



EcoPich Rocket Heater

Practical Construction Classes Coming Soon!

Overview for
Construction
Using
Refractory
(Ceramic)
Boards

This document gives an overview of a simple
Rocket Heating System.

For more detail:

vimeo.com/ondemand/rmh
permies.com/w/rmh-builders-guide
walkerstoves.com/innovations

For free consults
or more info,
contact:

Signal



WhatsApp



Telegram



email: Leslie@ResilientVillageUkraine.org



First Project Goals (SMART goals need. Some points could be notes or objectives under each goal)

- Build a quick heating core based on Rocket Stove technology , that can be used for manywartime applications.
- Estimated completion time per unit (depending on skill level, materials, and learning curve for various designs):
 - 10 – 30 work hours after gathering materials sources
- The prototype will be similar to the desgin created last winter and shown in the photo.
- Recommended for out-buildings and emergency usage until engineering specifications and housing code can be adapted.
- Completed items will initially be donated to military and civilians in greatest need.
- Like drone production, the design will be altered as needed using active feedback system of recommended improvements.
- Our team will need to oversee each installation to ensure safety standards are met.
- The system could be built with a thermal storage mass and cooking surface or serve as an efficient stand-alone wood/biomass heater wherever an exhaust chimney pipe can be set up.
- Future creations can encorporate many different desgn features, dependending on need.
- If cob & masonry materials can be sourced, various forms of mass thermal storage can be added to extend the warmth generated by a 2-4 hour burn time - up to 48 hours by using this design as the heating core for a full Rocket Mass Heating System.



Rocket Heater Combustion Chamber Using Refractory (Ceramic) Boards



Construction Materials

- Ceramic Board – new or used, 2 sheets, ~ 2.5 cm, 1m x 1m sheets
- 10 Split (thin) firebricks
- Heat-resistant stove cording (rope seal) - 538°C (1020°F), 14 mm suggested, 2 m for one heating unit (lower temp sufficient for barrel to manifold. However, extra cord may be used for door of a batch box design in the future, requiring higher heat resistance: 1260°C)
- Stove rope adhesive (see last slide for temperature range)
- Plumber's tape

Additional material options:

see slide # 10 “Finishes for Ceramic Board Cores”

See next four slides for:

Chimney pipe

Manifold

Bell or Barrel options



Chimney pipe

- 152mm (6 inch) single/double wall up to 3 feet above roof
- Accessories
- T joints - 3 (mass/chimney, 2 cleanouts)
- End cap
- Butterfly valve
- Chimney cap + screening
- Chimney installation package to match size of pipes used - 152mm

OPTIONAL:

Thermal Mass Bench Heat Conductor (Function of size and layout)

- Option 1 stratification chamber
half barrel or similar aluminum/steel sheeting
- Option 2 ducting/chimney pipes $\geq 152\text{mm}$ – single wall
Length depends on size of thermal mass bench



RMH Pipe Diameter and Room Size

- **Small Rooms/Small Cabins (100–200 sq ft / 10–20 m²):**

Use a **100mm (4-inch) system**. This smaller diameter keeps the system in scale with the lower heat requirement.

- **Average Room/Small House (200–500 sq ft / 20–45 m²):**

A **150mm (6-inch) system** is considered the standard size for most homes, efficiently heating a moderate space, often requiring a 150mm x 150mm or 150mm x 200mm firebox.

- **Large Room/Open Plan (500–1000+ sq ft / 45–90+ m²):**

A **200mm (8-inch) system** is needed for larger spaces, typically employing a batch box design to handle the increased fuel load.

Key Design Principles

- **Heat Riser Diameter:** The core diameter (heat riser) is usually 150mm for standard, with 200mm used for higher output needs.

- **System Sizing:** A 150mm (6-inch) rocket stove is generally sufficient to heat a 34x30 shop (approx. 1000 sq ft) when used as a batch box design, though 200mm is safer for larger, poorly insulated, or open-plan areas.

- **Avoid Scaling Down:** Reducing the ducting size by 50% can cut flow area by 75%, causing performance issues, so sticking to the standard 150mm or 200mm for the heat riser is critical.

For most residential applications, a **150mm (6-inch) system** is recommended to balance heat output and efficiency.

Experimenting with Manifold & Bench Options

- Stratification chamber versus pipe to be decided
- Dependent on available materials at best price

**Manifold Required
Bench optional**



Pipe systems are the long-time standard >>

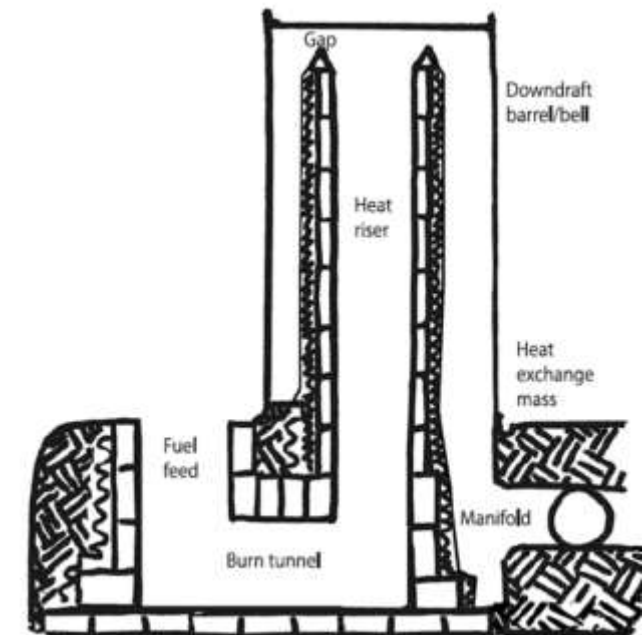
<< Very little info is available on stratification chambers.



**A
Simple Manifold**

>>

Designed ourselves for a small location in an automotive workshop.
Kharkiv,
December 2025.



Simple
“drum” from
rolled, thin
steel sheet
with solid top
to withstand
535+ C
Too thin for
long-term,
safe use



Long-Time Standard: Drums or Barrels

The most common industrial steel drum size in Ukraine, as in most regions, is the

- 55-Gallon Drum (Standard): 200–210 litre**

These standard industrial, cylindrical, welded containers are widely used for shipping liquids and solids, with standard dimensions typically featuring a diameter of about 584 mm (23 inches) and a height of 876 mm (34.5 inches) - preferably with a clamp-on lid for easier assembly.

or

- 35-Gallon Drum:** A 34.7 Liter, 166mm (17-inch) diameter steel food barrel can be used.

Unless you are trying to heat a large house, a 6" system may be right, which just happens to be the largest size that will conveniently work with a 35 gallon drum.

The drum should be removable for cleaning and servicing. Stove cording with thermal adhesive is generally used to give a tight seal between the manifold and drum/barrel bottom.

A Clean Barrel for the Bell

The bell is steel or stainless steel, airtight, and free of unsuitable paints and debris. You can approach finding the right barrel in a number of ways:

1. Get a recycled barrel, such as a food-grade 55-gallon drum. Remove the paint by abrasion, which means sand-blasting, sanding, or grinding; OR burning the barrel outdoors. See sidebar, "Pocket Rocket," later in this chapter.
2. Salvage an old water-heater tank or similar cylinder: remove all fittings and contents. Taking steps to prevent pressure explosion, leave one end sealed and cut the other open. Remove surface paint as above. Interior enamels may be left in place or removed.
3. Purchase a clean, unvarnished stainless steel drum directly from a manufacturer. (If varnished, remove varnish by abrasion or burning, as above.)
4. Commission a custom stainless or weathered-steel cylinder (or a similar column shape, such as an octagon or hexagon) from a qualified local welder. To maintain performance comparable to barrels we've tested, the steel should be at least 12-gauge, 20 to 24-inch inside diameter, 28 to 40" interior height, with airtight construction including an airtight lid or sealed top.

Protect the clean, bare metal with a heat-tolerant coating. You can use a high temperature paint or enamel, such as engine block or woodstove paints rated for 1200 to 2000°F, but we more often simply use food-grade oil such as coconut or safflower oil, and cure the barrel in place like a cast-iron pan.

For decorative options, see "Barrel Decoration," in Appendix 6.

TOOLS

to bring, find at debris sites, or purchase:

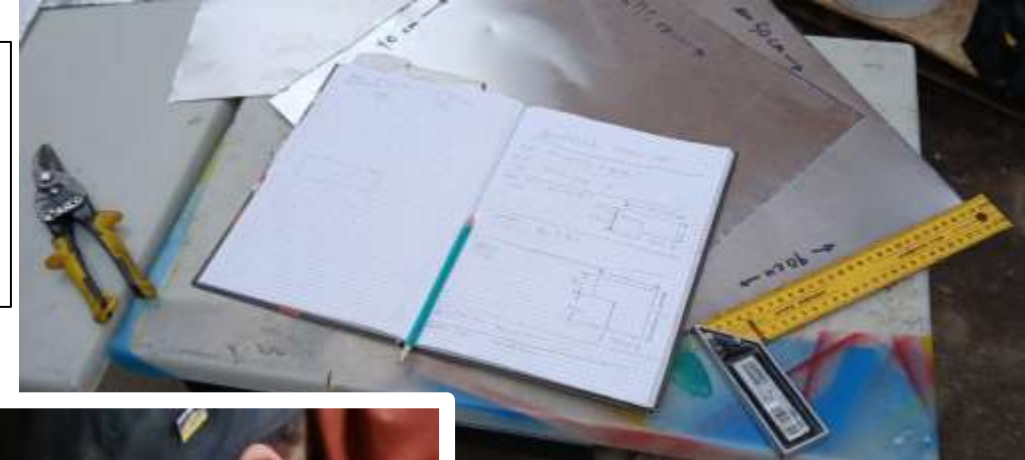
- Utility or pocketknife, bread cutter, hand saw (for ceramic board)
- Builder's level –1 meter long is best
- Builder's square
- Probe-type chimney thermometer
- Tin snips
- Measuring tape
- 30-40 Finishing nails (or similar gauge wire)
- PPE: Safety mask & goggles, gloves
- Basic tools: Pliers, Wrenches, Hammer, assorted nails, screwdriver, assorted screws
- Chimney roof framing, possibly heater foundation: dimensional lumber, insulation
- Firewood and fire starter – small sticks, tree branches, construction trimmings (no treated lumber), cardboard, paper, charcoal, straw, animal dung, etc. Must be dry!

For masonry/cob work:

- Shovel & pitchfork or similar tools (full sized and hand tool versions)
- Wheelbarrow
- Buckets and mixing trays for mortar and cob
- Brick hammer and chisel
- Mason's trowel
- Tarps, burlap/plastic storage bags or plastic sheeting 1 or 2 at least 4 meters long and 2 meters wide total
- Metal mesh screening (about 1/8" for sifting sand and up to 1" for simple rocket stove model)

NOTE:

We design these resilience projects with lack of electricity in mind. You certainly may use power tools!



Cutting Ceramic Boards:

Hand Saw/

Fine-Tooth Saw:

A good alternative for manual, controlled cuts, offering a smoother edge than a utility knife on very thick pieces.

or

Utility/Insulation Knife:

Use a knife with a long, sharp blade. Score the foam, then make several passes to cut through the depth.

Hot Spots

Materials used must meet or exceed heat requirements

The Rocket Mass Heater Builder's Guide, Ernie & Erica Wisner
vimeo.com/ondemand/rmh permies.com/w/rmh-builders-guide

	Celsius	Fahrenheit
Firebox exterior	~ 315 C	~ 600 F
Burn tunnel & heat riser	650 – 1100+ C	1200 – 2000+ F
Heat exchanger - Barrel exterior (Top is hottest)	315 – 537+ C	600-1000+ F
Connecting pipes	still hot to the touch	but gradually cooling
Exhaust/Chimney	60 – 90 C	140-190 F
Mass	38 – 148 C	100 – 300 F

Rocket Mass Heater Internal Combustion Temperature Maximums



Refractory materials must withstand 2000+ F
Actual temperatures vary based on design, type of fuel, and point in the burn (burn phase)



infrared (IR) thermometer
also commonly known as a temperature gun or non-contact pyrometer. It is an essential diagnostic tool used to measure surface heat.



Finishes for Heating Cores

Use recycled materials as much as possible to keep cost low and give new life to war debris.

Ceramic board is the most expensive component. Used pieces could be extracted from old heating systems where insulation from extreme heat is needed. From recycled heating systems and automotive hoods to factory trimmings from new boards.

For example, a destroyed oven may provide:

- ceramic core insulation board
- thermal braiding from oven door.
- heat-resistant metal, hardware...

Suggested Research:

Even small pieces of board could be fitted together over a pre-cut exterior metal panel with thermal glue to adhere the smaller pieces together and firmly attached to the metal. Vermiculite could be glued in place as a filler.

Questions and concerns could be posted at Permies.com with very active ongoing conversations including top experts in the field.

Outer Components Stand-Alone Heating Core

Consider:

- Aluminum sheeting (gauge to be decided)
- L-shaped and corner bracing
- Handles for the 2 sections if portability is needed
- Hinges to secure the 2 sections - oven braiding recommended for the joint where the two pieces connect

Outer Components
For an internal core that will be covered with a more permanent exterior

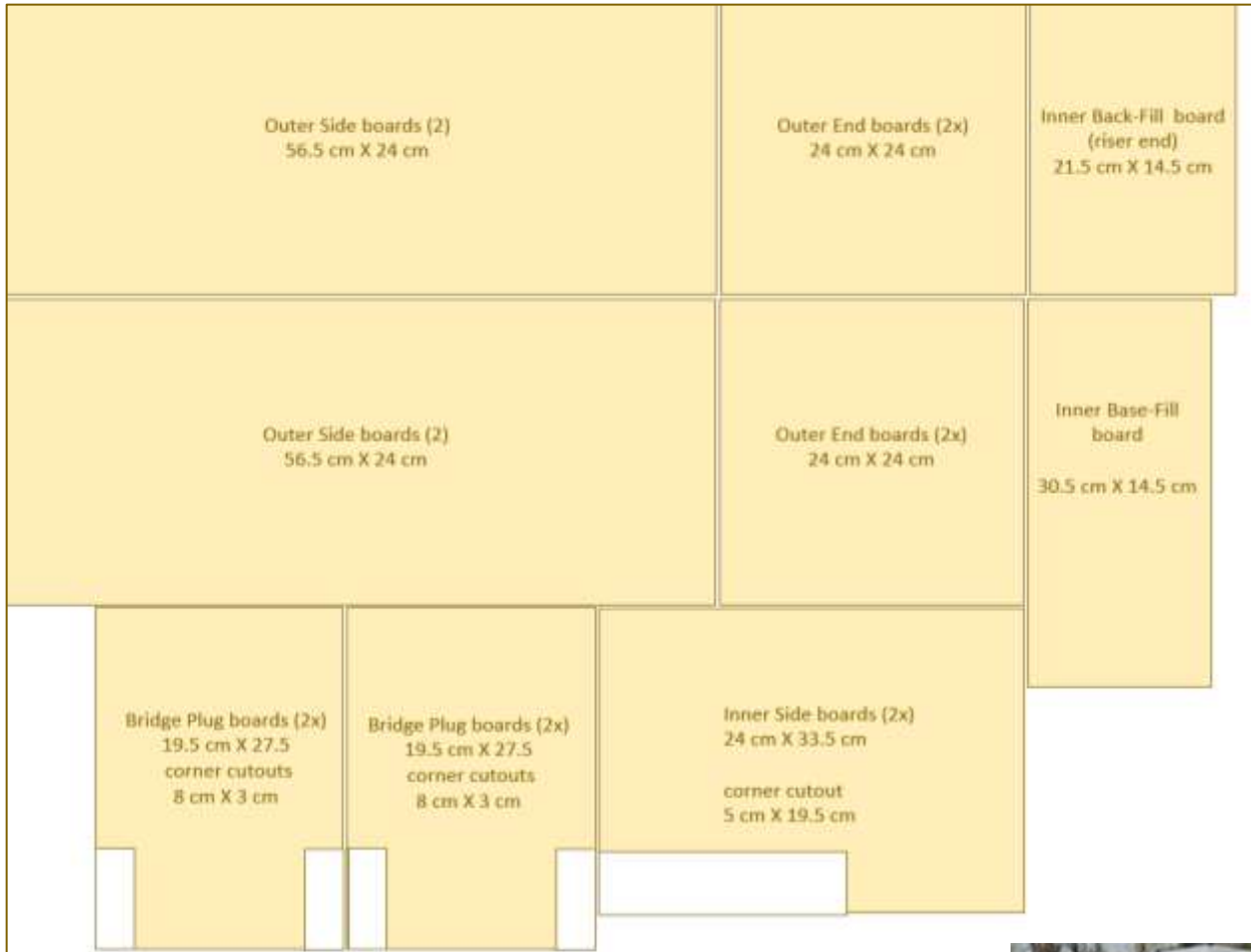
Even lightweight aluminum sheeting with plumber's tape for strapping, can secure the combustion chamber





Rocket
Heater
Core
Dimensions





Suggested Pattern Layout for Cutting Boards
Assuming 2 refractory boards, @ 1 meter x 1 meter
trimmings can make a small manifold

