# How To Design a Rocket Stove

## Sizing the combustion chamber to the pot size

<table>
<thead>
<tr>
<th>Pot size</th>
<th>Entrance to combustion chamber L cm</th>
<th>Cross sectional Area of entrance L² =A cm²</th>
<th>Inner Perimeter of combustion chamber P_inner cm</th>
<th>Outer circumference of combustion chamber (assuming 5 cm thick bricks) C_outer cm</th>
<th>Gap a =A/ P_inner cm</th>
<th>Gap b =A/ C_outer cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-15L</td>
<td>11cm by 11cm</td>
<td>121</td>
<td>44</td>
<td>87.9*</td>
<td>2.75</td>
<td>1.37</td>
</tr>
<tr>
<td></td>
<td>or 12.5 cylindrical</td>
<td>122</td>
<td>39.2</td>
<td>87.9*</td>
<td>3.1</td>
<td>1.37</td>
</tr>
<tr>
<td>15-50L</td>
<td>15 by 15</td>
<td>225</td>
<td>60</td>
<td>78.5</td>
<td>3.75</td>
<td>2.86</td>
</tr>
<tr>
<td>50-100L</td>
<td>16.5 by 16.5</td>
<td>272.25</td>
<td>66</td>
<td>83.2</td>
<td>4.12</td>
<td>3.27</td>
</tr>
<tr>
<td>100-150L</td>
<td>20 by 20</td>
<td>400</td>
<td>80</td>
<td>94.2</td>
<td>5</td>
<td>4.24</td>
</tr>
<tr>
<td>200-250L</td>
<td>22 by 22</td>
<td>484</td>
<td>88</td>
<td>100.5</td>
<td>5.5</td>
<td>4.81</td>
</tr>
</tbody>
</table>

(*This is based on a common size single pot rocket stove that has a 28cm diameter stove body. Obviously a stove body with a larger diameter would require an even smaller Gap b.*

The numbers that are given for Gap a and Gap b are minimums. If flow problems exist with these dimensions then the gaps can be increased by 5 mm.

The thickness of the insulation under the pot is equal to the **height of the pot supports minus the required Gap**.

Take the 20cm by 20cm combustion chamber as an example. If 6 cm pot supports are used and we require a 4.24 cm Gap b then we need to fill the stove with 1.76 cm of insulation. Notice that in the plans a 1.7 cm square mould is welded on the stove at Gap a.*
\[ C = D \times 3.14 \]

\[ D = \text{Diameter} \]

\[ R = \text{radius} \]

\[ \text{Perimeter (P)} = 4 \times L \]

\[ A = L \times L \text{ cm}^2 \]

\[ \text{Gap}^C = A \]

\[ \text{Gap}^P = A \]

\[ \text{Gap}^B = A \]

\[ \text{Gap}^A = A \]

\[ \text{Gap}^{\text{'D'}} \]

\[ \text{Gap}^{\text{'C'}} \]
To calculate Gap A (the distance between the pot and the inner perimeter of the combustion chamber) use the equation:

\[
\text{Gap}^A = \frac{\text{Area}}{\text{Inner Perimeter of combustion chamber}}
\]

To calculate Gap B (between the pot and the outer edge of the combustion chamber) use:

\[
\text{Gap}^B = \frac{\text{Area}}{\text{Circumference}} = \frac{[(L+7-10 \text{ cm}) * 3.14]}{}
\]

To calculate Gap C (under the outer edge of the pot and the stove body) use

\[
\text{Gap}^C = \frac{\text{Area}}{\text{Circumference}_\text{Pot}}
\]

To calculate Gap D (between the sides of the pot and the stove body) use

\[
\text{Gap}^D = \text{Gap}^C * 0.75
\]
Determining the volume of a pot or of a stove body

Volume = \( A \) (Cross sectional Area of cylinder) * \( H \) (Height of cylinder)

\[
A = \left( r^2 \times 3.14 \right) \times \frac{H}{D}
\]

To determine the circumference of the pot skirt

\[
C = D \times 3.14
\]

\[
C = D \left[ \text{Pot diameter} + \text{Gap}^D + \text{gap}^D + 1t \ (\text{thickness of metal}) \right] \times 3.14
\]

To determine the height of the combustion chamber use

Height of stove entrance = \( X \)

Height of combustion chamber above stove entrance = \( 1.5X \)

Total Height of combustion chamber (\( TH \)) = \( X + 1.5X + 5 \text{cm} \) (for thickness of insulation)
For example, the 60L institutional stove has these approximate dimensions:

\[ TH = X + 1.5X + 5 \text{ cm} \]

\[ 1.5X = 1.5 \times 165 = 247.5 \]

\[ X = 165 \]

\[ X + 1.5X = 165 + 247.5 = 412.5 \]

\[ TH = 412.5 + 5 = 417.5 \text{ cm} \]
To determine the height of the shelf above the bottom of the combustion chamber use:

Shelf height ($SH$) = $0.3X$

$X = 165$

$0.3(165) = 50$

Tile thickness (5mm)

$TH = 462$
Common dimensions for a single pot Rocket stove

3 legs

D = 280
C = 889