



Decentralized Energy Defense

Adaptable! Lightweight J-Tube Ceramic Heating Core

*Suitable for outdoor or emergency heat.
Plus cooktop!*

Overview for
Building
Using
Refractory
(Ceramic)
Boards



**Full-Build
Training
Coming
Soon!**



For free consults or more info, contact:

Signal

WhatsApp

Telegram



This document gives an overview of a simple J-Tube, Biomass Heating Core, adaptable to many heating & cooking systems.

For more detail:

vimeo.com/ondemand/rmh

permies.com/w/rmh-builders-guide

walkerstoves.com/innovations

email: Leslie@ResilientVillageUkraine.org

Introducing Ukraine's **EkoPich**

- material efficiency
- scalability
- emergency resilience

Lightweight portable Combustion unit



Suitable for
outdoor or
emergency
heat.
Plus
cooktop!

EkoPich



Adaptable
Ceramic core

**Beyond
EkoPich**

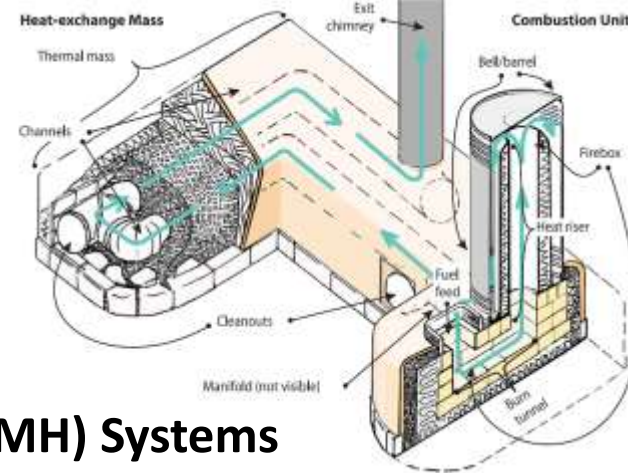
Indoor

**Rocket
Mass**

Heating (RMH) Systems

Use the same core to create infinite styles. Salvaged components (cob, brick, concrete, metal) can be used throughout.

After **3-4 hours burn time**
these heat storage systems can yield
24-48 hours of heat,
using small wood trimmings
and assorted biomass



Sauna!



*Deliver
critical heat
where
needed*

An ecological,
wood or
biomass
emergency
heating &
cooking
solution



ResilientVillageUkraine.org

First Project Goals

- Build a quick heating core that can be used for many applications.
- Estimated completion:
 - 10 – 30 work hours after gathering materials sources
- Recommended for out-buildings and emergency usage until engineering specifications and housing code can be adapted. When used indoors, proper exit chimney pipes must be installed. Running a straight, vertical installation through the roof is highly recommended since very little heat will exit the building. This makes the thermal "draw" minimal, so not as easy to get gases drawn up and outdoors.
- 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.
- 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.
- Contact us for free consultations.



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



Challenges of Sourcing Materials in Ukraine

Lacking a car much of the time, shopping at the metal bazaar in Kharkiv turned into a full-day challenge. For unusual materials, like ceramic fiber boards, it helps to find a heating expert. Online options exist, but it is best to see the material before purchasing if possible.

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.

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



Standard: Drums or Barrels

Common industrial steel drum sizes in Ukraine

•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.

Experimenting with Manifold & Bench Options

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

**For the Portable Version
No Manifold or
Bench Is Needed**



Pipe systems are the long-time standard >>

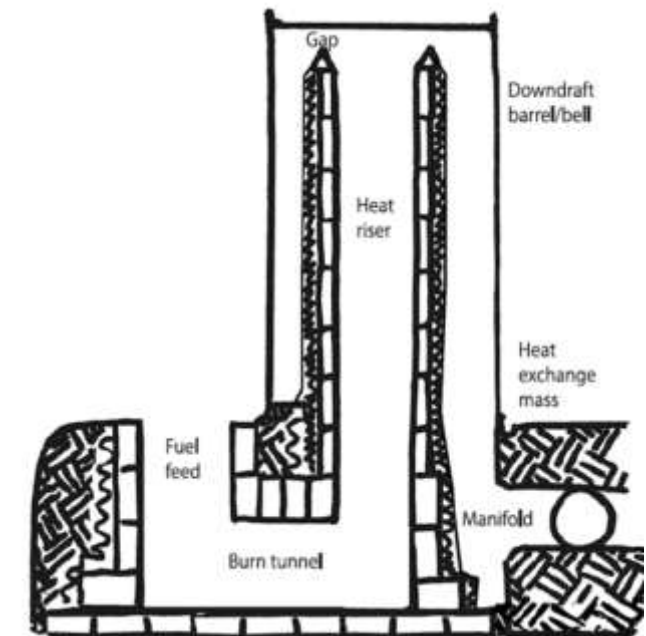
<< Very little info is available on stratification chambers.



**A
Simple Manifold**

>>

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



Kharkiv ProtoType Tests



Working with Limited Resources

Note: Pallets were the only available material to use as a level platform. Since rain and ice storms had thoroughly soaked everything in this tight outdoor space, fire danger was minimal.

Success under Difficult Conditions

20+ hours over a 4-day period, the core was exposed to wet conditions. Although priming the fire was challenging, the core fired up beautifully for all 6-8 tests.



Hot gases exit at the bottom of the barrel. The manifold then directs the gases thru the piping – either out the chimney or first into a storage area like a thermal bench.

Manifold



Low heat signature outside



< SEALED! All gases exit chimney pipe

TOOLS

to bring, find at debris sites, or purchase:

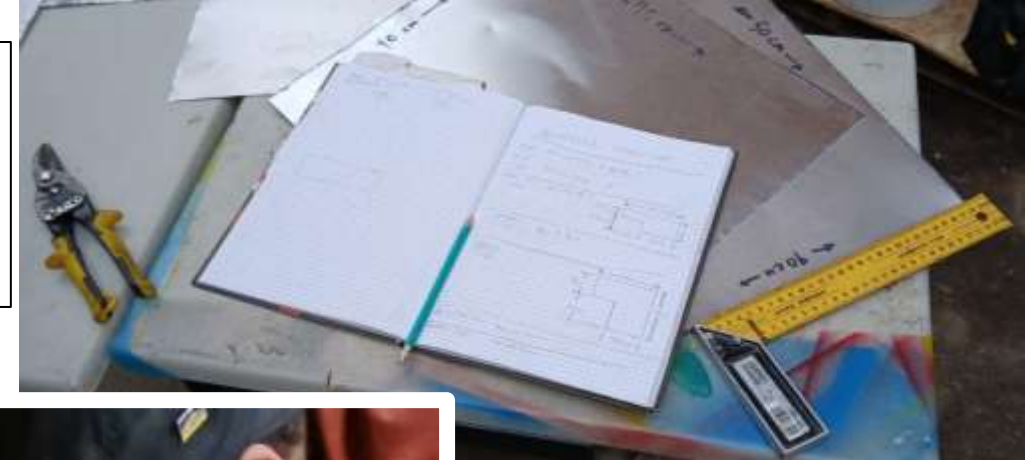
- Utility or pocketknife, bread cutter, hand saw (for ceramic board)
- Builder's level –1 meter long is best
- Builder's square
- Probe-type chimney thermometer
- Tin snips
- Measuring tape
- 30-40 Finishing nails (or similar gauge wire)
- PPE: Safety mask & goggles, gloves
- Basic tools: Pliers, Wrenches, 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 (guage 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

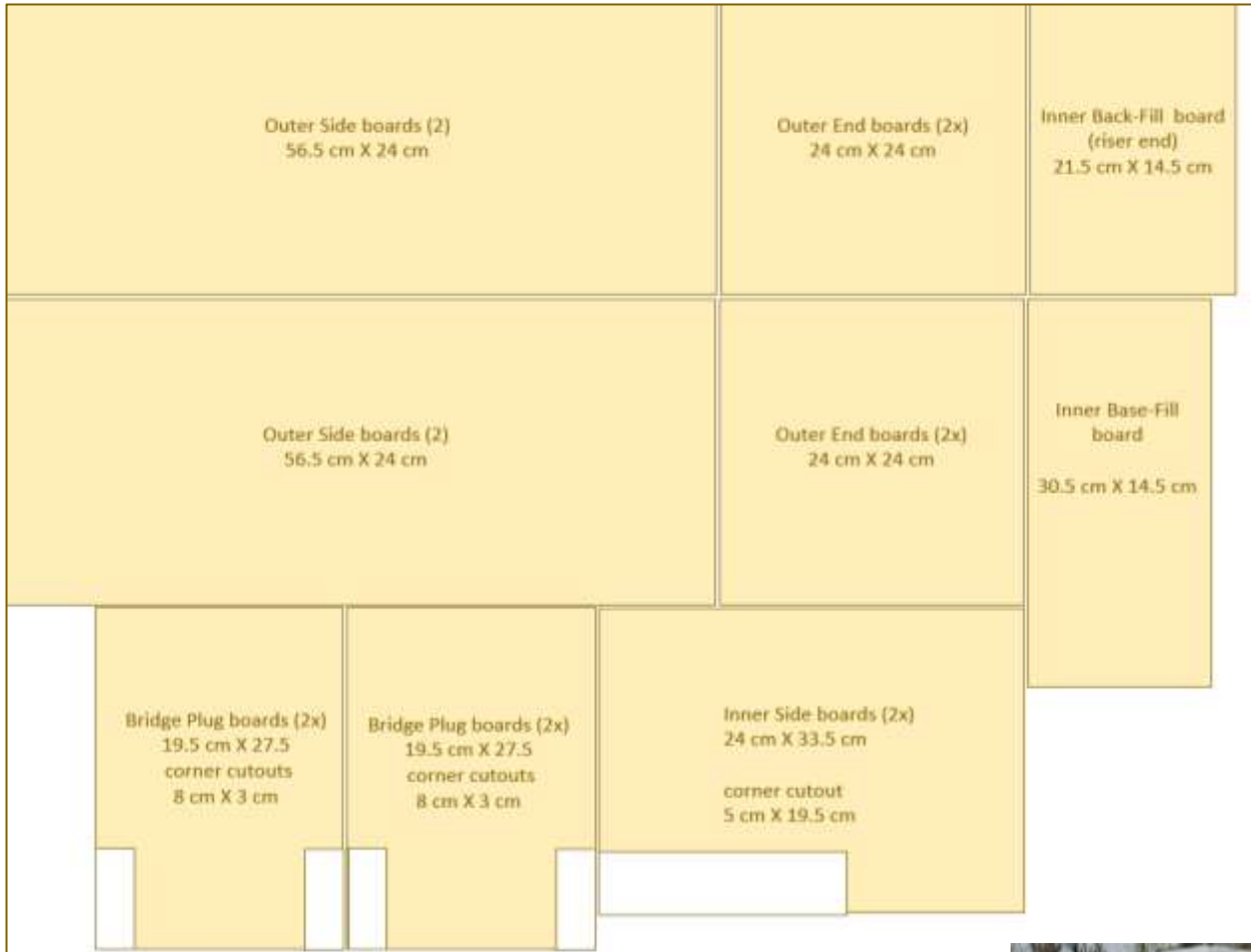
Even lightweight aluminum sheeting with plumber's tape for strapping, can secure the combustion chamber





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



Step By Step Guide to Building the Portable EkoPich

Contact us for details

Now Available!

1* Build EkoPich Ceramic Heating Core Detailed Instructions

Take extensive photos, videos, and notes

1 Prepare the Pieces

1.1 Create & Apply Templates

- Create full-size, reusable templates according to the dimensions on last page. Label each piece with marker pen.
- Material ideas: stone construction paper, cardboard, wood.
- Put your pre-made templates onto the refractory boards. Trace all pieces with a colored marker.

1.2 Execute the Cuts

- Put on respirator, safety goggles, and gloves.
- Use sharp utility knife or fine-toothed hand saw to cut pieces.

1.3 Lay Out the Inventory

- Arrange all cut pieces on a clean workbench. Group them by category: Base, Firewall, Walls, Bridge Plugs, and Heat Riser. Group all split tracks.

2 Build the Lower Unit (Firebox & Tunnel)

2.1 Anchor the Foundation

- Set down the **Base Board**. Use bricks or other suitable straight edges to hold the core shapes in place.
- Using small nails or pins, attach the two **Side Boards** and the two **End Boards** vertically to the base board. Move outer bricks to hold boards in place.

2.2 Insert Internal Fill Blocks

- Slide the **Inner Split Bricks** into position inside the trench to shape the internal flow.

3 The Combustion Bridge & Feed Tube

- Secure the two upper **Side Boards** containing the 5 cm x 19.5 cm corner cutouts. This creates your vertical fuel feed entry.
- Slide the two **Bridge Plug Boards** into the cutouts. This forms the restrictive flammal or "bridge".

4 Constructing the Heat Riser

Using pins and plumb lines, if desired, join the lower edges of the four **Riser Boards**. Press them securely together to form a square opening to match the burn tunnel surface area of the lower assembly.

5 Assemble the Full Combustion Core

- Work outdoors, against a solid, level surface with adequate clearance from any flammable surface. The surface should be fireproof or protected with metal sheeting, bricks, etc.
- Place the riser over the lower section to insure equal dimensions of the opening.
- Using a level, be sure the bottom section is level and the riser is vertical.
- Concentrate test assembly on securely fastening the two sections at the point where they join. Depending on final assembly desired, this could include pinning or nailing (until finished) into the joint, ensuring the lower section and at least 1/5 of the riser with loose bricks, concrete blocks, or other heavy material to keep the assembly secure.

6 Fire Tests

WARNING! AVOID HEAT INJURY OR DAMAGE AT TOP OF RISER EXIT!

Be certain the two components are properly secured for a test fire. No heat will escape through the core boards themselves, but the gases where the two sections join must be visible, carefully aligned and secured so no heat escapes. All heat should be directed up in the opening at the top of the riser.

- Follow **3-Test Fire Guidance** at all times. The system is unique in many respects. Traditional fire-fighting and maintenance do not apply.
- Use a heavy pyrometer, if possible, to check for hot spots at various times during & after the firing. Test under various conditions. Experiment with different fuels, kindling, and firewood for at least an hour. Record (video & notes).
- After the first core casing is in place, the final test fire should be run for 2-3 hours.

Firing Tactics

- Pre-Start the Chimney:** Drop a small piece of burning newspaper or cardboard directly into the base of the chimney just before lighting the main fuelbed. This warms the exhaust stack and forces air to start moving upward.
- Use Micro-Burns:** Do not overload the firebox. Use only small 150-45 mm long material (logs, sticks, twigs, etc.) to create small fires. Keep the firebox temperature (250°C-350°C) and verify that the core materials hold up. The system is not dry wood. Kindling and logs, twigs, etc., must be "flashed" off, meaning, carbonaceous, or carbon-rich - composed with metal ions - make great starters. Light and push into the burn tunnel to encourage flow. Watch and listen for the horizontal flames shooting through the tunnel with smoke without sound, the appearance of a "rocket boat" pattern.
- Track Ambient Temperature:** Record the exact outside air temperature in your log (refer next to your note entries). Experiments evaluating your data will approximate knowing the precise conditions under which the design was achieved.

Casing & Final Seal for Portable Designs

Insulated Seal, Hinges, Sheet Metal Wrapping, Handles

- aluminum sheeting (see - TBD)
- Wrap the ceramic core assembly tightly with aluminum sheeting, using corner braces to secure.
- Use thermal glue to attach stove pipe to outer bottom edge of riser. Follow instructions for the glue. Be sure there is a tight seal between the two sections. Secure on latches to all four sides of the bottom of the riser and slide catch later to bottom tunnel assembly to insure a tight fit. Wait 24 hours before first fire test and follow any other glue guidance. Riser may need to be nailed to the bottom opening as well. It is critical that no heat escape at this junction for most uses.
- If desired, mount metal burner frame on top of riser to safely elevate cooking pan or pot above heat exit.

NOTE
This portable version has not been constructed here in Ukraine yet. The materials are easily sourced, but precise descriptions and quantity are not listed in this document yet. A prototype still needs to be constructed to test the validity of the design. Please contact us if you are interested in this project.

Signal WhatsApp Telegram

email: Leslie@ResilientVillageUkraine.org

Materials List Portable EkoPich

Slack	Item	Size	# needed	Cost	Total
1, 11, 12	Refractory Boards 2.5 cm thick	1m x 1m	2		
3	Split (thin) Firebricks	100			
3	Corner seal, 1/8" x 1/4"	2 m	1		
4	Sheet metal (stainless steel)				
4, 5	Sheeting pipe (see table 4)				
6	Thermal glue				
8	Aluminum sheeting				
10	Aluminum sheeting				
10	1 x 1/4" x 1/4" (used for seal)				
10	Corner plates				
					TOTAL COST

* NOTE:
Tools and PPE are discussed in various documents and should be discussed during preparation of materials list. Some tools and a high-quality respirator (P95) / (N95) which is strongly recommended when cutting ceramic boards are available on Amazon.

Перелік матеріалів Портативна ЕкоПіч

Slack	Item	Size	# needed	Cost	Total
1, 11, 12	Вогнестійкі плити (вогнестійкі) товщиною ~2,5 см	1m x 1m	2		
3	Розщеплені (тонкі) вогнестійкі цегли	100			
3	Кутівий герметик, 1/8" x 1/4"	2 m	1		
4	Листовий метал (нержавіючий)				
4, 5	Листовий метал (нержавіючий)				
6	Термоклеї				
8	Алюмінієвий лист				
10	Алюмінієвий лист (виготовлений в Україні)				
10	Кутівий герметик				
10	1 x 1/4" x 1/4" (використовується для герметизації)				
10	Кутові пластини (кутові пластини)				
					РАЗОМ

Інструменти та ПЗ, деталізовані списки в різних документах, 1% купівлі інструменту від вас. Інструменти на Amazon. Деякі інструменти, а також високоякісний захисний дихальний апарат (P95 / N95), який надзвичайно рекомендований при розрізанні керамічних плит, легко знайти в інтернеті.

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

Coming soon:

Ukrainian version

Workshops to build your own



email: Leslie@ResilientVillageUkraine.org

Seeking Expert Review

Careful measurements, logs, photos, videos, and time stamps will be kept for the prototype. Current plan is to have the EkoPich design evaluated by an engineering authority for emergency and outdoor usage to start. Eventually, the design will be adapted to include a thermal storage bench for safe use in homes.