

Nepal Improved Cookstove

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Background and Objective

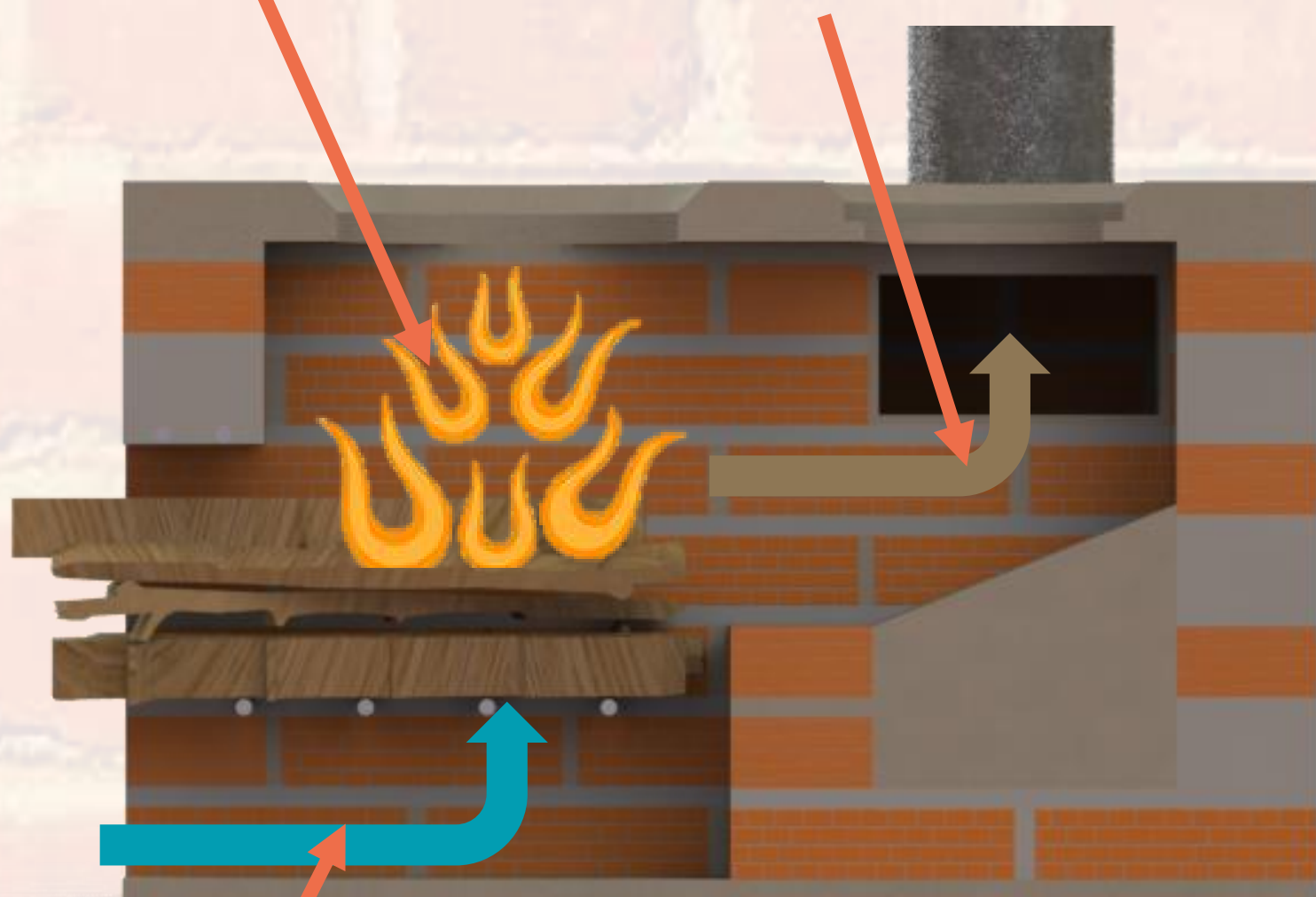
Mountains of Relief wants a stove to be designed for rural Nepal that can replace the current inefficient cooking solution, an unventilated fire in the home. This causes major health and deforestation problems. It should:

- Provide two burners for cooking
- Provide adequate space heating to the home
- Reduce emissions inside of the home
- Produced from locally available, cheap materials

Features

Combustion (from burning wood)

Hot Flue Gases (passed to the chimney)



Natural airflow underneath the combustion (preheats air and provides hotter combustion)

Clay stove top (made to fit specific cooking pots)

Brick (provides insulation to the combustion chamber)

Door (to contain the smoke, not shown)

Rebar (supports the wood)

Two burners (accommodates two pots)

Footprint 60 cm x 60 cm Chimney Height 220 cm Stove Height 35 cm

Space Heating Analysis

Space heating was analysed using SolidWorks and it found that the stove could maintain the room at 15 Celsius during the cold winter months. (2 Celsius)

$T_{outside} = 2^{\circ}C$

$T_{room} = 15^{\circ}C$

$\dot{Q}_{infiltration}$

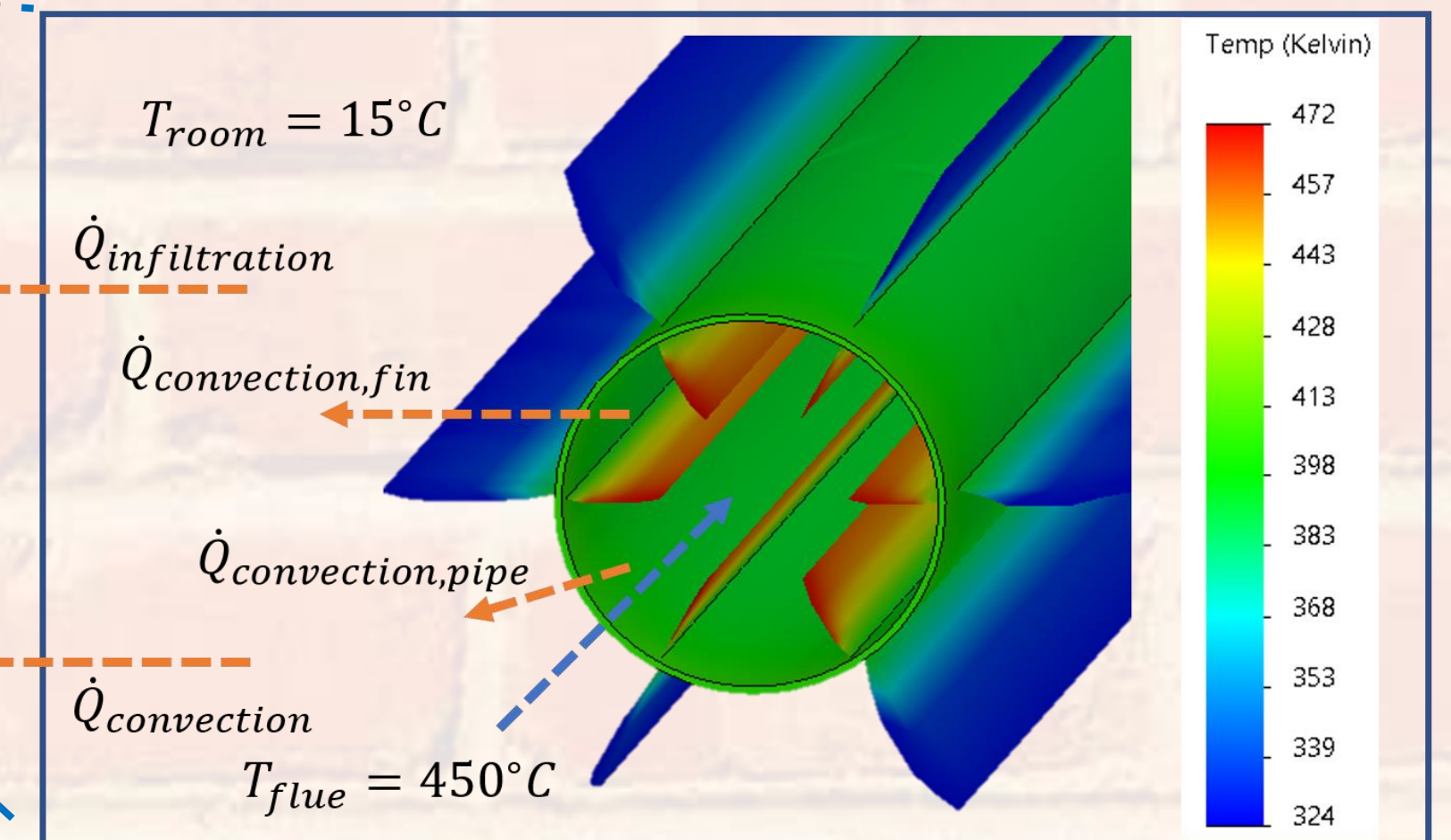
$\dot{Q}_{convection,fin}$

$\dot{Q}_{convection,pipe}$

$\dot{Q}_{convection}$

$T_{flue} = 450^{\circ}C$

Temperatures in the chimney and overall space heating ^{CV}



Chimney (removes harmful flue gases from the house)

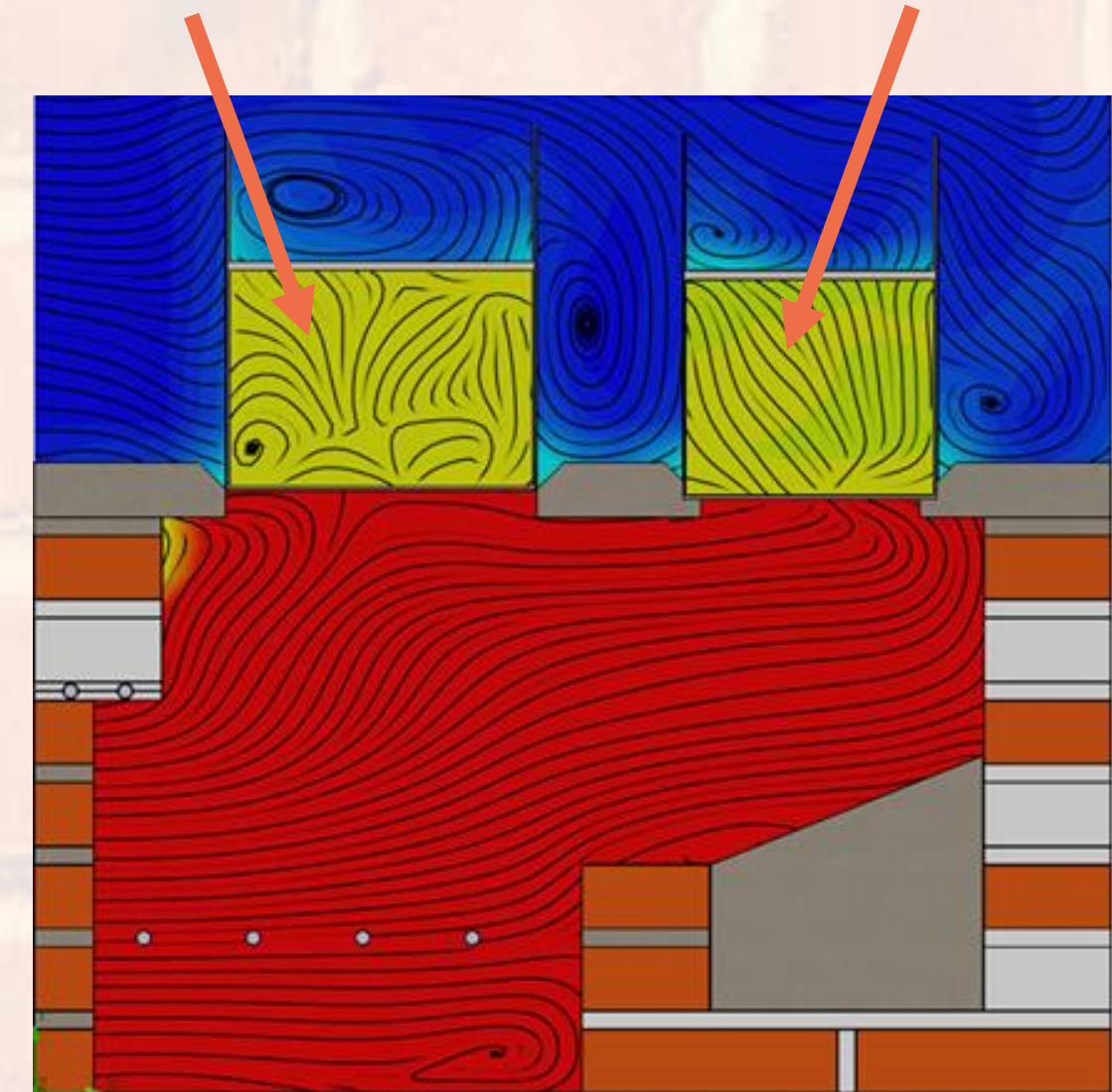
Fins (provide more efficient space heating for the room)

Cooking Heat Analysis

A SolidWorks heat analysis with both convective and radiative heat transfer revealed that the stove will transfer

*Pot 1 (2.5 L water)
Time to boil 32 min*

*Pot 2 (1.7 L water)
Time to boil 32 min*



Temperature of the combustion chamber and heat transfer to the two pots

Manufacturing and Cost

Manufacturing and Materials

- Minimal power tools and technical experience
- Use readily available, local materials
- Maximize service life and easy maintenance
- Minimize transport and labour costs

Cost

- Based upon material, labour, transport and equipment
- **\$80 CAD** (dependent on production volume)

Results

	Target	Result
Cooking Heat	1000 W	1040 W
Space Heating	1050 W	1070 W
Emissions to the Room	0.23 gCO ₂ /min	0.05 gCO ₂ /min
Wood Consumption Reduction	30%	57%
Cost	\$100 CAD	\$80 CAD



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