the baffle up and back until it is above the rear air plate. Finally, lower the baffle straight down so the front rests on top of the air wash manifold (#2 in the parts diagram, just above the door opening) and the rear rests on top of the rear air plate (the shelf above the horizontal line of holes in the back of the firebox). Properly installed, no amount of forward/backward or side-to-side motion should allow the baffle to fall.

The baffle must be installed a certain way for it to fit, and installing it can be difficult until you're familiar with the procedure. See the diagram above, or check out the unboxing video at [tinywoodstove.com/videos](http://tinywoodstove.com/videos) to watch a demonstration.

9. **INSTALL / SECURE THE FIRE BRICKS:** Fire bricks ship preinstalled in the Dwarf 3kW and 4kW models. The Dwarf 5kW fire bricks are shipped separately from

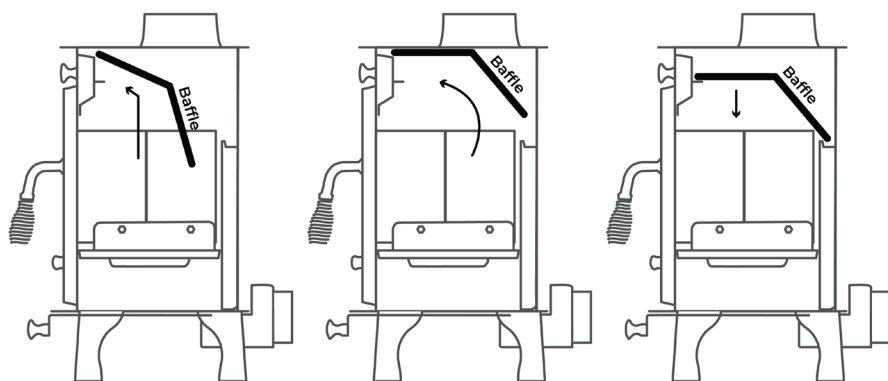


Figure 2.3: Installing the Baffle

the stove in the parts box. To install fire bricks in the stove, loosen the fire brick bolts that are installed horizontally through the fire grate support on either side of the firebox (#6 on the parts diagram). Slide the fire bricks downward into the channel to the side of the fire grate support. Fire bricks should be installed vertically, two bricks per side. Tighten the fire brick bolt finger-tight. Overtightening the bolt can break the fire brick.

**NOTE:** If it's difficult to get the fire brick to fit in the channel, loosen the fire grate support mounting bolt, which is located on the underside of the stove between the legs. Loosening the bolt will give some extra play in the fire grate support, which should allow room to slide the fire brick in. Re-tighten the bolt when the bricks are in place.

**NOTE:** The Dwarf 3kW LITE model uses ceramic fiber refractory panels instead of fire brick to save on weight. Since the panels are very lightweight, bolts are not needed to hold them in place, and the fire brick support bolts are omitted from this model. Do not discard the lightweight fiber panels inside of the firebox—they are part of the stove!

- 10. REINSTALL THE COAL BAR:** The coal bar is placed across the front of the fire grate just inside the door to keep logs from rolling out of the stove.
- 11. INSTALL GLASS (if needed)** Door glass may be shipped separately to protect it from shipping damage. Hold the glass pane against the glass gasket on the interior of the door. Pair each of the four metal retaining clips with a white pad. Place the pad against the glass, place the clip against the pad, then use the provided screws to secure the glass with each of the four metal retaining clips. The screws should be just snug. Overtightening can cause the glass to break.
- 12. PERFORM OUTSIDE BURN:** The high-temperature paint on your Dwarf stove needs to be cured prior to use. The paint consists of two parts: an air dry resin that

cures at room temperature and burns away at 600-650 degrees F, and a silicone resin that cures at 400-450 degrees F. The air dry resin produces some non-toxic (but unpleasant smelling) smoke when it burns away, so this is best done outside or in a well-ventilated area.

Once the stove is assembled, move it outside and insert 40-60" of pipe into the flue flange for the initial burn.

**NOTE:** The stove will not draft properly without a flue system. You must place 40-60" of vertical pipe on your stove during the outside burn or you will have difficulty bringing your stove up to temperature.

Gradual heating of your stove's finish will produce the best results. Heating uncured paint too quickly can "shock" the paint and cause premature failure.

First, make a small kindling fire, and keep it burning for 10-15 minutes. Second, add fuel to build a medium-sized fire and bring the entire stove surface temperature to 450 degrees F and keep it there for about 60 minutes. During this stage, the silicone resin in the paint will soften and may even appear wet as the paint cures. Do not touch the paint during this stage.

Finally, add fuel to bring the temperature up to 600-650 degrees F and keep it there for another 60 minutes. At this stage, the air-dry resin is burning off and you will likely notice some smoke and odor. After 60 minutes, there should be no more smoke or odor produced, and your cure is complete. Allow the stove to cool to a safe temperature before attempting to move it.

## **INSTALLING YOUR STOVE**

Prior to installing the stove, build a safe zone for it. This zone consists of a hearth of the proper size and thickness, proper clearances to combustible materials, and (in some cases) heat shields.

### **DWARF STOVE MINIMUM REQUIRED CLEARANCES**

Sides: 16" from combustibles

Rear: 18" from combustibles

Top: 36" from combustibles

Single Wall Stove Pipe: 18" from combustibles

Insulated Chimney Pipe: 2" from combustibles

*Observing proper clearances is vital to the safety of your installation.*

Clearance violations are one of the most common causes of wood stove related house fires. Combustible materials close to the stove can appear fine for years, but they deteriorate as they are repeatedly heated, and the temperature required to ignite the material drops. A fire can start without warning or even a spark. Combustible materials

inside walls are especially common sources of house fires with poorly installed stoves. Materials hidden from view can still deteriorate to the point that they can ignite at relatively low temperatures. Larger clearances are always acceptable.

## HEAT SHIELDS

If the required clearances don't work for your space, the use of heat shields can safely reduce clearances by up to  $\frac{2}{3}$ . There are several types of heat shields, and each performs differently. Find more detailed instructions for building heat shields at [tinywoodstove.com/how-to-build-heat-shields-for-wood-stoves](http://tinywoodstove.com/how-to-build-heat-shields-for-wood-stoves)

### The Dwarf Heat Shield Kit

The Dwarf Heat Shield Kit is an optional accessory available for purchase at [tinywoodstove.com](http://tinywoodstove.com). The shield attaches to the sides and rear of the Dwarf 3kW Standard, Dwarf 4kW, and Dwarf 5kW stoves. The Dwarf Heat Shield Kit reduces required clearances to 9" at the back of the stove and 8" on the sides ( $\frac{1}{2}$  reduction).

### Air-Cooled Wall Shield

The most effective heat shield is made of 24 gauge (minimum) sheet metal with 1" air space behind it, and 1" gap around the entire perimeter of the shield for air flow. The shield is attached to the wall using ceramic or metal spacers. The "air wash" behind the shield is very effective at minimizing the heat transferred to the combustible surface behind the shield. Avoid placing spacers directly between the stove and the wall so that they don't conduct heat through the shield. A heat shield of this type can reduce wall clearances by up to  $\frac{2}{3}$ , or ceiling clearances by up to  $\frac{1}{2}$ . This means 6" from the back of the stove, 5  $\frac{1}{3}$ " from the sides of the stove, 18" from ceiling, and 6" from single wall pipe.

### Insulated Wall Shield

An alternate wall heat shield design is made of  $\frac{1}{2}$ " thick cement board with 1" non-combustible insulation behind it (Rockwool or ceramic fiberboard) and no air space. This type of heat shield can reduce wall clearances by up to  $\frac{1}{2}$ , or ceiling clearances by up to  $\frac{1}{3}$ . (9" from the back of the stove, 8" from the sides, 24" from ceiling, 9" from single wall pipe).

### Masonry Shield

Finally, a 3  $\frac{1}{2}$ " thick masonry wall can be used as a heat shield with no air space. This type of heat shield can reduce wall clearance by up to  $\frac{1}{3}$ . (12" from the back of the stove, 10  $\frac{2}{3}$ " from the sides of the stove, 12" from the single wall pipe)

## HEARTH

When using the standard 4" stove legs, use a hearth underneath with insulation and ember protection. This can be achieved by placing a  $\frac{1}{2}$ " thick layer of mineral fiber board under a non-combustible material (metal, glass, tile, stone, etc.) to shield combustible flooring from any embers or coals that could potentially fall from the stove.

When using the optional Tall Legs or Wood Storage Stand, use a hearth with ember protection. Additional insulation under the ember protection is unnecessary.

## ANCHORING YOUR STOVE

Dwarf Stoves ship with balancing foot bolts for use in a stable structure that does not move. When using the balancing feet instead of anchoring the stove to the floor, each foot bolt can be adjusted so that the stove is level.

When installing a stove in a structure that moves, or for extra assurance that the stove won't shift, anchor the stove to the hearth.

To anchor your stove, remove and discard the balancing foot bolts and mark the position of the center of the hole on the hearth. If you have access from below the hearth, you can drill a hole at each of those points and thread a bolt through the hole from below, adding a lock washer and a nut on top to secure the stove. The leveling feet are threaded M8 1.25, or a ¼" bolt can fit through the hole without mating with the threads. If you do not have access to the area below the stove, install ¼" threaded rod anchors at each of the marked points, then bolt the stove down to the anchors through the holes in each leg.

## FLUE REQUIREMENTS

Your Dwarf Stove must be connected to a Class A chimney system installed according to the chimney manufacturer's instructions. Stovepipe constructed of 24-gauge or thicker steel may be used to connect the stove to the chimney system, but may not pass through a combustible roof or wall. Proper flue components are available for purchase at [tinywoodstove.com](http://tinywoodstove.com). A wood stove must have its own dedicated flue system. Do not attempt to share the flue system with another appliance.

For ideal draft with a roof exit, Dwarf stoves require a well-designed flue system with a minimum 60" of chimney height measured from the stovetop to the chimney opening, with the diameter of the pipe matching the stove's flue flange. If using a wall exit, Dwarf stoves require a minimum of 80" of vertical chimney height for ideal draft. In some cases, a shorter chimney or the next larger flue size may draft adequately, but will not perform as well. A pipe size smaller than the stove's flue flange is not permitted.

Your Dwarf Stove requires a well-designed flue system to function properly. If you are designing your own flue system, you can find more detailed flue design resources at [tinywoodstove.com/learn](http://tinywoodstove.com/learn). Personal assistance is also available to help with your project by contacting us at [support@tinywoodstove.com](mailto:support@tinywoodstove.com).

### DWARF STOVE HEARTH PAD DIMENSIONS

*Rear and Sides:* Match clearances dictated by the type of heat shield used

*Front:* 12" (or 18" if building codes require)

*Thickness:* ½" minimum noncombustible material if using standard legs.

24 gauge minimum as ember protection if using Tall Legs or Wood Storage stand.

## ASSEMBLING THE FLUE COMPONENTS

Please follow the manufacturer's instructions (and local building codes where applicable) for installation of your flue components, including required clearances around the pipe. Detailed flue installation instructions for various flue configurations can be found at [tinywoodstove.com/manuals-and-downloads/](http://tinywoodstove.com/manuals-and-downloads/).

### Fastening Joints Together

The first section of the flue system should be inserted into the flue flange and sealed in place with stove cement. Joints between flue pipes should be secured with either metal locking clamps supplied by the stovepipe manufacturer or three heat-proof fasteners (rivets or self-tapping sheet metal screws). Additional sealant in pipe joints is not required or recommended.

All male/crimped ends of the single-wall pipe (and inner walls of the double-wall pipe) should point downward toward the stove to keep any creosote, condensation, and dust from leaking out of the stovepipe.

### NOTE FOR VEHICLES AND HOMES ON WHEELS

Before attempting an installation, we recommend getting the structure perfectly level front-to-back and side-to-side, then not moving it until the install is done. Doing this will allow the use of a bubble level and a plumb bob while performing the installation.

## OPERATING YOUR WOOD STOVE

Every wood stove installation is unique, so it will take some time to get acquainted with your new Dwarf Stove. Whether you're brand new to wood stoves, or you have heated with wood your entire life, you should expect a learning curve with your new stove. People with years of experience burning wood sometimes have a difficult time with a new stove, especially a small stove, because it behaves differently than they're used to.

We highly recommend purchasing several packs of kiln dried hardwood fuel from your local hardware store for your first few burns. It's not necessary to use "perfect" fuel all the time, but it's important to experience how your stove functions under ideal conditions. Then, you'll be more successful in adjusting your technique and maintenance frequency with varying quality fuel sources.

Proper performance of a wood stove, especially a small wood stove, requires a hot chimney to create draft. When starting a fire, your goal is to bring the flue up to temperature (approximately 400 degrees F) as quickly as possible and create a strong bed of coals for hot, efficient burns. The best way to accomplish this is by starting a fire with plenty of small, dry kindling, and gradually working up to larger log sizes as a bed of coals grows. Putting too large of a log on a fire before having a sufficiently large bed of coals will cause a smoky, smoldering fire.

An efficient burning fire will have little or no visible smoke exiting the chimney. If large clouds of dark smoke are coming from the chimney, the stove is smoldering and likely



producing creosote. Frequently burning smoldering fires can create dangerous creosote deposits. It's important to burn the stove efficiently and to inspect and clean the flue system 1-3 times a month depending on wood type, burn temperatures, and flue size.

## LIGHTING A FIRE

**WARNING:** Do not use any liquid fuels such as gasoline, gasoline-type lantern fuel, kerosene, diesel, charcoal lighter fluid, or similar liquids to start or 'freshen up' a fire in this appliance. Keep these flammable liquids well away from this appliance while it is in use.

13. Clean the fire grate and glass from the previous fire and empty the ash pan if needed. Open the primary air (left lever) and secondary air (right lever) 100% by pulling the valve toward you until it stops. Open the air wash (gate valve above the door) 100% by sliding it completely to the right.
14. Using a Firestarter - Add kindling to the firebox in a log cabin or tipi configuration. Light the firestarter and add to kindling. Leave the door cracked open until the fire starter has caught the kindling on fire. Add more kindling and close the door.

- OR -

Using Newspaper - Loosely crumple 2-3 pages of newspaper, enough to cover the bottom of the firebox. Spread a small handful of kindling across the top of the newspaper. Add a second small handful of kindling perpendicular to the first. Light the newspaper and leave the door cracked until the kindling has caught on fire. Add more kindling and close the door.

15. Add fuel to kindling. Once the previous batch of kindling is burning, add fuel in batches. Start with small pieces and work up to logs as the stove heats up and the coal bed is established. The goal is to create a progressively larger hot fire on a bed of hot coals. Opening the door before the previous batch of wood is fully lit can cause some smoke to escape the stove. Keep the door closed as much as possible. Leave the air control settings fully open until the first logs burn down to hot, glowing coals, or your flue temperature hits 400 degrees F.

## OPERATION

After a hot coal bed is formed or new fuel is charred and ignited, you can adjust the air controls to slow down the rate of burn if needed. It's a good idea to use a flue thermometer and adjust the air controls according to thermometer readings.

### STOVE PIPE THERMOMETER

*Placed on stovepipe 12"-18" above stovetop*

Too Cool: <250 degrees F

Just Right: 250-500 degrees F

Too Hot: >500 degrees F

Going too far above or below these temperature readings can cause problems. Temperatures that are too cool (except after the fire has burned down to coals) can indicate a cold chimney and incomplete burn, which can cause excessive creosote buildup and chimney fires. Temperatures that are too hot indicate inefficient burning (generating heat faster than the stove can release it into your space). Temperatures approaching 900 degrees F and higher can cause permanent damage to your stove and flue system.

**NOTE:** Smaller stoves (Dwarf 3kw & 4kw models) tend to have lower flue temps. An optimal burn will likely be on the lower end of what a standard thermometer reads. Additionally, you will have lower flue temps towards the end of a burn cycle when all the fuel has burned down to coals.

*\*Stove Pipe Thermometers are available for purchase at [tinywoodstove.com](http://tinywoodstove.com)*

*\*\*If purchasing a thermometer from another vendor make sure it's calibrated for stove pipe and not the stove top. Stove top thermometers have a different temperature range than pipe thermometers.*

To dampen the stove for a slower burn, a good starting point is to close the air intakes by 50%. When the air supply to the fire is restricted too soon or too much, there won't be enough air for thorough combustion (you'll see dark smoke coming out of the chimney and the flue temperature will be low) and you'll have more creosote buildup.

Take some time to experiment with the air settings, and get a feel for how they affect the fire. Because the flue system, not the stove itself, is producing the draft, no two installations will perform exactly the same.

Depending on the fuel you burn, you will use different air settings. Here is a summary of what happens inside your firebox and how each of the air control affects the fire.

## **PRIMARY AIR (Bottom Left Control)**

The primary air enters the stove below the fire grate, and blows directly on the hot coals. This air supply is used when first starting a fire, when adding new fuel, or as the primary air source for coal. Generally, using the primary air controls burns the fire quicker and less efficiently.

After the surface of your fuel is blackened and on fire, you can start shutting down the primary air and feed your wood fire with mostly secondary air for a more efficient burn.

The only exception to this is with a coal fire. Anthracite coal fires require oxygen to pass through the coal bed from the bottom, so a coal fire can be more easily sustained by restricting secondary air, and feeding air primarily from the primary intake.

## **SECONDARY AIR (Bottom Right Control)**

The secondary air enters the fire box at the bottom of the rear air plate, and is preheated as it rises to the holes near the top of the firebox. Burning wood releases flammable gases that mix with oxygen at the top of the firebox for a complete, efficient burn.

Feeding a wood fire with oxygen from the top makes for a slower and much more

efficient burn as the smoke/gases are more completely burned before leaving the stove, and gases are released from the logs at a much slower rate.

Any unburned gases escaping the stove either end up as air pollution outdoors or condense in the chimney and form creosote. Using lots of secondary air to more completely burn your fuel makes your stove burn cleaner, more efficiently, and require less maintenance.

**NOTE:** on the Dwarf 3kW LITE model, both the primary and secondary air intakes are controlled by one lever and cannot be adjusted independently.

## **TERTIARY AIR / AIRWASH (Top Control)**

The tertiary air enters the stove just above the door through the air-wash manifold. This air is preheated and washes down over the surface of the glass keeping the glass clean.

The tertiary air control is mainly designed to keep the stove glass clean, but it does contribute some air to the bottom front (primary air) of the fire.

## **RIDDLING GRATE**

The lever on the bottom left of the stove is used to operate the mechanical riddling grate. This feature was originally for coal use, but it's handy for use with any fuel. Use the riddling grate to shake ashes accumulating on the bottom of the firebox, or to settle the fuel inside your stove without opening the door. With a tool or heat proof glove, sharply pull and push the lever back and forth to shake the riddling grate.

Note that the Dwarf 3kW LITE model is not equipped with a riddling grate.

## **ASH DISPOSAL**

The ash pan should be cleaned between fires, or as needed. It's important to note that the primary air supply is fed through the back stove behind the ash pan, so this area must be kept clear to ensure the stove can function properly.

When emptying the ash pan during the fire, use the provided ash pan tool to lift out the pan, and empty the pan in a fireproof container with a well-fitting lid. The closed container of ashes should be placed on a noncombustible floor or on the ground, away from all combustible materials, pending final disposal. The ashes should be retained in the closed container until all cinders have thoroughly cooled.

# **MAINTAINING YOUR STOVE AND FLUE SYSTEM**

## **CLEANING THE STOVE**

Use a brush to collect ash in the ash pan, and empty it prior to each fire and as needed. Ashes may contain embers for hours or days after the fire goes out, so they're best disposed of in a fireproof ash bin. Improper disposal of ashes (i.e. tossing them in the kitchen trash can or sucking them up with a household vacuum) is a leading cause of stove-related house fires, so treat ashes with appropriate care. Do not use a vacuum to

remove ashes from your stove unless it is a purpose-built fireproof ash vacuum, and has been emptied of any dust or debris prior to use. Warm ashes can also release carbon monoxide.

While the Dwarf stove is equipped with a tertiary air wash to keep the glass clean, the glass will still need to be cleaned periodically. Touch up the stove glass prior to starting each fire to avoid hard-to-remove deposits. Moisten a crumpled sheet of newspaper with water and dip it in some wood ash, then use the ash to scrub the glass until the deposits are removed. Polish the glass with dry newspaper to remove any remaining ash. If hard to remove deposits have accumulated on your stove glass, a melamine foam sponge can be used to remove them.

The exterior of your stove is painted with high-temperature stove paint. As the stove wears in over time, you might scratch the paint, especially on the top cooking surface. You may periodically wipe the stove top down with a thin layer of cooking oil to cure any bare metal and prevent rust, same as you would with a cast iron skillet. Cooking oil can smoke when curing, so be sure to have the space well ventilated during the next fire. Alternatively, black stove polish can restore your stove's appearance to nearly new.

We like the look of a worn-in stove, but if you ever want your stove to look brand new again, you can repaint it with flat black Stove Bright brand high-temperature paint, which is made by the same manufacturer who produced your stove's factory coating. Alternatively, you can use other colors of Stove Bright paint to change the color of your stove or its components. Stove Bright Paint can be ordered at [tinywoodstove.com](http://tinywoodstove.com).

## REPLACING FIRE BRICKS

Dwarf stoves are manufactured using refractory fire brick on the left and right sides of the firebox. These fire bricks are designed to hold heat, shield the sides of the stoves to prolong the life of the stove body, and reflect heat back into the fire to make your burn as efficient as possible. Fire bricks can last for years of typical use, but will eventually need to be repaired or replaced. Chips and cracks can be repaired by filling cracked joints with stove cement. If fire bricks need to be replaced, correct replacement bricks can be ordered at [tinywoodstove.com](http://tinywoodstove.com).

*See Assembling Your Stove earlier in this manual for instructions on changing the fire bricks.*

## MAINTAINING THE DOOR SEAL

Your stove's door seal is designed to provide years of service, but it will wear out far sooner than the stove itself. If the stove gasket comes loose, it can be reattached with stove gasket cement. If the gasket fails to seal the firebox, the door latch can be adjusted, and/or the gasket can be replaced.

Symptoms of a bad door seal include difficulty controlling draft even with air controls closed, smoke escaping from the area around the door, or light from the fire visible through the door jamb. To inspect the seal, while the stove is cold place a dollar bill halfway in the door opening and close and latch the door. If you're able to pull the bill out from between the door and the stove with no resistance, the gasket is not sealing properly.

The door uses a cam-style latch, which can be tightened or loosened to achieve an ideal door seal. The cam (the metal tab that holds the door closed) is held in place by two nuts tightened together, one on either side of the cam. To adjust the position of the cam and tighten or loosen the door seal, loosen the nut furthest from the door, reposition the nut closest to the door, then retighten the nut furthest from the door. Retest the seal with a dollar bill. If the new position is acceptable, lock the cam in place by placing a wrench on both nuts at the same time, and simultaneously tightening each nut toward the cam. The door gasket replacement kit available at [tinywoodstove.com](http://tinywoodstove.com) also includes a shallower jam nut that can be substituted to provide greater adjustment range.

If adjusting the door latch is not sufficient to seal the door, then the gasket is worn and should be replaced. Remove the old gasket from the stove and scrape off the old gasket cement using a scraping tool like a flathead screwdriver. Cut the new braided fiberglass stove gasket material an inch or two longer than the old one, and use stove gasket cement to adhere it in place, cutting off any excess. Allow the cement to dry, then clean up any excess cement with a wet rag. Adjust the door latch as noted to achieve an ideal door seal, and then fire the stove to cure the cement.

*A door gasket replacement kit for your Dwarf Stove can be purchased at [tinywoodstove.com](http://tinywoodstove.com)*

## FLUE INSPECTION

When wood is burned slowly, it produces tar and other vapors, which combine with moisture to form creosote. Creosote vapors condense in a relatively cool flue system. When ignited, creosote deposits in a chimney will make an extremely hot fire.

The chimney connector and chimney should be inspected at least twice monthly during the heating season, or if you experience deteriorating performance or puffs of smoke entering the room. If there is  $\frac{1}{8}$ " or more of build-up on the wall of the flue, it should be removed to improve the stove's performance and reduce the chance of a chimney fire.

**Failure to maintain the flue system can lead to poor stove performance and chimney fires which can cause property damage, injury, or death.**

Depending on the installation, inspection may be done from inside the stove by removing the baffle (#11 on the parts diagram). See Step 2 of the *Assembling Your Stove* section of this manual for the baffle removal procedure, and Step 8 for the reinstallation procedure. To inspect from inside the stove, use a flashlight and mirror or a phone camera to see if there is any build-up on the interior walls of the pipe. If you have access to the roof, simply remove the rain cap and inspect the interior of the pipe from above. If you have a rear exit kit or a wall exit, the flue can be inspected by removing the cleanout cap at the bottom of the tee.

## CLEANING THE FLUE

To clean the flue, use a stiff-bristled or rotary chimney brush that will fit the diameter of your pipe. If there is excessive creosote buildup that is glossy and hard or excessively sticky, burn a creosote remover stick to loosen the buildup and make it easier to brush away. (Burning a creosote remover stick is not a substitute for mechanical sweeping.)

If possible, sweep your chimney from the top down. Remove the baffle from your stove and close the door. Remove your chimney cap and brush the interior of the pipe until the buildup is removed. Allow several minutes for the dust to settle before opening the door and cleaning the debris from the firebox. If your stove has a rear exit, clear any accumulated debris from the inside of the flue flange, and then remove the rear exit tee cap to dispose of the collected debris. Replace the tee cap (if applicable) and the baffle.

If you must brush from the bottom, use drop cloths to contain the dust until it is able to settle.

Never use a household vacuum to clean your wood stove. If you choose to use a vacuum, it must be a purpose-built ash vacuum with a fireproof canister and HEPA filtration.

The US EPA has determined that creosote dust is a probable human carcinogen. Avoid breathing creosote dust, or allowing excessive contact with your skin. Use of a NIOSH-approved respirator and gloves are recommended when cleaning your flue system.

You can purchase our favorite rotary chimney cleaning system and creosote remover sticks at [tinywoodstove.com](http://tinywoodstove.com).

## SOURCING AND PROCESSING FIREWOOD

The best natural wood fuel for your stove is thoroughly dried hardwood with a moisture content of less than 20%. A wood moisture meter is an inexpensive and useful investment if you're going to be buying firewood or curing your own. Avoid burning wet wood in your stove. For wood to burn, water must be driven off first, which consumes heat. Wet wood lowers the BTU output of the stove and cools combustion gases which can cause poor draft and creosote formation.

To cure firewood, split it and stack it loosely in a sunny location, perpendicular to the prevailing wind. Cover the top of the stack only to keep precipitation off of it. The sides should be exposed to allow airflow.

Different types of wood require different curing times, but in general, firewood needs to cure for a minimum of six months before it's used. Ideally, most firewood should be seasoned for 18 to 24 months. Most firewood purchased in bulk has not been seasoned sufficiently for immediate use, so you may need to purchase it at least a year in advance.

Even if the wood dealer says that the wood has been drying for a year, you should examine it before using it. Wood does not dry quickly until it is split and stacked. A tree that has been down for over a year might still be more than half water. Look for cracking

on the cut ends of logs and bark that is falling off as good indications that firewood is properly seasoned. Properly cured firewood will weigh less than wet wood, and will make a sound like bowling pins when knocked together. Wet wood is heavy for its size, and makes a dull thud when knocked together.

The most reliable way to tell if wood is properly cured is to use an electronic wood moisture meter. Split a log and take a measurement from the center of the newly cut surface, parallel to the grain. Properly cured wood should read less than 20% moisture content in the center of the log. If the wood reads higher than 20%, it needs a few more months to cure.

Soft wood has a lower BTU content than hardwood because it is less dense. If you burn soft woods in your stove, be sure that they are properly cured, keep the logs small and the air controls as open as possible to assist with complete burning, and inspect and clean the chimney more frequently. Avoid burning large amounts of pitchy soft wood like pine, which can cause excessive creosote formation.

*We have simple firewood moisture meters for sale at [tinywoodstove.com](http://tinywoodstove.com).*

## SOURCE IT WHERE YOU BURN IT

Firewood often contains wood boring insects, which are spread by moving firewood across long distances. Introducing a new wood-boring insect can be devastating to local forests, so be mindful of your firewood source. If possible, find firewood within 10 miles of where you'll use it. Don't travel more than 50 miles with air-dried firewood.

### RECOMMENDED FIREWOOD LENGTH

Dwarf 5kw 10-12"

Dwarf 4kw 8-10"

Dwarf 3kw 6-8"

If you must travel with firewood, look for bundles of firewood from the hardware store that are labeled "kiln dried." Firewood that has been heated in a kiln is usually safe to transport since all the insects inside it have been killed.

Manufactured pressed wood logs or bricks are also safe to transport, and are a good option for long, clean-burning fires. Used pressed wood logs made from sawdust ONLY.

## ALTERNATE FUELS

Your wood stove can be used to burn a variety of solid fuels aside from wood. Most Dwarf stoves (except for the 3kW LITE) can burn anthracite coal. Charcoal can also be used in your wood stove. You can use hardwood pellets by adding a basket insert that fits inside the firebox. You can even burn dried cow chips in your stove (yes, we've tried it, and it works but it doesn't smell great).

Unacceptable fuels for the stove include any liquid fuels, which could cause an explosion. Do not burn plywood, OSB, or other wood products containing glue, since the burning



glue can be toxic and leave hard-to-remove deposits inside the flue. Don't burn trash, leaves, or pine needles. Newsprint can be used as tinder for starting fires, but don't burn large quantities of paper in your stove.

Pressed sawdust logs are excellent fuel for your Dwarf stove, especially for achieving longer overnight burns. However, some pressed logs use a paraffin wax binder that can cause unsafe creosote buildup in your chimney. Find a list of our favorite pressed logs at [tinywoodstove.com/fuel-for-tiny-stoves/](http://tinywoodstove.com/fuel-for-tiny-stoves/).

If you're going to burn coal, we recommend anthracite coal. Bituminous coal will also burn, but it gives off a lot of soot which is bad for air quality, makes a mess on the roof, and will clog up the flue system fairly quickly. If you must burn a dirty fuel like bituminous coal, be sure to inspect and clean the flue system more frequently.

## DIRECT AIR

Direct Air is a popular upgrade for Dwarf Stoves. It allows the stove to draw air from an outside air supply so that the stove isn't using warm air from inside of the living space for combustion. The Direct Air kit for the Dwarf Stove connects the primary and secondary air supplies to outside air. A small amount of inside air is still used for the tertiary air wash to help keep the stove glass clean.

To install the Direct Air kit, bolt the optional Direct Air kit accessory over the air intakes on the underside of your stove. Using 3" stovepipe or metal dryer duct, pipe the air intake horizontally through the wall, or downward through the floor. All parts of the air duct should be at or below the level of the direct air intake. The opening on the outside of the structure should be covered with ¼" hardware cloth to prevent animals from entering. If the air duct terminates horizontally, cover the exterior opening with a hood to prevent wind from blowing directly into the pipe. The air duct should be installed with at least 1" clearance to combustibles for all parts of the duct within 5' of the stove.

There is some confusion about whether supplying a wood stove with outside air is necessary for safe operation in a small space. A wood stove exhausts all combustion products outside, so it won't deplete the oxygen in your small space the same way that a catalytic propane heater might, even if it is using room air for combustion.

Most spaces are not airtight enough to cause a problem, but if your space is very airtight, the stove might not draft well without a Direct Air kit. If this is the case, the stove will be difficult to light, and may release some smoke into the room when you first try to light it. If the stove is not drafting well but cracking a window near the stove fixes the problem, your space may be a good candidate for a Direct Air kit.

Another reason people opt to use a Direct Air kit is that it makes the stove more efficient. Instead of using your interior warm air for combustion, you use outside air. This will help keep heat inside the living space, rather than sending it up the chimney to be replaced by cold outside air being pulled in. If your space becomes drafty when operating the stove, adding a Direct Air kit may help keep cold drafts to a minimum.

## CONTROLLING HUMIDITY

In small spaces, too much humidity can be a problem. Humidity produced by cooking, showering, and breathing can build up and condense on cold windows and walls. Wood stoves produce dry heat which can lower interior humidity.

If you want less humidity in the air while the stove is running, crack a window or a roof vent. Escaping warm air will carry humidity with it.

If you want more humidity in the air while the stove is running, boil some water on the stove top. A tea kettle with the lid removed tends to work as well as a purpose-built cast iron steamer. A helpful tool is a hygrometer (humidity sensor) which can help you monitor humidity levels.

## CHIMNEY FIRES

Chimney fires are unlikely to occur when burning clean, efficient fires, combined with regular inspection and flue cleaning. However, it's important to know how to identify a chimney fire and what to do about it.

A chimney fire is caused when built-up creosote in the chimney catches fire. They tend to burn much hotter and more forcefully than normal operation.

A chimney fire sounds like an unusual roaring or low rumbling sound coming from the stove or flue pipe. It's a more intense sound than the gentle whooshing that a properly functioning stove will usually make. A roaring chimney fire is often accompanied by an intense, hot metal odor, and a cracking sound. There may be sparks, flames, or thick smoke coming from the top of the chimney.

If you have a chimney fire, you should immediately close the stove air controls, evacuate the structure, and call the fire department. Opening the stove door can dramatically increase the intensity of the fire. Do not open the stove door unless throwing in a flare style chimney fire extinguisher. In that case, close the door immediately after throwing in the lit flare.

Even if extinguished in time to prevent further damage to the structure, chimney fires can cause serious damage to flue components. If you have a chimney fire, have the flue inspected by a qualified professional. The flue must be cleaned and any damaged components must be replaced before using the stove again.

Preventing chimney fires means preventing creosote buildup with regular cleaning and minimizing the conditions that cause creosote formation. See the *Maintaining Your Stove and Flue System* section of this manual for cleaning and inspection recommendations.

Creosote forms more readily when chimney temperatures are too low, when wet or resinous wood is burned, and when air supply is restricted. See the *Sourcing and Processing Firewood* and the *Starting and Managing a Fire* section of this manual for more details.

# TROUBLESHOOTING

## ***Problem:***

***Smoke is escaping the stove when the door is open***

CAUSE	SOLUTION
The door is open	The stove is not meant to operate with the door open. Keep the door closed except for briefly loading wood into the stove or tending to the fire. Close the door as soon as it is loaded. Little to no smoke should escape if the fire is burning efficiently, but smoke can spill out if the fire is smoldering.
The fire is smoldering, producing excessive smoke	Close the door and open the air controls to provide the fire with sufficient air. Avoid opening the door when the fire is smoldering. Use smaller sized fuel to establish a hot coal bed before adding larger pieces. Use fuel that has been properly cured.
The flue is not hot enough to draft properly	Open air controls and add small pieces of fuel to build a hot fire. Continue adding progressively larger pieces of fuel until there is a hot bed of coals and the flue is up to temperature. If the coal bed burns out before the logs burn down to coals to replenish it, then the fire is not hot enough for the log size being used.
The chimney needs to be swept	A dirty flue system will not draft as strongly as a clean one. Inspect the flue system, and mechanically sweep it if there is more than 1/8" of buildup.

### **Problem:**

## ***Smoke escaping from the stove when the door is closed***

<b>CAUSE</b>	<b>SOLUTION</b>
Newly installed stove has paint that is not yet cured	Stove paint must be heat cured, and it will smoke whenever it reaches a new high temperature. If you skipped the outdoor burn step in the <i>Assembling Your Stove</i> section of this manual, or did not burn it hot enough, smoke will come off the stove as the paint cures. Open the windows and doors of your space to ventilate the paint fumes. It may take several burns before the paint is fully cured, but subsequent burns will generally not off-gas unless reaching a new high temperature.
The flue is not hot enough to draft properly	It's important that the flue system is brought up to temperature as quickly as possible when starting a fire. Use dry kindling to build a hot fire quickly, which will heat the flue and produce draft. If you build a smoky fire before the flue is hot enough to draw out the smoke, there may be smoke escaping from the air controls. If you are using a wall exit in an especially cold climate, consider burning smoke-free firestarters in your stove to warm your chimney before adding kindling. See the <i>Starting and Managing Fires</i> section of this manual.
Restricted or blocked flue	A dirty flue system will not draft as strongly as a clean one. Inspect the flue system, and mechanically sweep it if there is more than 1/8" of buildup.
Depressurized house	Close windows and vents in the upper areas and the downwind side of the structure. Turn off any exhaust fans, including HRVs or ERVs operating in "exhaust only" mode.

***Problem cont:***

***Smoke escaping from the stove when the door is closed***

CAUSE	SOLUTION
Not enough air supply available	Crack a window open in the same room as the stove to provide additional air supply. If this fixes the problem, consider installing a Direct Air kit. The window should be as close to the stove's height as possible and on the windward side of the structure. Cracking a window or vent at the top of the structure or the downwind side may cause warm air to escape rather than cold air to enter, which could cause more draft issues.
Wind creating a downdraft	Make sure the chimney opening is at least 3 feet above the roof line or 2 feet above anything within 10 feet. Trim trees if they are within 10 feet and upwind of the flue. When located in an area prone to high winds, consider replacing the roof vent with a wind-directional rain cap.
Insufficient chimney height	If the chimney is shorter than 60" from the top of the stove to the chimney opening (or 80" if using a wall exit), or the chimney opening is less than 3 feet above the roof line or 2 feet above anything within 10 feet, consider adding additional sections of chimney pipe. If you are operating the stove at high altitudes, consider adding additional sections of chimney pipe.
Poor flue design	See the <i>Flue Design</i> section of this manual. Consider using a roof exit instead of a wall exit, eliminating elbows, and/or replacing some interior stovepipe with insulated pipe. When adapting the stove to a chimney size other than the flue collar size, consider replacing the flue with the proper sized stovepipe or adding a properly sized liner.

***Problem:***  
***Stove Not Providing Enough Heat***

CAUSE	SOLUTION
Poor combustion	Open air controls further. Use smaller sized fuel to create a hot coal bed before using larger logs. If the coal bed burns out before the logs burn down to coals, the fire is not hot enough for the log size being used.
Poor fuel	Use properly cured hardwood fuel for the stove. Try using store-bought kiln dried hardwood to see if that fixes the problem. Wet wood can decrease your stove's heat output by 50%. Check the moisture content of wood using a moisture meter. Avoid using softwoods that have a lower BTU content than hardwoods.
Cold drafts from doors and windows when using stove.	Consider using the Direct Air kit to feed the stove with outside air rather than air leaking in through door and window gaskets.
Space too large, too cold, or not sufficiently insulated	Other than switching to a larger stove, adding insulation to the structure and fixing air leaks to improve heating performance is the best solution. In extreme climates, covering windows with thermal shades or bubble insulation, or adding skirting below the structure can significantly improve heat retention. If there are roof air vents, consider purchasing insulating covers for them. Consider adding rugs to better insulate floors, or tapestries to insulate walls. Check the door and window gaskets for leaks and replace if necessary. Add the Direct Air kit to feed the stove with outside air rather than sending warm inside air up the chimney.

## ***Problem: Fire Bricks Cracked, Broken, or Worn***

<b>CAUSE</b>	<b>SOLUTION</b>
Normal Wear	Fire bricks should last for years of normal use but will eventually need repair or replacement. Repair cracks with stove cement. Replace bricks if they cannot be repaired. See the <i>Maintaining Your Stove and Flue System</i> section of this manual.
Rough Usage	Repair or replace bricks as above, and avoid striking bricks or wedging logs against bricks.

## ***Problem: Dirty Glass***

<b>CAUSE</b>	<b>SOLUTION</b>
Normal accumulation of soot	Clean the stove glass by crumpling a sheet of newspaper, dipping it in water and then wood ash, and using the ash to scrub the stove glass. Clean stove glass regularly to prevent difficult to remove buildup.
Tertiary airwash control closed	Try to keep the tertiary air control at least 50% open while operating the stove. The primary purpose of the tertiary air control is to provide an air wash over the stove glass to help keep it clean.
Fire too close to glass	Try to keep fuel toward the back of the stove, and the cut ends of logs pointing away from the glass. If fuel burns too close to the glass, it can overpower the tertiary air wash.
Poor fuel choice or burn technique	Burn properly cured hardwood fuel if possible. Avoid burning wet wood and sappy softwoods like pine. Avoid smoldering fires. Don't burn trash or large amounts of paper. See the <i>Sourcing and Processing Firewood</i> section of this manual.



### ***Problem: Fire Goes Out***

<b>CAUSE</b>	<b>SOLUTION</b>
Insufficient air supply	Keep air controls open enough to burn a hot, efficient fire.
Logs are too big	Use smaller logs or burn hotter fires. If the coal bed burns out before the log burns down to coals to replenish it, the logs are too large for the fire.
Wood is too wet	Use only properly cured wood to fire the stove. Consider purchasing a moisture meter to test fuel.
Draft is too weak.	It's important to bring the flue system up to temperature as quickly as possible when starting a fire. Use lots of small, dry kindling when starting a fire to heat the flue and establish a bed of hot coals as quickly as possible. See the <i>Starting and Managing Fires</i> section of this manual.

### ***Problem: Stove or Flue Glowing Red***

<b>CAUSE</b>	<b>SOLUTION</b>
Over-firing stove	Close all air controls to cool down the stove, and resume the fire after temperatures are back in normal operating range. Add fuel gradually to prevent over-firing the stove. Use air controls to adjust the intensity of the fire. Check door gaskets when stove has cooled to make sure they are properly sealing. Repeatedly over-firing can cause damage to the stove and flue components, and risks causing chimney fires. See the <i>Maintaining Your Stove and Flue System</i> section of this manual.

## ***Problem: Excessive Creosote Buildup***

<b>CAUSE</b>	<b>SOLUTION</b>
Poor fuel choice	Use only properly cured wood to fuel the stove, hardwood if possible. Invest in a moisture meter to ensure wood is properly cured.
Frequent smoldering fires	Avoid choking the fire down with the air controls. If lots of dark smoke is visible from the chimney, the fire is smoldering. Burn hotter, more efficient fires by using smaller logs and maintaining a good bed of coals.
Inadequate maintenance	Inspect and clean the chimney more frequently. See the <i>Maintaining Your Stove and Flue System</i> section of this manual.
Draft is too weak.	It's important to bring the flue system up to temperature as quickly as possible when starting a fire. Use lots of small, dry kindling when starting a fire to heat the flue and establish a bed of hot coals as quickly as possible. See the <i>Starting and Managing Fires</i> section of this manual.
Poor flue design	See the <i>Flue Design</i> section of this manual. Consider using a roof exit instead of a wall exit, eliminating elbows, and/or replacing some interior stovepipe with insulated pipe. When adapting the stove to a chimney size other than the flue collar size, consider replacing the flue with the proper sized stovepipe or adding a properly sized liner.

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