PD-AAU-787
48190

MAR 15 1985

Rouch

Programme Report (Technical)
Jan. 5 to February 10.

Improved
Soapstone Stoves:

- Variable tests on the improved soapstone stove were completed. Trip to El-buur was made by John Selker, Mohamed Hassan, and Dahir. The first order of 250 stoves was negotiated at 300 shillings each. 23 Stoves were produced during the stay in El-buur and brought to MGD for demo to the wholesalers and retailer. Two major wholesalers representing MGD and NW were contacted through the coop. They expressed their interest to test market the improved stoves. Other lists of wholesalers conducted in MGD for days in late January and through the El-Buur coop.

Problems:

- Because of the unavailability of blocks of stones for improved stoves (as they claim) and the skill and timeline envolved in producing the improved stoves, plus some hidden motives such as the high price offer in the early stage of prototype production and expatriate involvement in negotiations, the coop are not willing to listen to reasoning or logic in lowering the price.
- Even though template use and measurement were introduced the finished products were unsatisfactory, due to improper use of the templates or not using them at all and the fact that the craftsmen are not used to considering exact dimensions.
- Draft control was also introduced by instructions and demonstrations from Abdillahi Gabriye, yet the result was unstatisfactory, because the door has exactly to fit the opening and shaped properly to do that dimensions have to be considered. No consideration of dimension is given by the carvers.

Recommendations:

- Since there is no other soapstone coop. Accept their price if it cannot be helped for the moments and figure out ways to tackle the price problem in the
future.
- Make them understand the project is for the benefit of the Somalis and that it is non-profit. A letter from NRA praising their past activities with the project and the governments wish in future cooperation might encourage the work with VITA.
- Paying an incentive to someone influencial in the coop might facilitate better working relationships between VITA and the coop.
- Use of templates and measurements should be encouraged in a way that doesn't inflict conflict.
- The draft control was felt by all that apart from test purposes, it would be useless for the stove life and long term use. Door with metal

hinges were suggested by the coop, before any other kind of deviation is taken regarding the draft control, the specific difference of the stove with draft and without draft should quantified from the lab test results and field test carried out, to quatify the fuel saving of the improved soapstone stoves and to know the difference between the one with draft and the one without in actual use.

Actions already taken.

-Considering the stone size required for the improved stoves, the top part (7cm) of one of the previous design was removed and tested in comparision with top on. Lab results were the same, though effect of wind on performance of the stoves without top was not quantified (test was done indoor). This didn't help us reduce the price of production, even though it is a shorter stove. That is what led us to discover the hidden motives.
-Two tape measures were purchased and given to the coop to encourage use of measurements, (they had none before)
(more on the trip, see trip report by MH)

- Field test questionnaires are designed and decision made to start as soon as possile.

(A)
- Considering the life of the soapstone, the sheet metal is not appropriate
grate. To get long term grate a design was make the grate from cast iron. Negotiations were done for mass production with the foundry and mechanical work shop. (50 Shs. per grat)

Ceramic stoves:
-So many potters were located in lower Shabelle and site for kiln construction done. Material preparation for the kiln is accomplished. A retailer was contacted in Merca.
- A trip to B/weyn was made by MAN and Childers. Stove body size template, pot rest mould and some other tool developed. Satisfactory training given to the potter on making the improved stoves and on firing the kiln. Stoves were produced during the visit using the new tools, templates and moulds.
- The kiln in B/weyn was assesed. Temperature profile measurements done, problems and recommendations made by childers.
- Roof was built for the kiln.
(for problems and recommendations see Childers trip report

(B)
- A second trip to lower Shabelle was made by Laurie, Man, and Jinah. The selected potter was given training on VITA stove design and same templates use in B/Weyn were introduced with slight modifications. The price of production is still questionable but some samples, best stoves so far were made during the visit.

On the job training:

- Classes were conducted by Selker and Childers consisting of lectures on data interpretation and practical basic drawing techniques.

Substantial understanding of the numbers in the test data results was attained.
- Basic carving techniques with local hand tools on soapstone was conducted by Mr. Abdillahi Sabriye to John Belker.

Agency relations:

- The 12 soapstone stoves which remained from the last order were brought to MGD by Abdillahi Sabriye, upon discussion with Mr. Nenab of UNICEF on future cooperation between UNICEF's stove project and VITA. 4 improved soapstone stoves with metal grates were sent to UNICEF, Hargeisa and one left at UNICEF Mogadishu for display. The stoves sent to the north will be used for demo in the marketing survey during NGA trip.
- The Technical Director participated in a seminar held at Hotel Jubba, on project design for rural development, conducted by Surend/Ministry of Interior and by Dr. Richard Ford of Clark University. Display of improved soapstone, ceramic and metals stoves was done on the initiative of surend at the pool ground.
- Discussion between Chris of the American Friends Service and consultant Childers + VITA Technical Director was held on the Socio-Economic and technical problems on AFS stove programme and on the possible solutions. It was decided assessment be done during the NW trip to give practical recommendations.
-The Technical Director met with Mr. LEVERN W. Faidley Senior Energy Officer of FAO on arrangements by the TCAE coordinator and discussed a large on VITA's National Woodstove Project. Project Goals, achievements, setbacks and problemsd and future plans. Also discussed general topics concerning renewable energy in Somalia.
- A brief technical document was prepared for IVC (Japan Volunteer Center) based on their technical inquiry regarding stoves and sent to Mr. Shima of JVC in Lugh.

Fig. 1
Template for Stove Body

Material: wood (or metal)
The template is calibrated for 10% horizontal shrinkage and approx. 4% vertical shrinkage. The shrinkage differs due to alignment of clay particles.

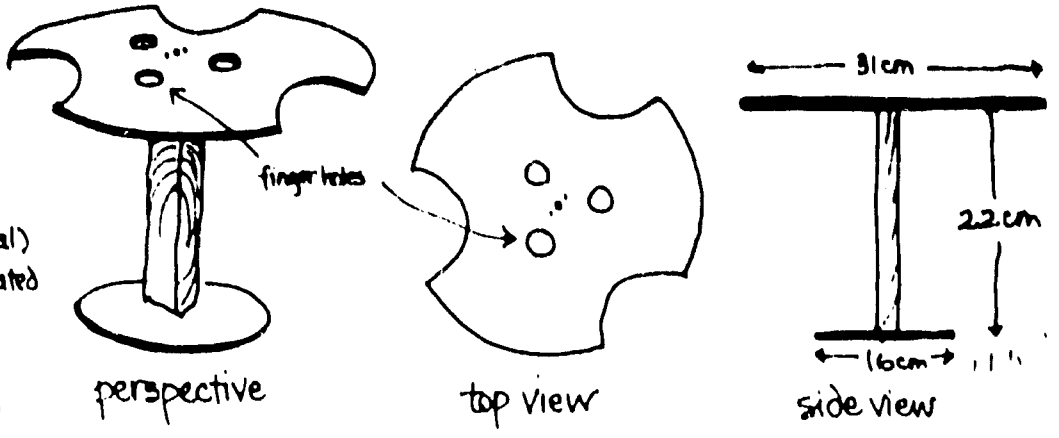


Fig. 2.
Pressmold for Potrests

Material: Ceramic (or concrete)
The mold is

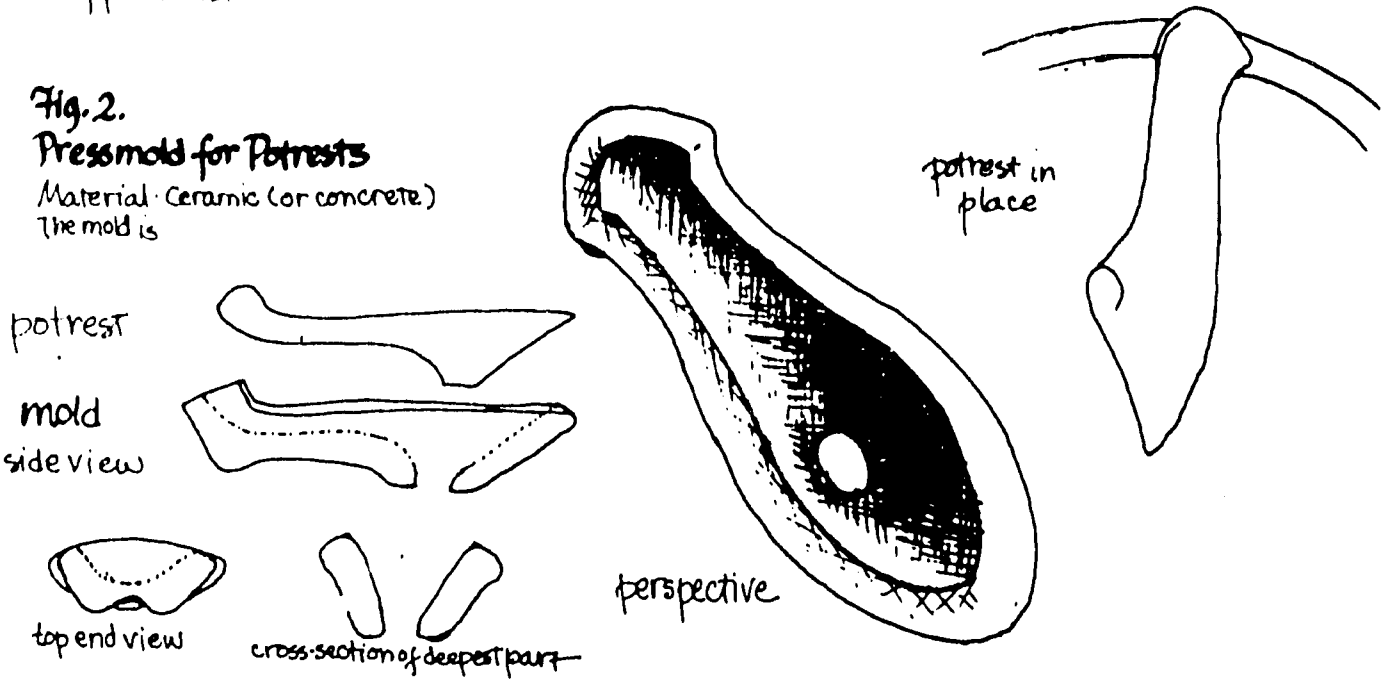
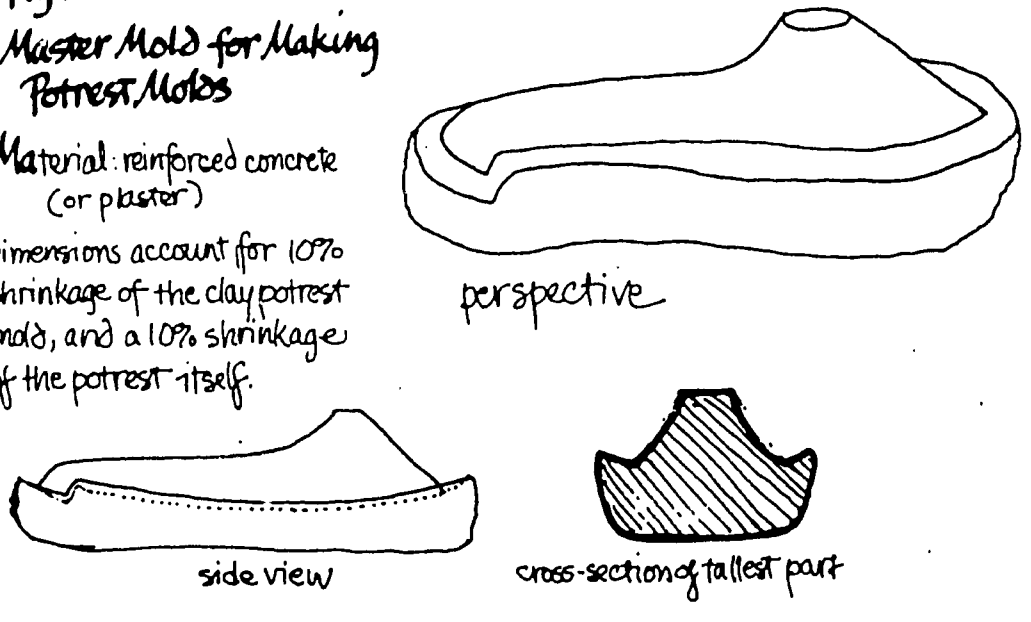


Fig. 3
Master Mold for Making Potrest Molds

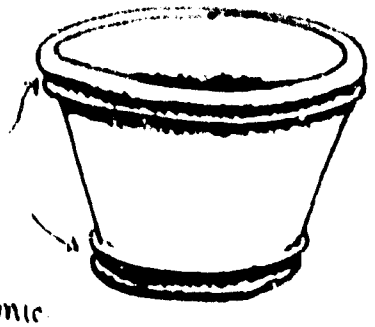
Material: reinforced concrete (or plaster)

Dimensions account for 10% shrinkage of the clay potrest mold, and a 10% shrinkage of the potrest itself.



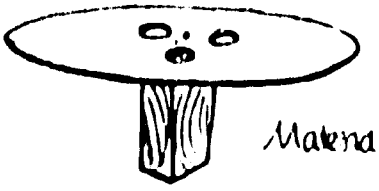
TOOLS TRIED BUT NOT ADOPTED

Fig. 5
Mold for Stove Body



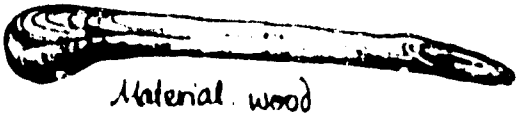
Material (ceramic (or wood or concrete)

Fig. 6. Template for Potters Height



Material. wood

Fig. 7. Compression Paddle for Strengthening Door



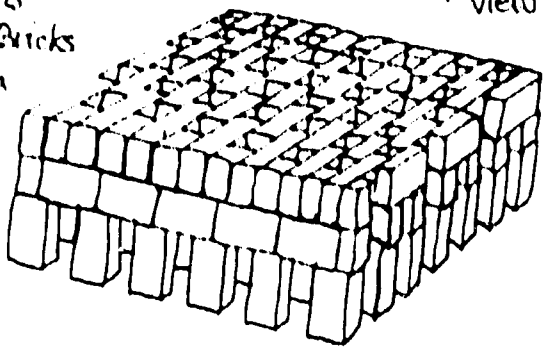
Material. wood

POSSIBLE KILN IMPROVEMENTS

Fig. 8.
Chequer Floor

Materials
150 fired bricks
for 2m²area

Perspective View



Isometric View

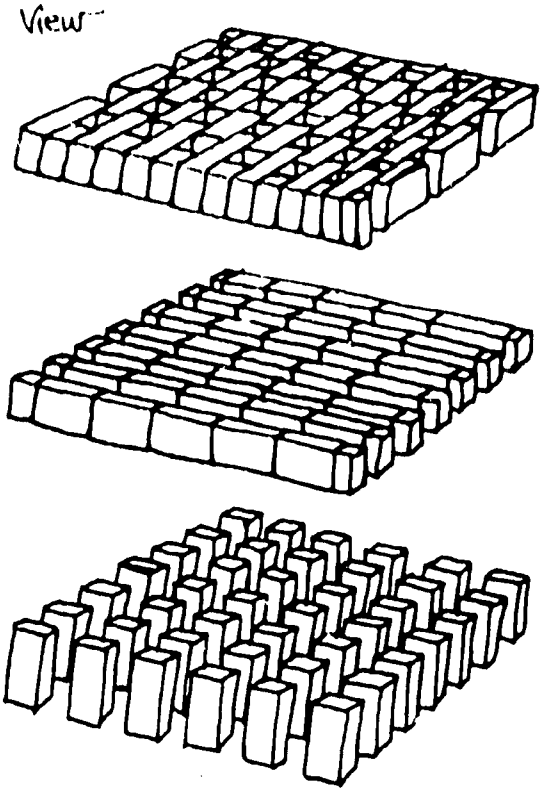
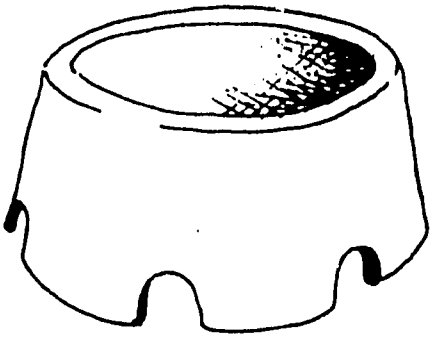


Fig. 9
Simple Circular Kiln



The kiln can be built to any size. Kilns like this are 2 meters tall in West Africa. People use ladders to get inside. Pots are piled higher than the walls and covered with broken pots for insulation.

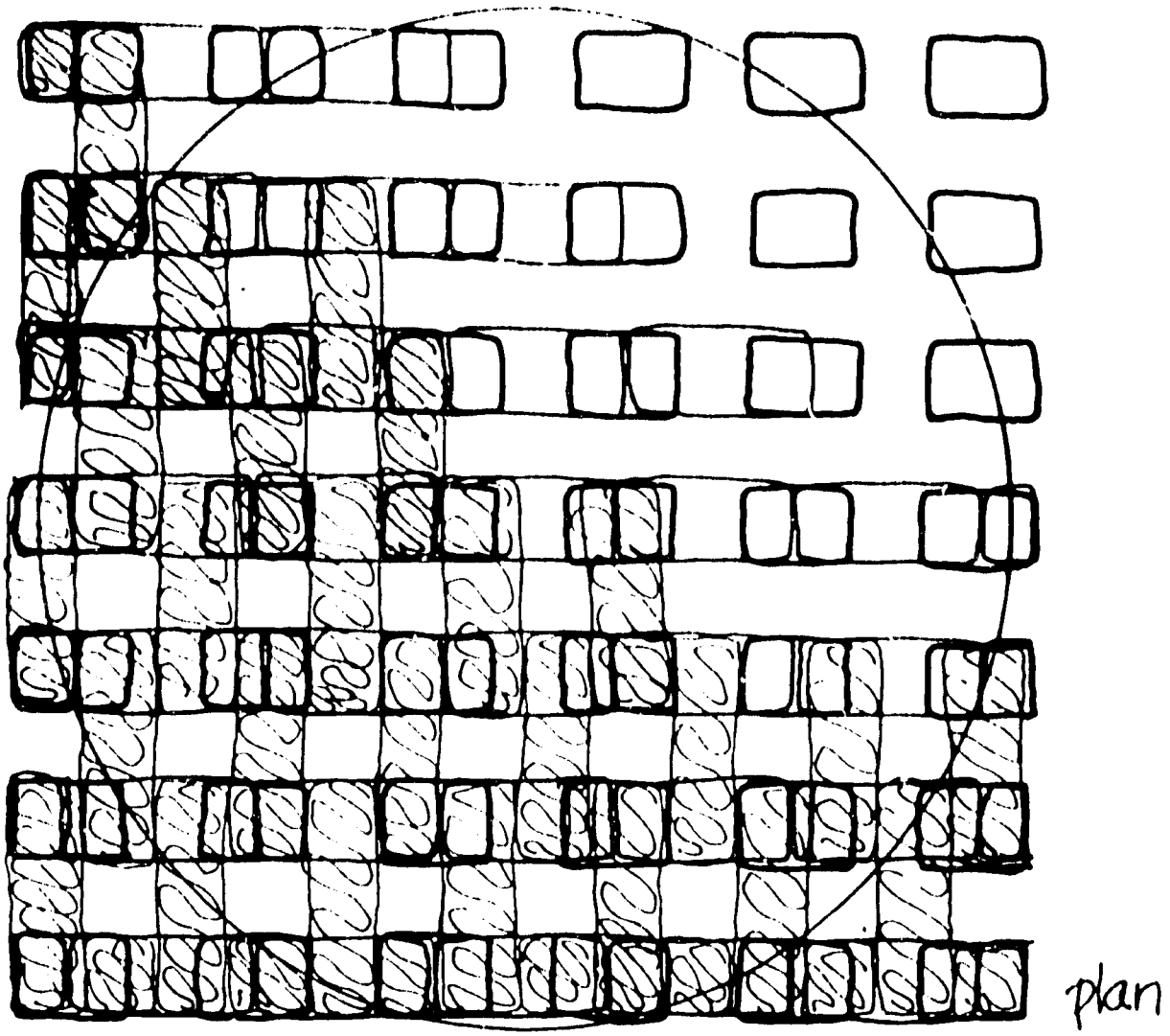
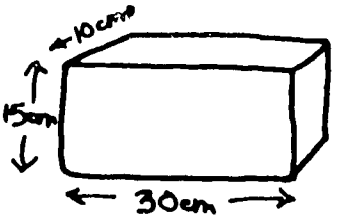


Fig. 9 Chequer floor for Beled Weyne kiln

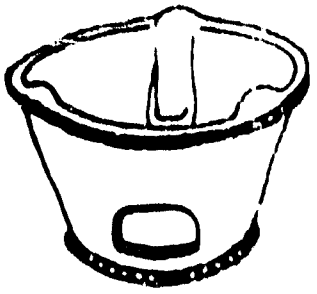
Material: fired brick

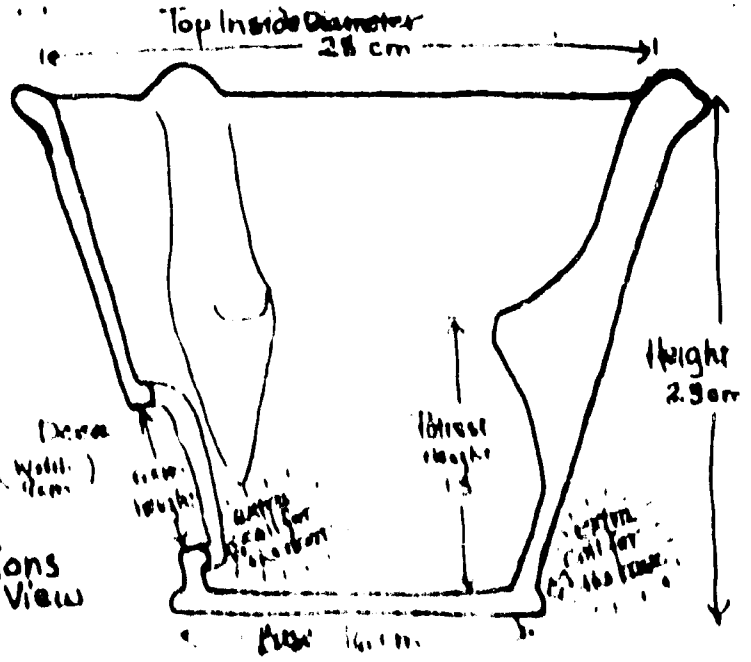
length : width : thickness ratio = 3:1.5:1



SOMALIA NATIONAL WOODSTOVE PROGRAM

CERAMIC STOVE





Dimensions
Cutaway View

(1)

Use template to mark the inside diameter of the base.

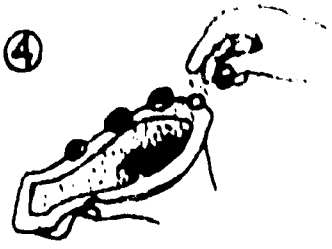
(2)

Build walls straight up and out - not curved

(3)

Use the template to be sure the top is the correct height and width. Add an extra coil at the base

(4)



Dampen the potrest mold. Coat the inside evenly with ashes.

(5)

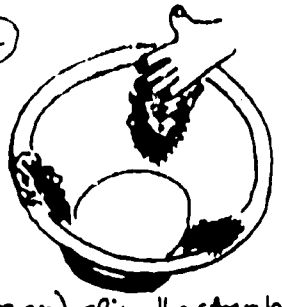
Press a coil of clay into the mold. Be sure the clay reaches the deepest part

(6)

Leave a knob at the top. Scrape the rest flat

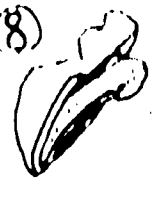
Score and slip the back of the potrest

(7)

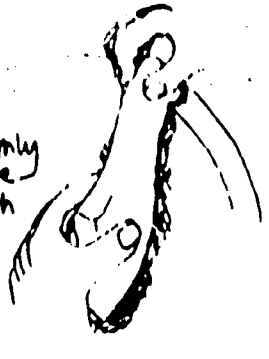


Score and slip the stove body where the potrests will be attached.

(8)

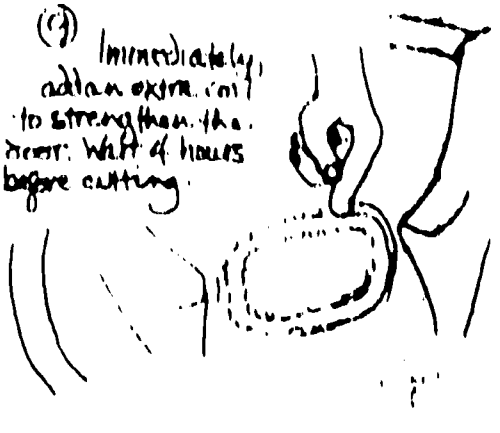


Remove the potrest from the molds.



Press it firmly onto the stove body. Smooth the edges.

(9)



Immediately, add an extra coil to strengthen the door. Wait 4 hours before cutting.

①
②
③

④
⑤
⑥

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⑨

CLAY BODY FORMULATION FOR CERAMIC STOVES

Clay used in making ceramic stoves will need to have certain characteristics before and after firing.

Depending on how the stove will be made, the clay body needs more or less plasticity. Plasticity is the ability of clay to bend and stick together. If a stove is formed in a mould, it will need slightly less plasticity than if it is formed by coil or throwing techniques.

The clay body needs about 20 to 35% of coarse material to allow the clay to dry and fire evenly and quickly. Sand, mica, or grog (fired and crushed ceramic) will work, making the body more porous. These materials will also increase thermal shock resistance of the finished stove. This refers to the ability to withstand the repeated expansion and shrinkage that happens to materials that are heated and cooled. Stoves, heated with use, must be able to withstand water spilling on them.

The clay body needs to fire at or near 900 C, producing a hard surface and a ringing tone after firing. A high iron content lowers the firing temperature but also makes a more brittle ceramic. Iron turns the ceramic a deep rust to black color.

TESTS

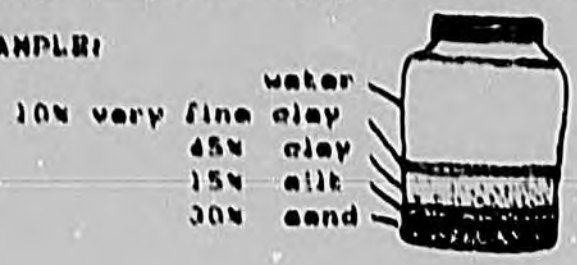
There are several ways in which to test clays so that you know what to expect from them. Most tests only give approximate information.

An experienced potter can tell much about the clay by feel. If a clay is very sticky, then it is highly plastic. This means it has relatively small particle sizes, and will shink a lot. The fingers can feel the presence of sand or coarse particles as well. Make a pencil-sized coil of clay and then roll it around a finger. Does it bend without breaking? If there are no cracks at all, then it is a highly plastic clay. If there are small surface cracks but the coil stays together, then it is less plastic. If the coil breaks, then it is either semi-plastic or non-plastic! "short."

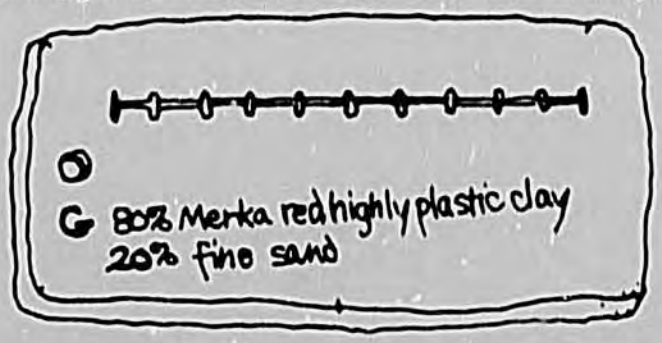
A visual test that can be done is to dissolve the clay sample in a glass jar with four times more water than clay. Shake the solution thoroughly. Set the jar down and watch the contents settle. Sand and large granules will settle immediately. (Gravel should be removed first if possible.) Silt particles settle in about 20 seconds. Clay particles are those which take longer than 20 seconds to settle; the finest particles may require a full day. Most often the soil will

form distinct layers, and if you remember how long it took each layer to settle you can have a fairly good idea of the particle size distribution. Be careful! very fine clays often dry into hard lumps that may not dissolve for several days. These will confuse you because they are heavy and will settle immediately.

EXAMPLE:



Observing a clay sample as it dries will also give you information about the clay. If it makes a smooth surface and is prone to warping and cracking, then it probably has relatively fine particles in it. Such a clay would be a good plasticizer for a clay body, used in combination with sandy clays and/or short clays that do not shrink much.

Testing your clay sample for shrinkage is one of the few quantitative tests that can be done simply. Using clay as moist as the potter uses, make a small plate the thickness of pots or stoves, 15 cm by 7 cm. VERY PRECISELY, draw a line and mark 10 cm on it. Because lines have thickness, measure the 10 cm to the outside of the lines. Also mark the source of the clay on the sample, and significant characteristics so that you will recognize it. (If you make a hole in your tiles, they will store easily on a string.) Let it dry carefully, turning several times to prevent warpage. When it is completely dry, measure the line again. The number of millimeters it has shrunk is the percentage of dry shrinkage. Measure again after firing, and you have the percentage the clay shrinks after firing. Clays that shrink more than 10% should be avoided, unless the only clays available are those that are short and those that are highly plastic. You will need to measure the shrinkage percentages of different combinations of clays and sandy soils. Overall you would like to come up with a claybody that shrinks less than 7% and has enough plasticity to make stoves easily. You will want to keep careful records of your tests. Often only a code is marked on the shrinkage test itself. Make several of each test sample, in case of breakage, and to get an average figure for shrinkage. You can fire them at different temperatures to test for shrinkage at those temperatures.

As you will see, arriving at a suitable formula is not something you want to have to do often. Only large sources of clay should be considered, enough to make stoves for several years.