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## The Ring of Fire Kiln – A Better Biochar Kiln

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*The Ring of Fire Kiln. Copyright 2020 Wilson Biochar, LLC.*

The Ring of Fire kiln is a metal container for converting waste wood and brush into biochar, a valuable soil amendment. The kiln consists of an inner ring composed of three sheets of mild steel that are bolted together. An outer ring of lighter gauge steel bolts onto the brackets that hold the inner ring together. The purpose of the outer ring is to serve as a heat shield that holds in heat for better efficiency. Total volume of the kiln is 3 cubic yards. When using dry, small diameter brush and branches, one person can produce a cubic yard of biochar in 3-4 hours, consuming 6-10 cubic yards of brush.

<b>Ring of Fire Biochar Kiln Specifications</b>	
Kiln diameter (with heat shield)	77 inches
Kiln height (with heat shield)	44 inches
Kiln total volume:	3 cubic yards
Kiln weight (fully assembled)	238 pounds
Number of kiln body sections	3
Weight of one kiln body section	40 pounds
Number of heat shield sections	6
Time to assemble in the field	15 minutes
Burn time to make 1 cubic yard biochar	4 hours
Time to quench and load finished biochar	1/2 hour
Number of workers needed	one to two

<b>Ring of Fire Biochar Kiln Components</b>		
<b>Quantity</b>	<b>Part Name</b>	<b>Description</b>
3	Kiln Body Sheet	18 ga CR steel sheet 40" x 72"
6	Heat Shield Sheet	26 ga sheet 20-1/4" x 81"
3	Connector Bracket	Angle 2" x 1-1/2 " x 1/8" – 40"length
9	Heat Shield Bolts	3/8" x 1" bolts - standard
18	Fasteners	3/8" wing nuts



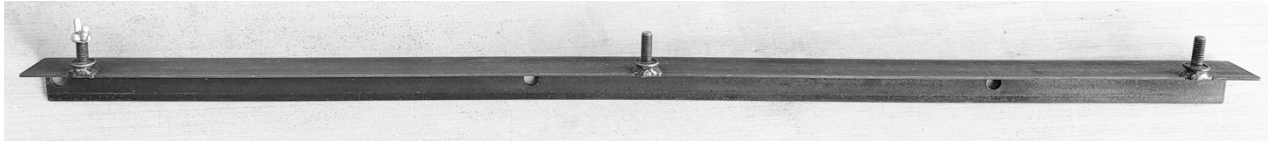
*This slash pile made a cubic yard of biochar in 4 hours.*

## Kiln Assembly Instructions

1. Clear a level area of ground of all flammable materials (short green grass is fine) for a diameter of 8 feet where you will assemble the Kiln.
2. Assemble the Kiln Body first, using the three Connector Brackets to connect the three Kiln Body Sheets. The Connector Brackets have one end with a drilled hole that is very close to the bracket end. The other end of the bracket does not have a hole. Orient each Connector Bracket so that the end with drilled hole is on top. Insert the Connector Bracket studs into the holes on the Kiln Body flanges. Hand tighten the wing nuts on the studs to secure the Kiln Body Sheets.
3. Attach the six Heat Shield Sheets to the Connector Brackets using the included Heat Shield Bolts. The sheets will overlap with each other. It is easiest to loosely attach the three lower level sheets first, and then attach the upper level sheets. Finally, tighten all the wing nut fasteners, hand-tight, to secure the Heat Shield Sheets.
4. Before loading and lighting the kiln, you must seal the bottom edge of the Kiln Body against the ground. Use a shovel to push mineral dirt up against the Kiln Body to prevent air from getting into the Kiln. **Failure to take this step will cause the Kiln Body to get too hot, and it may warp excessively.** However, even if this happens the Kiln will still be functional.
5. The kiln will warp somewhat with use and it will become discolored with soot. This will not affect the functioning of the Ring of Fire Biochar Kiln.



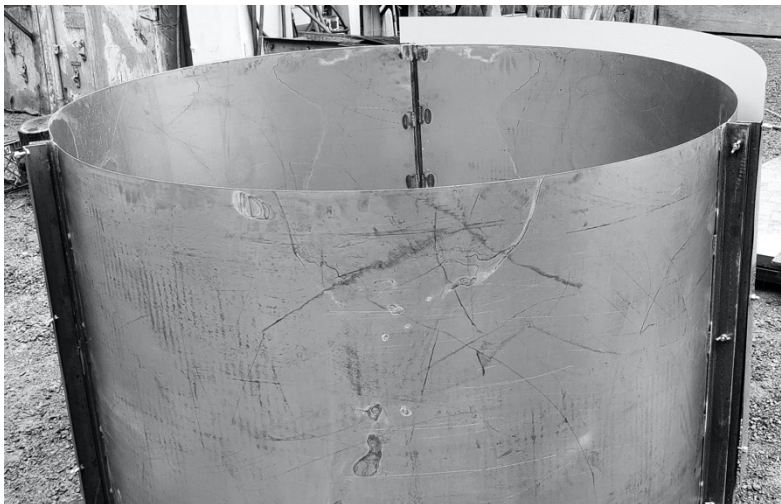
*Partially assembled kiln showing the bracket that holds the Kiln Body sheets together and provides a means of attaching the heat shield.*



*The Connector Bracket. The Ring of Fire Kiln comes with 3 Connector Brackets. Note that one end has a drilled hole that is very close to the end of the bracket. Place the bracket so this end is on top.*



*The Connector Bracket showing the arrangement for attaching the Heat Shield. The Heat Shield extends 4 inches above the top of the Kiln Body.*



*Above: Kiln Body assembly complete.*

*Right: Inserting the Connector Bracket through the end flanges of two Kiln Body sections to connect them.*





*It is easiest to attach the bottom Heat Shield sheets first.*



*Completely assembled kiln. Notice that the kiln bottom has been sealed by pushing up dirt around the bottom edge.*

## Instructions for use

### The Ring of Fire Kiln Basic 3-Step Method:

1. This method starts by building an open pile in the container, lighting it on top, and letting it burn until it collapses and coals begin to form.
2. The operator then switches to a second stage of adding small amounts of new material on top of the coals, one layer at a time, until the container is full.
3. When the kiln is full of hot char, and the flames are gone, quench it with water to save the charcoal

The Ring of Fire Kiln must be continually tended, adding new fuel before the charcoal turns to ash. As each new layer of fuel bursts into flame, the heat transfers by radiation into the partly charred material underneath, which continues to char, releasing gasses for the flame. The flame also consumes all the air that might otherwise reach the char underneath. The combination of flame on top and the closed bottom preserves the char until it can be quenched and saved.

### Detailed Steps:

**Feedstock moisture:** Ideally, moisture content should be below 25%. Wet wood should be tossed aside and not used until it dries out. You will burn up too much wood to create the heat needed to dry the feedstock. A moisture meter for checking firewood costs about \$30.

**Feedstock size:** ideal size is between 1 and 4 inches thick. If the feedstock is very dry, thicker pieces can be successfully charred. Feedstock can consist of brush, branches, small logs, old lumber, mill ends or any clean biomass material that will not pack down. Wood chips will not work well because they pack down and exclude the air needed for combustion.

**Assemble the kiln:** assemble the inner kiln pieces on flat ground. See Kiln Assembly Instructions.

**Seal the kiln bottom.** You **MUST** seal the bottom of the kiln so that no air can enter from the bottom. Use mineral dirt, clay or sand, not flammable material. If the kiln is NOT properly sealed, it will not operate properly. The kiln will also get too hot and the metal will warp.

**Initial filling of the kiln:** Best practice for lighting is to stack an initial pile of medium size material (1-2" thick is ideal) in the kiln. This pile should fill the kiln up to slightly above the kiln rim. On top of the pile of medium size material, place a densely-packed pile of small, very dry brush for kindling. This can be about 12 inches high.

**Lighting:** Light the kindling and make sure the flame is spread evenly across the top. A propane torch is helpful but not necessary if the fuel is dry. Avoid using liquid accelerants.

**Tending:** Once the initial pile burns down to glowing coals, begin adding more wood. Add a new layer of wood when the previous layer begins to show a film of white ash. Try to keep each layer of wood the same diameter so that charring is even. Add your biggest material in the middle stages of the burn so it has time to char completely.

**Finishing:** As the kiln fills with red hot glowing coals, make the last few layers of medium sized material to allow any larger pieces to finish charring. The charring is complete when the flames die out. Don't worry if bigger pieces are not fully charred. After you quench, just set them aside for the next burn.

**Quenching, phase 1:** When all the flames are gone, begin adding water in a gentle spray to the top of the kiln. Take care not to use a strong spray because it can drive air into the kiln and force a cloud of black particulates into the steam.

**Quenching, phase 2:** Once the kiln walls have cooled enough to touch, disassemble the heat shield and set it aside. Then disassemble the main kiln body and move it away from the hot biochar. Keep spraying water on the biochar while you rake it thin so it loses heat. Once the biochar is cool enough to touch with your bare hands, you can transfer it into bags or containers for storage.



*Initial loading of the kiln. It is best to use material that is one to two inches thick. Fill the kiln to the about one foot above the top and light it evenly across the entire surface. This first charge will burn down quickly to form a solid bed of glowing coals. At that point, add more material.*

**CAUTION: Do not use the Ring of Fire Biochar Kiln unless you have been trained and are experienced in all aspects of fire safety for conducting an open burn.**



*Quenching the biochar: spray and rake it thin so it loses heat.*

### Useful Tools:

You may want to acquire the following tools to help with efficient biochar production:

1. Wood moisture meter
2. Propane torch for lighting
3. McCleod fire rake







**LIMITED WARRANTY:**

*Wilson Biochar, LLC warrants to the original purchaser that the Ring of Fire Kiln is free from workmanship and material defects for one year from the date of purchase. If a product is defective, Wilson Biochar, LLC, at its option, will repair or replace with a new product free of charge, excluding any applicable shipping and handling charges. If the product being warranted has been discontinued, the replacement product will be of equal or similar value. Altering any Wilson Biochar, LLC product, or using the product in any way other than the intended use, will void this lifetime warranty. No warranty is offered on rust, paint or finishes due to being made with material with potential for corrosion. Steel products will develop a natural iron oxide patina over time. Wilson Biochar, LLC's liability and obligation is limited to repair or replacement of the product, at their option. The purchaser must provide Wilson Biochar, LLC with photos of the product's defects for evaluation. Upon approval of warranty, Wilson Biochar, LLC will issue a return for repair, or return for exchange of the defective product. This warranty does not cover damage or product failure caused by accident, misuse, negligence, tampering, modifications, act of war, overloading, improper attachment, improper maintenance, or failure to maintain. Wilson Biochar, LLC is held harmless for any injury or death caused by the misuse of this product. This warranty gives you specific legal rights providing said product is put to its proper designated use. This warranty is expressly in lieu of all other warranties, express or implied, including the warranty of merchantability and fitness for a particular purpose. No oral agreement, guarantee, promise, representation or warranty shall be binding. In no event will Wilson Biochar, LLC be liable for any special, indirect, incidental or consequential damages even if Wilson Biochar, LLC has been advised of the possibility of such damages and even if Wilson Biochar, LLC has knowledge that failure to perform could cause consequential economic losses. In any event, cumulative damages for breach of this warranty will be limited to the amount actually paid to Wilson Biochar, LLC for the product. This paragraph shall apply to all actions related to the product, whether based on tort, contract or other theories. The purchaser acknowledges that this paragraph allocates the risk of product failure between Wilson Biochar, LLC and the purchaser, and that this allocation is reflected in the price paid.*