

"ENGINEERING REQUIREMENTS RELATING TO HYGIENIC MID DAY MEALS IN SCHOOLS"



Brief:

- mid day meal scheme launched by Gol to help poor pupils from rural and urban areas to resolve the issue of lack of nutrition, food security and access to education.
- community participation - mothers watch
- 1004000 plus children served
- cooking cost per child 4.13 -6.18 INR per child

Food norm

Food norm with effect from 1-12-2009

S. No.	Items	Quantity per day/Child	
		Primary	Upper Primary
1	Foodgrains	100 gms	150 gms
2	Pulses	20 gms	30 gms
3	Vegetables (leafy also)	50 gms	75 gms
4	Oil & fat	5 gms	7.5 gms
5	Salt & condiments	As per need	As per need

which means

- 450 calories and 12g of protein at primary
- 700 calories and 20g of protein at upper primary
- palatable and hygienic
- free from adulterants, contaminants-both biological , chemical and physical contaminants

Lifting and transportation of food grains and Procurement

- FAQ- fair average quality - FCI
- Only packed dals ,salt, spices,condiments and oil with AGMARK quality
- Zero energy cooling chamber 10 -15 deg C and 90%RH
- FIFO
- Wooden plank- 12 cms from floor
- USe of airtight container

Food safety

- Cereal to pulse ratio is 3:1 to 5:1
- -Single Meal
- Temperature of serving -65 deg C+
- Veg and Non-veg separate
- Fridge- 4 deg C to 6 deg C
- Testing by CSIR
- Pest control by physical means
- Ventilation

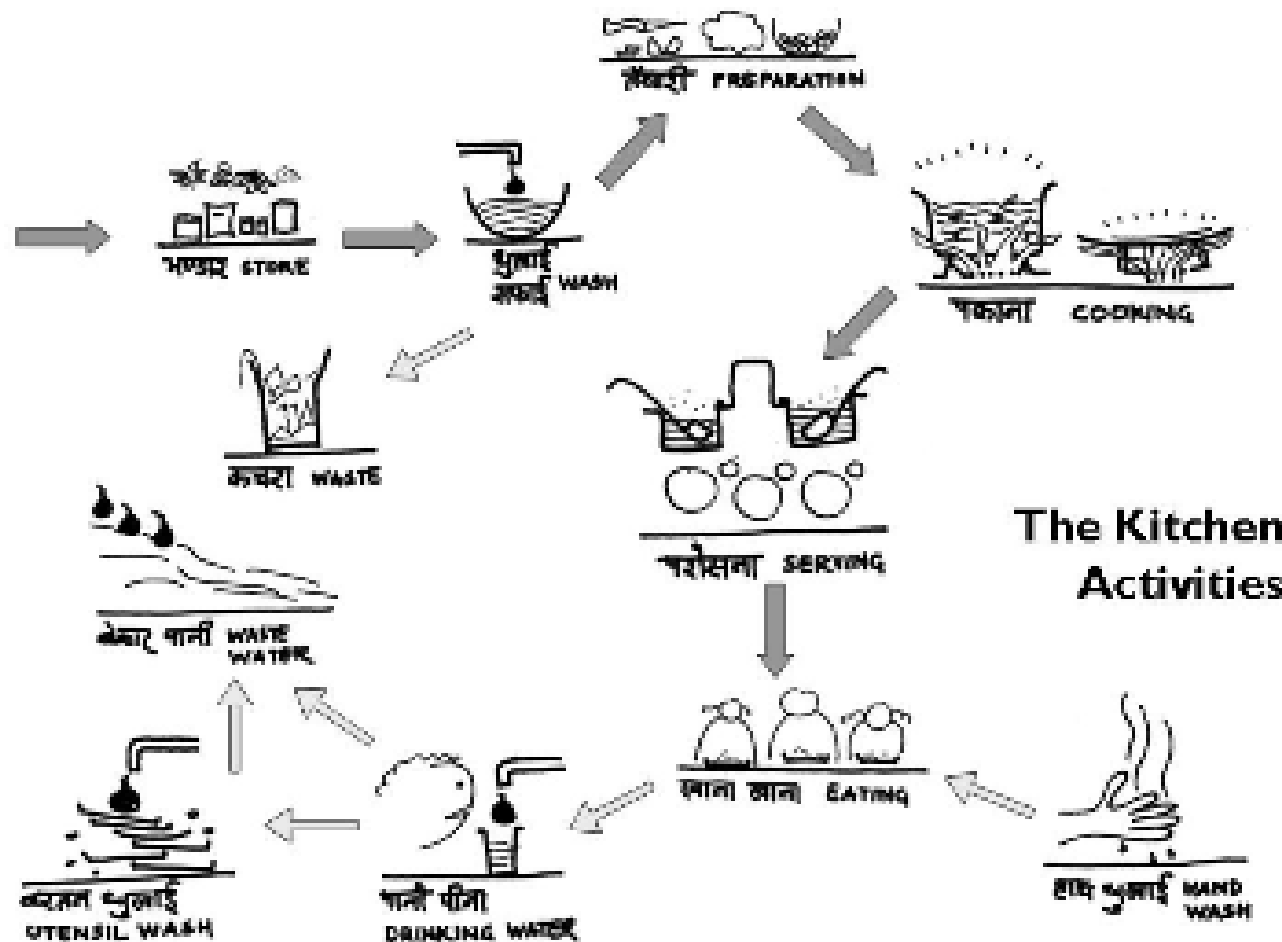
Food safety - Clean

- Use of food safe utensils
- Use of clean water
- Use of clean food
- Use of clean handwash
- Use of clean fuel
- Use of clean stove
- Use of clean space.

There are three key issues of a Mid Day Meal (MDM) Kitchen. These are:

1. **Safe Storage**
2. **Hygienic Cooking and comfortable serving**
3. **Hygienic drinking and water hand wash**

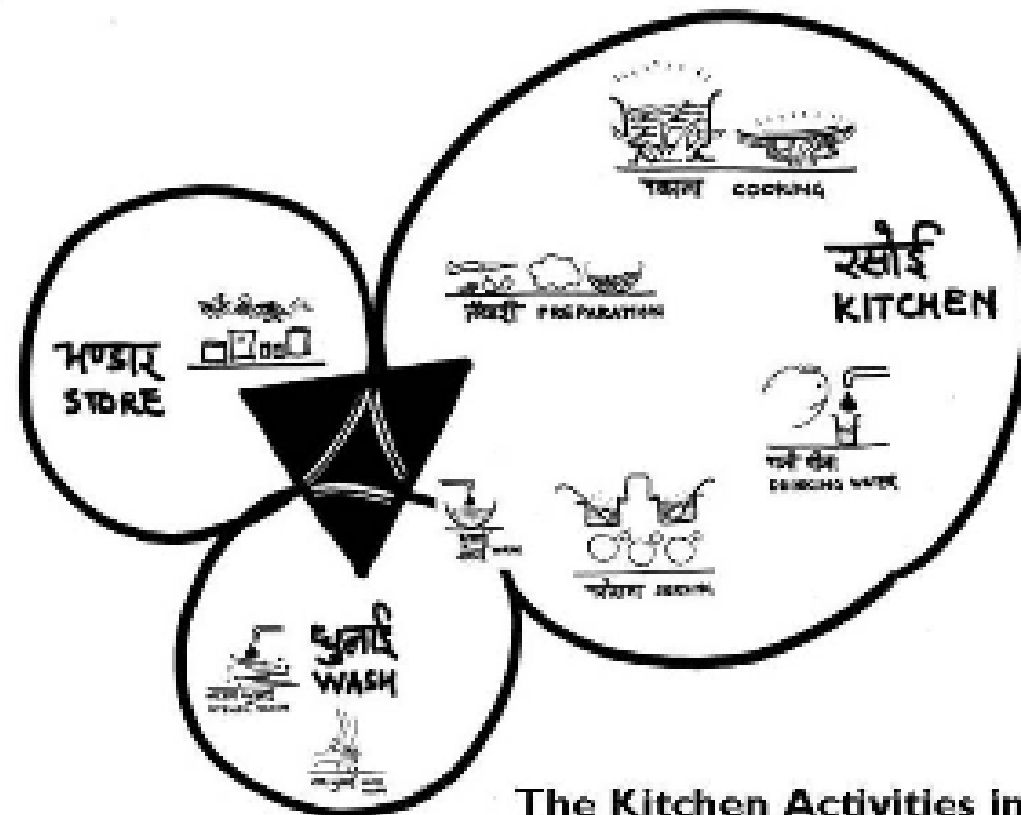
These issues need to be addressed through some essential activities. These are linked to each other in a logical sequence, as shown here. This sequence of operation is essential for efficient functioning of the kitchen. The design has to facilitate this sequence.



It is important to address them in any generic design. Thus, the MDM Kitchen will need to have three major areas, where these activities can be performed:

1. **The Store**
2. **The Preparatory, Cooking and Serving Space**
3. **The Wash Space**

The activities that may not be in the core, can be on the periphery or around the core. E.g. MDM Eating space, Waste (Garbage) or Waste Water, etc.



The Kitchen Activities in Core

Current Norms for Design and Construction

- 20 sq.m of floor space for every 100 children enrolled in school
- Thereafter, for every additional 100 children, 4 sq.m of additional area is permissible.
- The construction cost is to be determined on the basis of plinth area norms and State Schedule of Rates prevalent in the State/UT, since 1.12 2009

Design Priorities

The school kitchen shed includes three specific areas;

- Safe storage
- Hygienic cooking and serving

Recommended Design Guiding Principles

- Provision/space must be proportionate to children's enrolment
- Storing, cooking and serving to happen in safe, secure and hygienic environment
- Design and its provision must be child friendly
- Design and activities around must inculcate the values of healthy eating practices and social values of equality
- Design must be sensitive to local culture and traditional methods of cooking
- Design must have integral provision : store, wash area, preparatory area, cooking area and serving area
- Design options must allow expansion of key components, with natural light and ventilation to be used maximally to keep the place clean, dry and hygienic
- Design must allow diverse and safe building systems to be used – so that s
- Design must allow natural sunlight and ventilation to be used maximally.
- Kitchen fixtures and hardware must be rodent and pest proof
- Operation and Maintenance of the construction of the design must be simple and low resource consuming.
- User and environment-friendly energy saving or renewable energy options must be planned along with Kitchen

Understanding the Design

Design Option I (A,B,C)

First Design option has three different, fixed variants for 100, 200 and 300 children, respectively. Shown here is the Design Option IA concept for 100 children. The generic form of IA expands to accommodate the requirements of 200 (IB) and 300 (IC) children.

The performance specification for foundation, wall, door and windows, roof, floor, finishing materials are such that diverse building materials and systems can be used to make it.

The technical drawings of all the design variants are given in Annexure-I.

There can be multiple options for filtering, storing and distributing drinking water in child friendly manner



Rodent proof storage with shutters



Multiple level and depth of ledges for preparation and easy access to raw food material. Cooking working zone can be floor based or raised platform based



Smokeless Chulha

Efficient Stove, or Solar cooker and other options to supplement main cooking to save energy costs



Useful Wash area

Let waste water from the kitchen can be used to irrigate the kitchen or herbal garden, depending upon quality of water



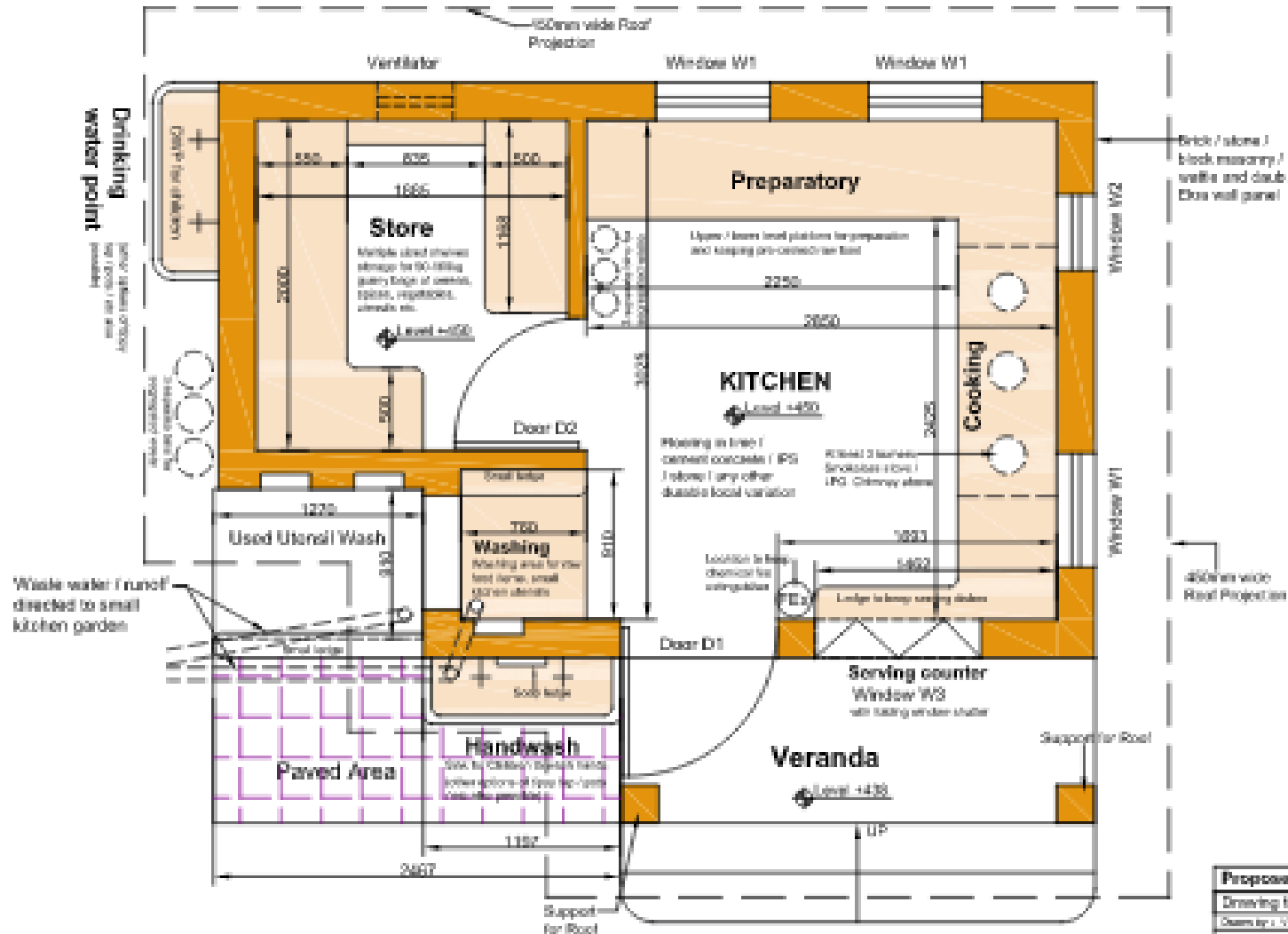
Segregated garbage and its appropriate reuse/recycling/disposal integrated



There can be multiple options of child-friendly hand wash that can be integrated with K. design, based on resources available. Use of inclusive fixtures

DESIGN OPTION IA. PLAN For 100 Children. Area 20 sq.m.

Annexure 1a



Best Orientation



Satisfactory Orientation



Acceptable Orientation



MDM Kitchen cum Store CONCEPT DESIGN OPTION 1a
for 100 Children in a School
Built-up Area = 20sqm

Proposed : MDM DAY MEAL KITCHEN DESIGN

Drawing title : Kitchen Plan Option 1a

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Approved by : RV In charge : RV Date : April 2015



All dimensions are in meters.

REVISED:

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Suggestions:-

Design should take into account hazard resistance features applicable in respective areas like fire, earthquake, land slide, floods, etc.

Design can consider the most suitable energy system for cooking and design adapted to use that – Solar cooker, bio-mass gasifier, etc. – which can either supplement or replace the entire conventional energy requirement

Costs need not be same across the state – regional variation, as directed by the State Schedule of rates for urban, rural remote sites, with regional variation is allowed as per current provisions.

What is the problem?

Why improved cookstoves?

Health

- Indoor air pollution accounts for 4 to 6% of the Indian national burden of disease.
- 18% of partial and complete blindness among people aged 30 and older in India can be attributed to biomass fuel use

Acute respiratory infections in India are the largest single disease category in the world, accounting for 2.5% of the global burden of ill health (WHO 2007).

- 1) ENERGY AVAILABILITY
- 2) ENERGY ACCESS

What is the problem? Why improved cookstoves?

□ Environment

- Biomass burning contributes in the range of 33 to 56% of total black carbon emissions (vehicle emissions is the largest source)

- Use of traditional biomass places pressure on already strained ecosystems

The data required for the installation of the stoves would be :

- (i) Number of meals cooked
- ii)Type of stove currently in use.
- iii)Type of meal cooked.
- iv)Hours of operation of the stove.
- v)Willingness to shift to the new stove.
- vi)Fuel usage per day (in kg).

Why haven't past programs worked?

- Low adoption rates due:
 - expense of stove
 - difficulty using cookstoves correctly
 - low levels of formal education
 - lack of knowledge about the benefits of nontraditional cookstoves
 - mismatch between cookstove characteristics and local needs

Installation at Pneuma Trust



INSTALLATION AT R.C PRIMARY SCHOOL



Smokeless PYRO MP50 stove

Mid day meal prep...



Mid day meal prep.,..



Stoves for MDM schools

Features :



- Suitable when cooking in a kadai or any other vessel or for deep frying
- Multipurpose / multi fuel stove can use, firewood, briquettes and charcoal but with suitable attachments
- Available in 5 different cooking capacities for cooking 70 – 450 meals
- Versatile: For preparing all types of food items - curries, sambar, rasam, chicken, rice dishes, fried foods etc.
- Mild steel stove standing at 91 cms and weighing 44kgs (this information about the stove with 50 cm diameter)
- With chimney to expel minimum release of smoke away from the cook and diners
- An optimally designed grate to ensure complete and clean combustion of fuel
- Presence of air vents to regulate fuel burning rate
- Lined with cold face insulation bricks to prevent heat loss
- Fuel saving of 40% over conventional stove and so reduces cooking cost
- Durable – life of stove more than 5 years

PYRO Multipurpose Stove

Available Models :

Stove diameter (cm)	Wt. of cooked rice In 40-45 mins	Vol of sambhar/dal cooked In 1 hr (ltr)	Vol of oil heated In 20 min (ltr)	Vessel Diameter (cm)	Firewood burning rate kg/hr
37 cm	6 kg for 70 meals	Upto 16 ltr	15 ltr	36-40 cm	2.5 kg
45 cm	11 kg for 80-100 meals	About 25 ltr	17-18 ltr	45-50 cm	4 kg
61 cm	16 kg for 140-160 meals	About 35 ltr	20-25 ltr	60-65 cm	4-5 kg
78 cm	26 kg for 270-300 meals	50-60 ltr	30-35 ltr	80-85 cm	6-8 kg
96 cm	36 kg for 400-420 meals	75-85 ltr	41-45 ltr	95-100 cm	8-9 kg

for loose fuels

Features :



- Especially recommended for use in food processing units for deep frying of sweets, savouries
- Very versatile stove – ideal for cooking meals also
- Uses low cost, free flowing fuel powdery / loose biofuels like sawdust cashew shells, ground nut husk etc.
- Mild steel stove body with provision of hopper for easy fuel feeding
- Lined with cold face insulation bricks to prevent heat loss
- An innovative sloping grate for optimizing air fuel mixing and to ensure complete and clean combustion of fuel
- Presence of air vents to regulate fuel burning rate
- Fuel saving of 40% over conventional stove and so reduces cooking cost
- Durable – life of stove more than 5 years
- Recommended for heavy duty operations

PYRO Loose Fuel Stove

Available Models :

For cooking meals

Stove diameter (cm)	Wt. of cooked rice in 30-35 mins	Vol of sambhar/dal cooked in 45 min hr (ltr)	Vol of oil heated in 15 min (ltr)	Vessel Diameter (cm)	Fuel burning rate kg/hr
60 cm	16 kg for 150 meals	31-45 ltr	19-25 ltr	57-84 cm	4-5 kg
70 cm	18 kg for 180-200 meals	46-48 ltr	26-28 ltr	67-74 cm	6-7 kg

**The latest in
stove design**

AGNI-MITRA

**70% saving
in fuel consumption**

**Fuel cost
reduced by
Rs 7000
per month.***



PYRO

Thrift • Savings • Profit



- Forced draft blower operated by mains with an adapter – 12 V, 1 amp capacity
- Clean burning of loose fuel; No smoke, no soot, clean vessels
- Any dry, small size (1-2" pieces) biomass can be used as fuel except rice husk.
- Space required: 2.5 ft x 1.5 ft. Weight 12-15 kgs depending on size
- Good quality, stainless steel finish.
- Safe, easy to use and maintain
- Retains heat and cooks fast because of well insulated stove body.
- Fuel consumption – average 3 kg/hr and fuel consumption and flame height can be reduced by varying the airflow valve.

Sustaintech India Pvt. Ltd.

SUSTAINTECH



Agnimitra

- 10 kg of raw rice can be cooked with 2.25 kg fuel in 45 mins in a 40 cm vessel.
- 30 litres of sambar can be made using 3 kg of fuel in 1 hr using 40 cm vessel.



Principle

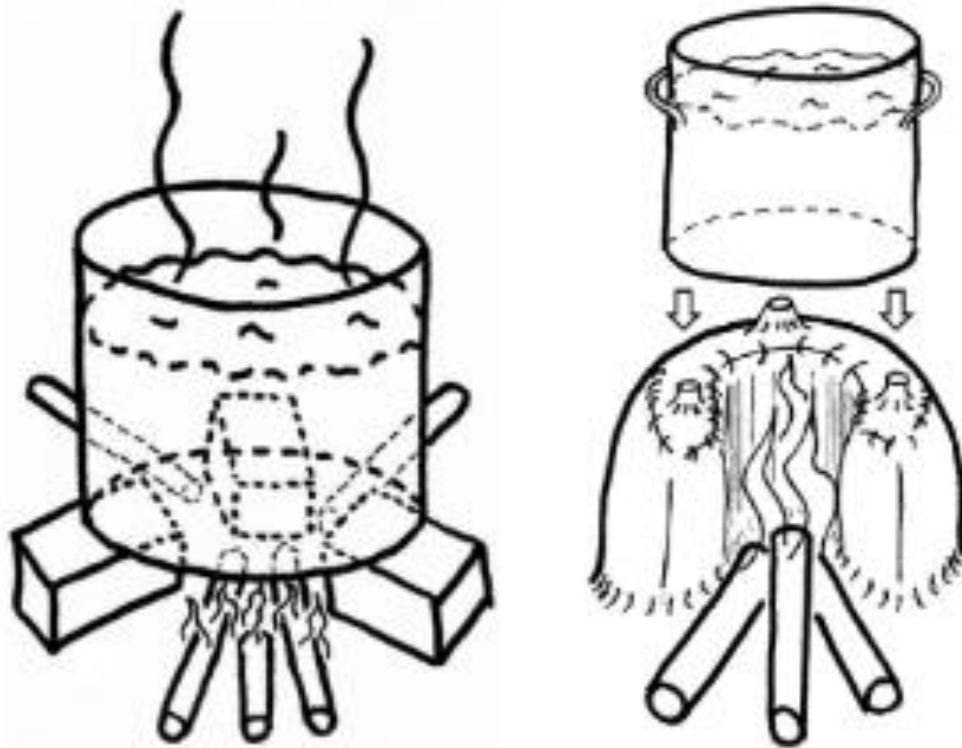
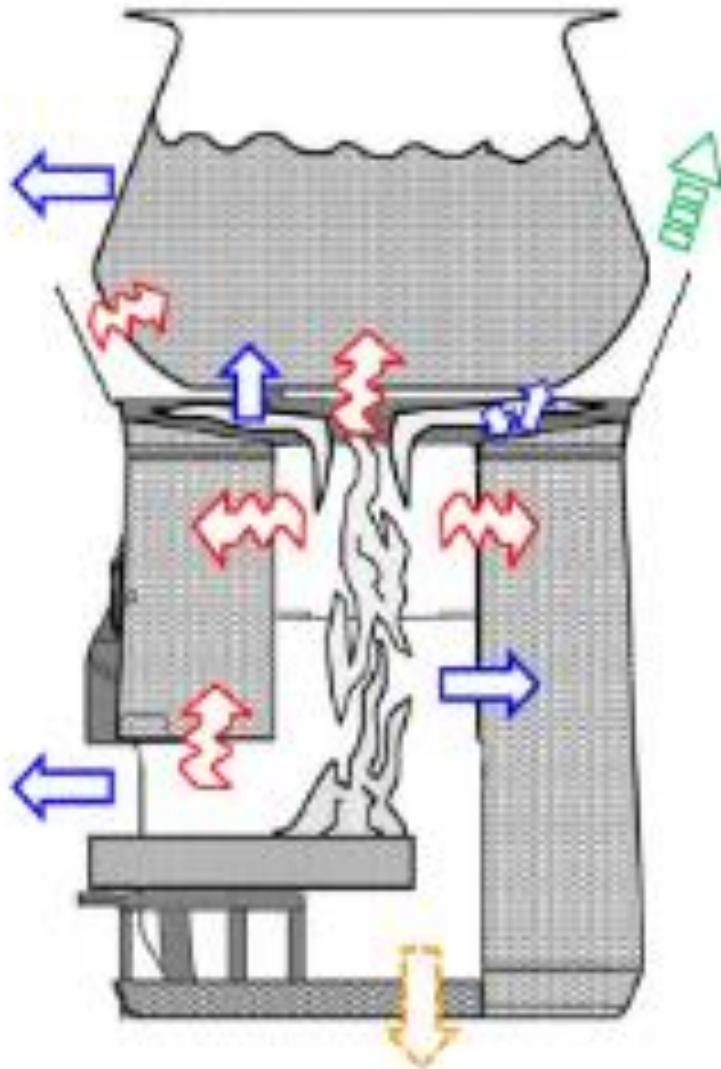






Figure 2.1. Three-stone fire (left) and built-in stove (right).

Heat distribution



- Convection..... 
- Radiation 
- Conduction 
- Energy Wasted..... 

Heat balancing

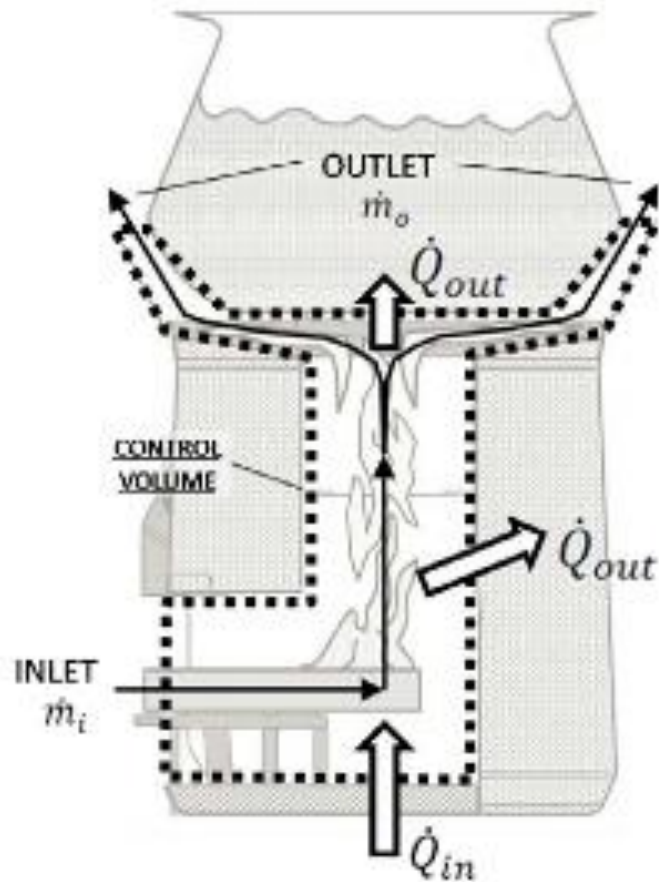


Figure 3.2. Cookstove control volume schematic.