

Designed and Fabricated by Joshua B. Guinto and the Fabrication Team
For the Culinary Education Foundation
Katipunan Avenue, Quezon City
April 2016

The Brick InStove for Braising

The Brick InStove for Braising

- Introduction
 - The stove was constructed for the renewable energy program of the Culinary Education Foundation
 - It was in response to the need of cutting down the cost of gas and electricity of the Cravings Restaurant.
 - The restaurant was awarded their ISO Certification in 2014.
 - Their energy saving campaign would be among their cutting edge performance for the certification.

The Brick InStove for Braising

- The Design
 - From thousands of stove designs, the author decided to adopt the mechanisms of the InStove that was developed by the Aprovecho Research Center at Oregon. The InStove (Institutional Stove) utilizes the principles of the rocket stove and then applied for big scale operations including humanitarian missions.
 - It further created the double skirt walls which maximizes the contact of the hot gases to the walls of the pot before it goes out the chimney. The InStove is made purely of metal.

Share

f 238
Twitter
G+
in
+ 38



60 and 100 Liter InStoves

High Performance

- **75 to 90 percent fuel savings.** Two or three kilograms of fuel is enough to cook a full pot of food.
- **90%-plus reduction in harmful emissions,** including carbon monoxide and black carbon. InStoves produce no visible smoke.
- **Twice as fast** as cooking on an open fire – comparable to LPG.
- **50% thermal efficiency,** a 2 to 5 times improvement over traditional methods.

Safe

- **Zero Indoor Air Pollution,** thanks to an integrated chimney that can route all emissions outside and away from people.
- **Safe to the touch.** Efficient, insulated design ensures safe surface temperatures to prevent burns.
- **Stable.** Practically tip-proof to reduce the chance of spills and scalds.

Practical

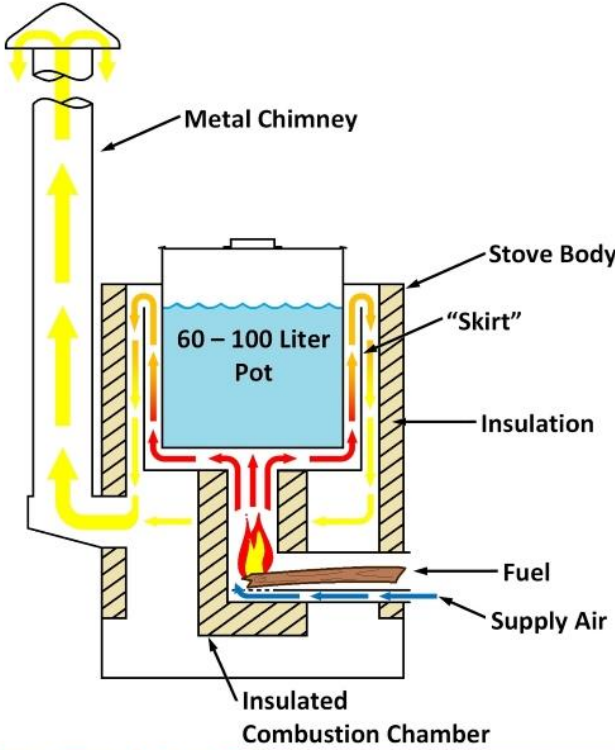
- **Fuel flexibility.** Efficient operation with a variety of biomass fuels in addition to wood, including our sustainable biomass briquettes.
- **Durable.** InStoves are expected to last 10 years with replaceable parts and all stoves come with a 1 year warranty.
- **Cost-effective.** Our cookstoves can pay for themselves many times over in fuel savings, alone.
- **Portable.** No permanent installation is required, making InStoves easy to transport and relocate.
- **Local manufacturing** can be set up anywhere in the world with our Factory-in-a-Box production method.

The Brick InStove for Braising

Click here to learn more about InStove features and performance.

How it Works: Rocket Stove Technology

At the heart of these stoves is an advanced, insulated metal combustion chamber built from high-temperature 310 stainless steel and 601 nickel alloys. The "rocket stove" design concentrates heat and mixes combustion gasses to create operating temperatures in excess of 1100 degrees Celsius, which allows the stoves to literally "burn up the smoke." This produces a fire that is cleaner and more efficient than is possible otherwise. In fact, we believe testing shows our institutional stoves to be unparalleled in performance. Official, third party test results are available [here](#).



Labels in the diagram: Metal Chimney, Stove Body, "Skirt", Insulation, 60 - 100 Liter Pot, Fuel, Supply Air, Insulated Combustion Chamber.

Share

- f 238
- Twitter
- G+
- in
- + 23

Windows taskbar: 11:01 PM 4/11/2016

Source: <http://www.instove.org/60-100-liter-cookstove>

The Brick InStove for Braising

The Design

Meanwhile, the author, with the experience earned with fire bricks, decided to create the brick equivalent of the InStove in combination with metal. The bricks would outlast any metal and also promotes local manufacturing among communities with a good source of clay.



The Brick InStove for Braising

Fabrication Stage

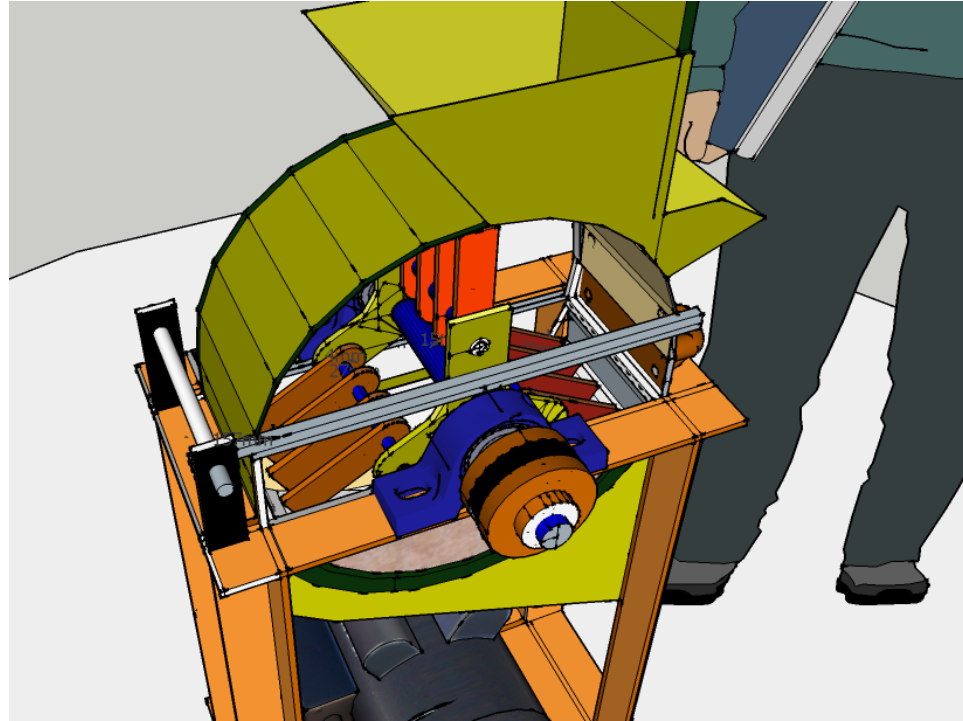
The bricks were manufactured at the author's workshop at Daet, Camarines Norte. The clay recipe makes the brick light but durable enough to bear the load of the pot which could weigh as much as 55 kg at full capacity.

Photo shows the brick press that the author designed and fabricated in 2004.



The Brick InStove for Braising

On March 2016, the author designed and fabricated another machine , that is the hammermill. This machine was then used extensively to mill the dried clay For the bricks.



The Brick InStove for Braising

After drying, the bricks were then baked in the kiln.



The Brick InStove for Braising

Fabrication Stage

All the bricks had to be packed and sent on a bus to Manila where they are picked up by the truck of the restaurant.



InStove for Braising

Fabrication Stage

Constructing the InStove using primarily bricks faces several challenges.

First, the fire box required an arch to hold the fuel magazine, the fire chamber and then all the weight of the heavy pot. Second, another layer will have to bear the weight of the insulating skirt.



The Brick InStove for Braising

Fabrication Stage

At the onset, the bricks had to be shaped to form a cylinder when stacked together.



The Brick InStove for Braising

Fabrication Stage

Trying to make sense of the design into the actual construction mode required a lot of re thinking.

Another stainless metal sheet (not shown in the photo) act as the skirt around the pot.



The Brick InStove for Braising

Fabrication Stage

During the first round of test with the fire box, I realized that the 400 square cm, that is 20 cm on one side of the fire box is much too large. It gives a big flame but consumes too much fuel.



The Brick InStove for Braising

Fabrication Stage

Some adjustments had to be made to reduce the cross section area, bring the hot gases closer in contact and to improve the draft.



The Brick InStove for Braising

Fabrication Stage

There was also a question whether a receptacle to hold the incoming fuel is necessary.



The Brick InStove for Braising

Fabrication Stage

The bricks were joined using a mortar from a mixture of equal parts of grog (pulverized bricks), carbonized rice husk and clay.

Notice the canals and holes in each brick. The holes serve to reduce the weight of each brick. A rebar may also run through this hole if necessary.

The canals serve to hold the mortar to better bind each brick together.







The Brick InStove for Braising



The Brick InStove for Braising

Fabrication Stage

After the first round of installation, I decided to move the entire stove to face another direction to allow better movement of fuel and operator.

The bricks are now held by an angle bar as support. Notice the arc that now forms the fuel magazine.



The Brick InStove for Braising

Fabrication



The Brick InStove for Braising

■ Test Results

- On 14 and 15th of April, the stove was tested with the following results.
 - 50 liters of water boiled in one hour
 - Less than 4 kg of dried buko shells was used.
 - According to the Master Chef of the restaurant, it takes them one hour to boil the same amount of water in the same pot using their electric stove at their regular kitchen.
 - The client was very pleased with the results. In fact she had me repeat the test to verify the result.

The Brick InStove for Braising

Test Results



The Brick InStove for Braising

- Lessons and Innovations
- **1.** The start up ignition will be very quick if a small flame is lit inside the chimney. This quickly cause a hot column of of air to rise up the chimney and quickly pull up the smoke.

The Brick InStove for Braising

Lessons and Innovations

2. To close the gap between the skirt and the insulating bricks, a flap was fabricated out of stainless metal sheet. The flap was fastened with a bolt thus firmly attaching it to the pot.



The Brick InStove for Braising

Lessons and Innovations

By mere intuition, I decided to leave the gap between the fuel magazine and the insulating brick skirt. I suppose it will help the stove pull in some secondary air.

The flame shows that it does pull in some air.



The Brick InStove for Braising

Lessons and Innovations

The square tube shape of the chimney allowed me to save a lot of difficulties in making the corners. I simply had to cut a 90 degree angle at the elbow and the chimney quickly folds into a 90 degree corner.



The Brick InStove for Braising

- **Questions**
- **With the stove still on its early testing stage, there are still many questions unanswered.**
 - What is the efficiency of this model?
 - Is it durable? How long will it last?
 - Can it be used with a wok ?

The Brick InStove for Braising

More news in the coming months.
Until then.

Thank you for viewing and for your remarks!!