

# De Montfort Mark 8a Incinerator

## Introduction

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This is the recommended incinerator for all but large hospitals.

The instructions which follow are meant to be used in all countries. The building instructions give the number and position of the bricks, but not the overall dimensions of the incinerator. This is because bricks differ slightly in size between one country and another, and it is simpler to adjust the overall size of the incinerator to the available bricks than to have to cut bricks to an exact dimension.

Similarly, only approximate dimensions of the steelwork are given. The correct procedure is to lay out the first two layers of bricks, and then measure the length and breadth of the steel which fits on top. The steel top can then be made to fit the finished brickwork.

The steel tunnel and ash door can also be dimensioned to fit the brickwork by taking measurements from the brickwork once the tunnel is formed in the first five layers of bricks.

## Summary of characteristics

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**Use:** designed especially for most healthcare facilities, except large hospitals (more than 300 - 400 beds)

**Capacity:** 12 kg/h

**Lifespan** (average): 3-5 years

**Approximate unit cost** in USD (materials only): 250 - 1'000 depending on the availability of refractory bricks

**Time necessary to build:** 3-4 days

**Remarks:** Where the load to be burned consists almost entirely of **sharps boxes** filled with used hypodermics, special conditions apply:

1. The plastic in the syringes has a very high calorific value and additional fuel will not be required after the initial warm up period.
2. Boxes should be introduced **one at a time**. There will be a brief delay, then an increase in smoke level followed by a gradual decrease. The next box should be introduced when the smoke level is observed to be decreasing.
3. Tests have shown that this means that boxes of up to 100 syringes can be burned at a rate of about **one every 10 minutes**.
4. Introducing boxes at a higher rate than this will result in very high smoke rates and molten plastic at the base of the incinerator.

## List of materials

item	dimensions	quantity
Fire bricks		200 (approx.)
Sand		200 kg
Fire cement (high alumina)		50 kg
Rolled steel angle (mild steel)	30x30x3mm thick	12 metres
Rolled steel channel (mild steel)	100x40x5mm thick	4 metres
Flat sheet (mild steel) for loading door	600 x 750 x 3mm	1 sheet
Flat sheet (mild steel) for ash door	250 x 250 x 3mm	1 sheet
Flat sheet (mild steel) for chimney spigot support	250 x 150 x 3mm	1 sheet
Mild steel pipe	150mm diameter x 3mm thick (approx)	4 metres
Hinges for ash door		
Pipe, for loading door hinge	1 inch	1
Rod, for loading door hinge	3/4 inch	1
Masonry plugs (rawlplugs), screws, etc	no 10	16
Welding rods (mild steel)		40
Steel cable (optional)	5 mm 7 strand	40 metres
Turnbuckles (optional)	M8 x 150 mm long	4 (not essential)
Wire Mesh (optional)	Any fine gauge	loose fill
Fuel tank, tap and pipe (optional)		1 set

### Note

If required, the incinerator body can be clamped together with steel bars. It can also be surrounded by an outer case of common bricks to give extra strength and

weather protection. In this case, the two thicknesses of brick should be “capped” with cement.

Materials should be obtained before starting the construction !

## Complete layout



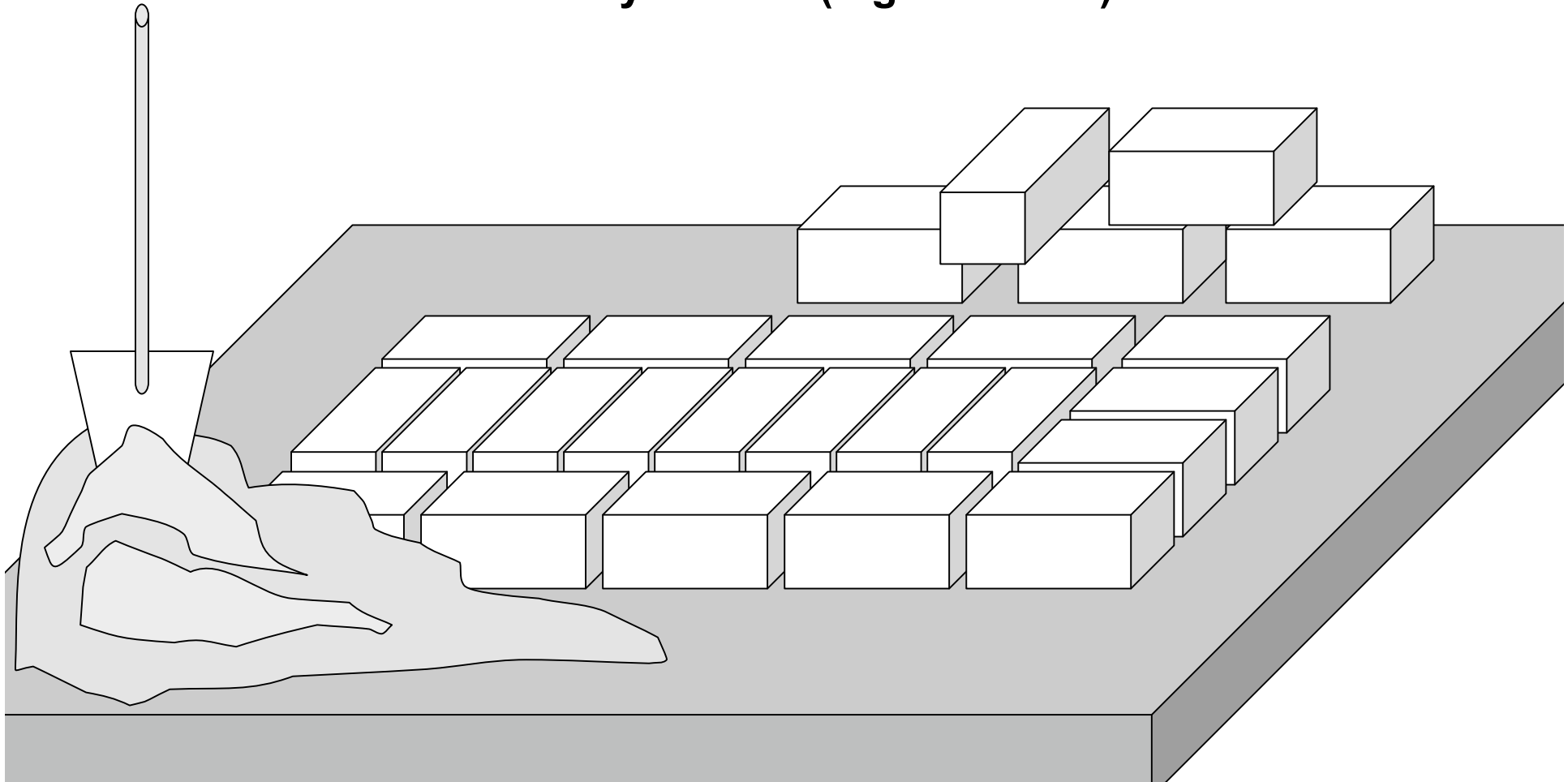
Figure 1: De Montfort incinerator Mark 8a

# FOUNDATION

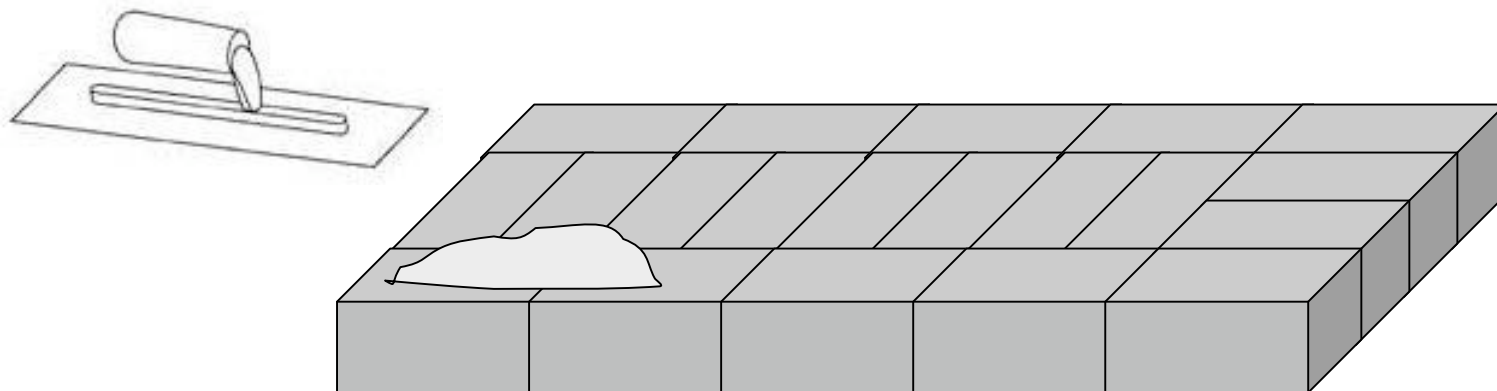
**Concrete foundation: L x W x H = 2m x 2m x 0.15m**

**Refractory bricks: L x W x H = approx. 230 x 110 x 65 mm**

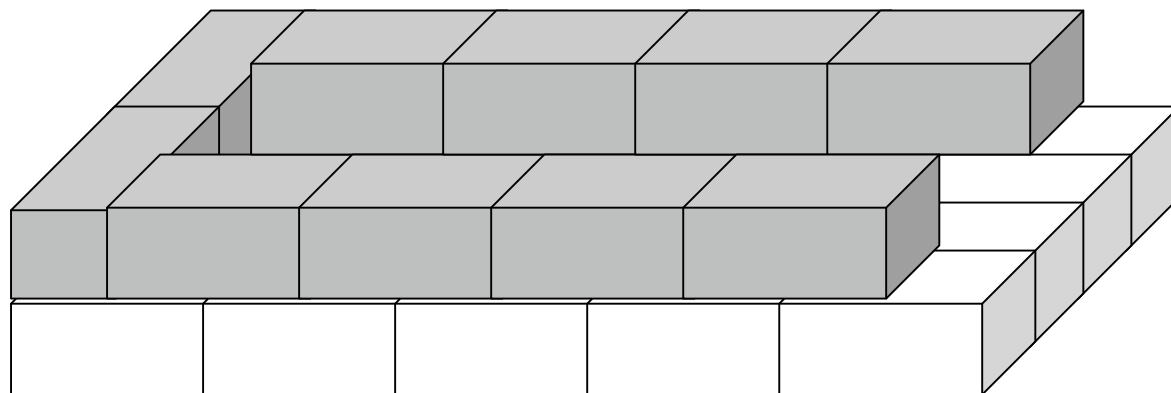
**Mortar: Refractory cement (high alumina)**



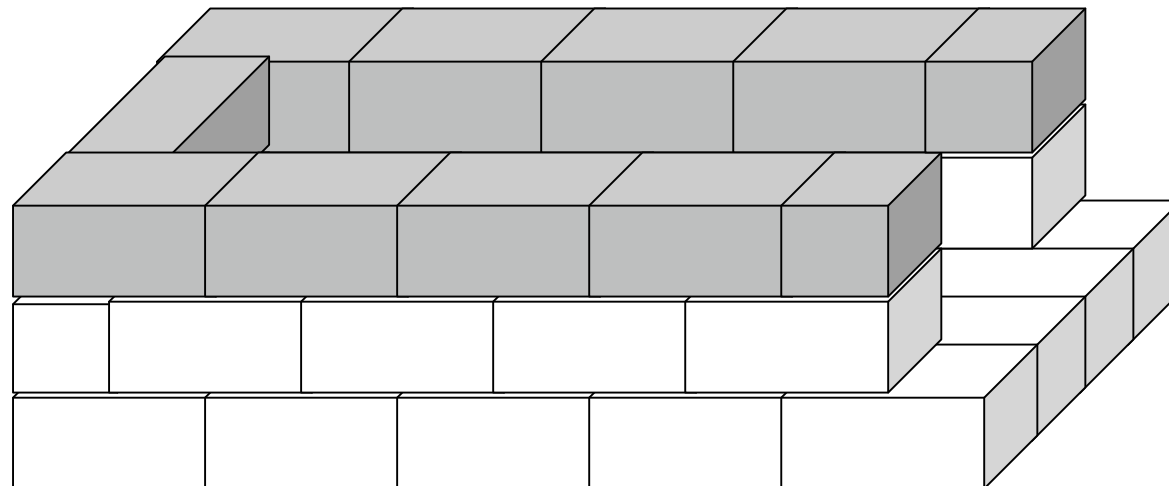
# LAYER 1



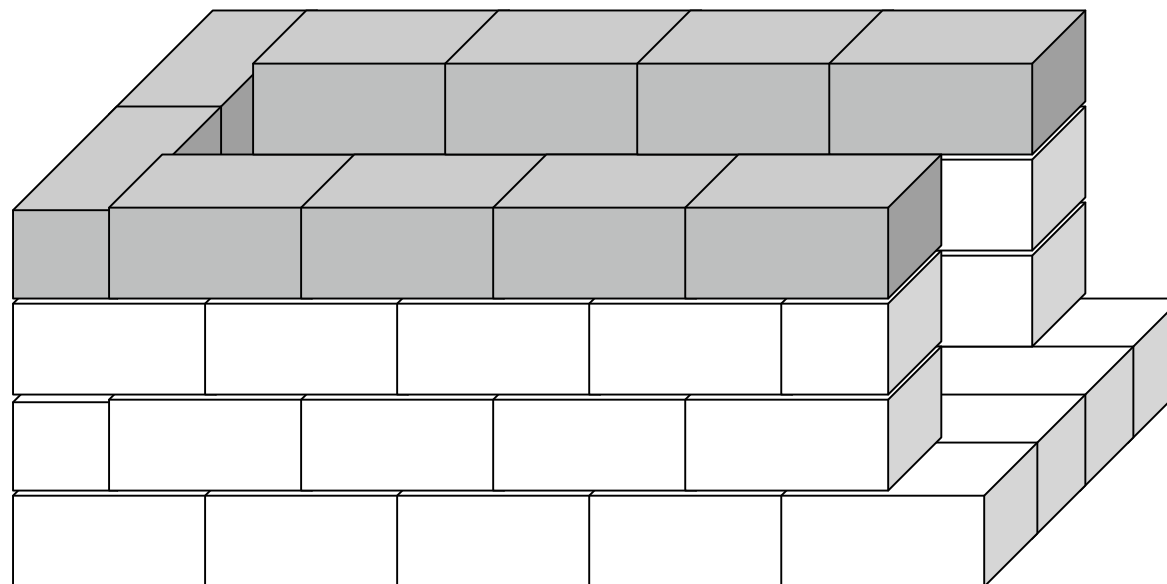
# LAYER 2



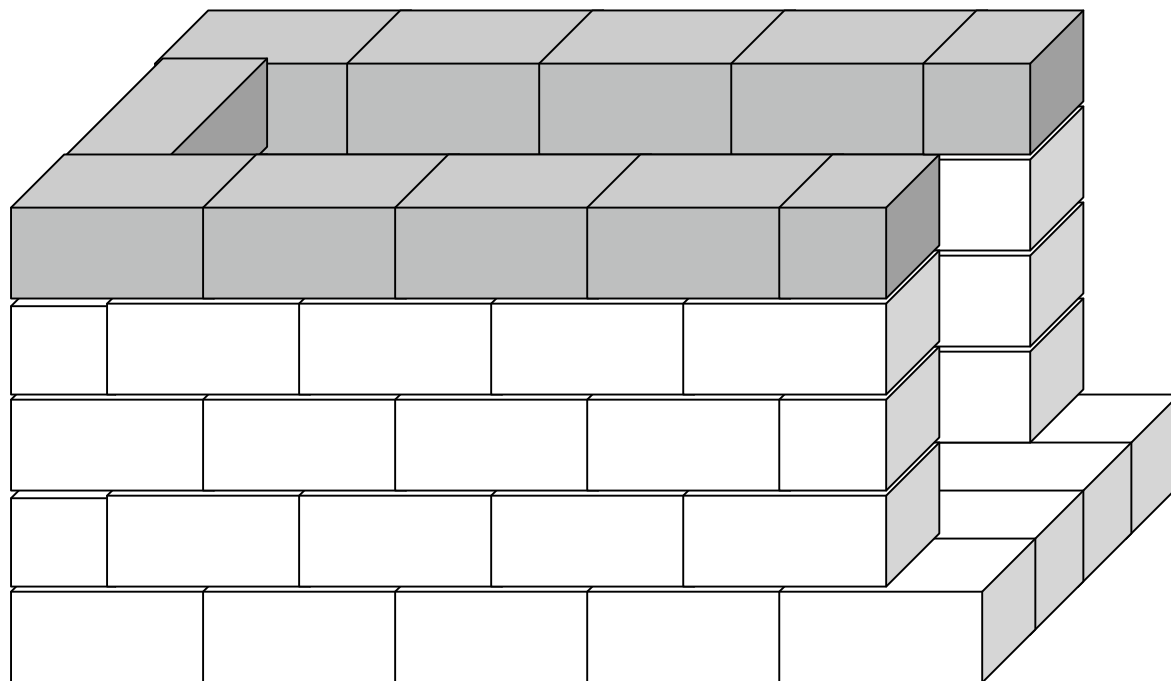
**LAYER  
3**



**LAYER**  
**4**



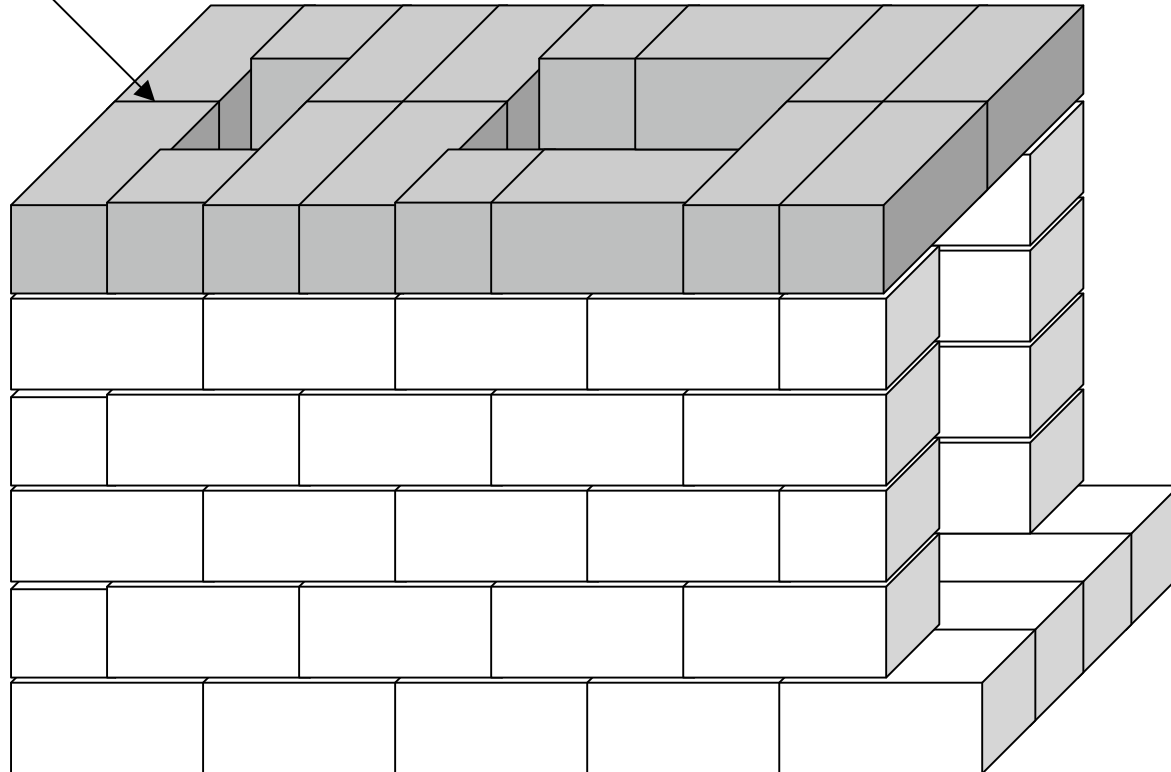
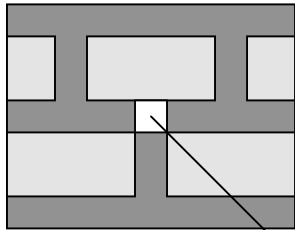
**LAYER**  
**5**



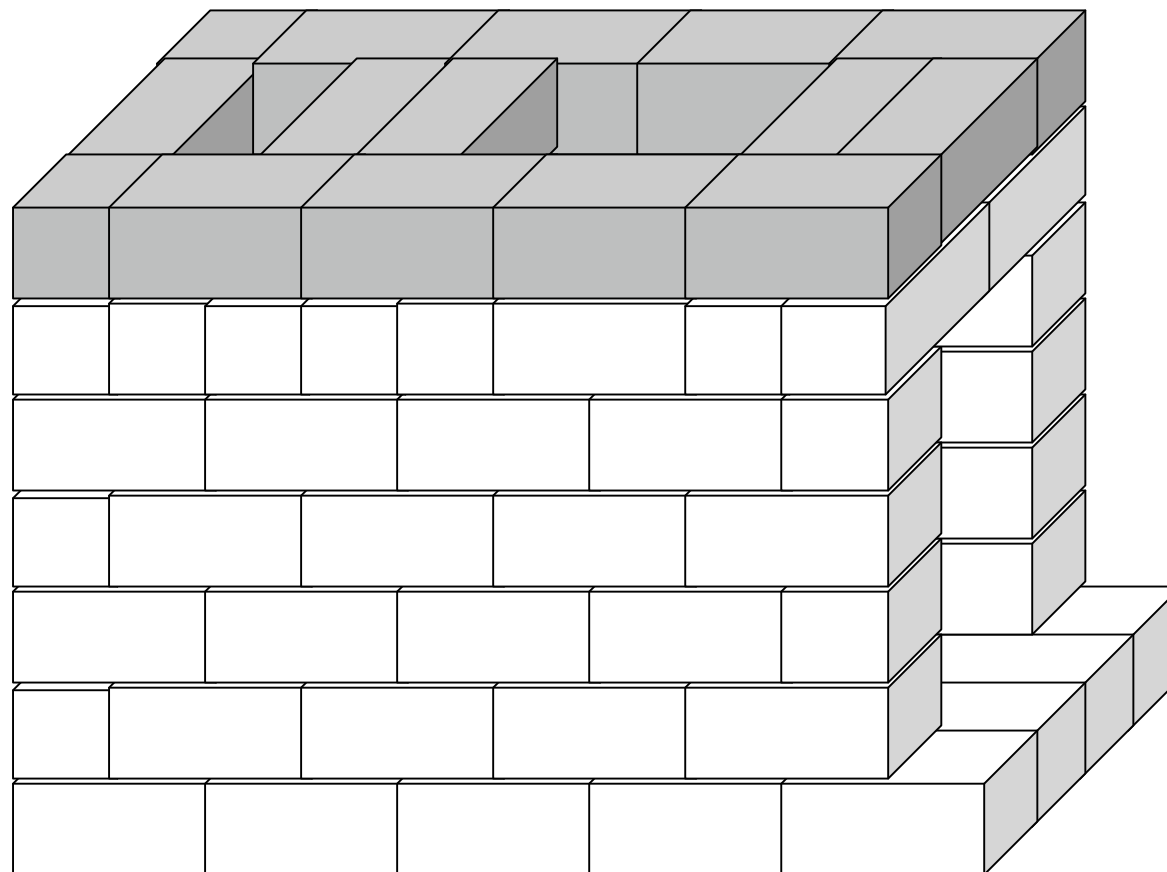


**LAYER  
6**

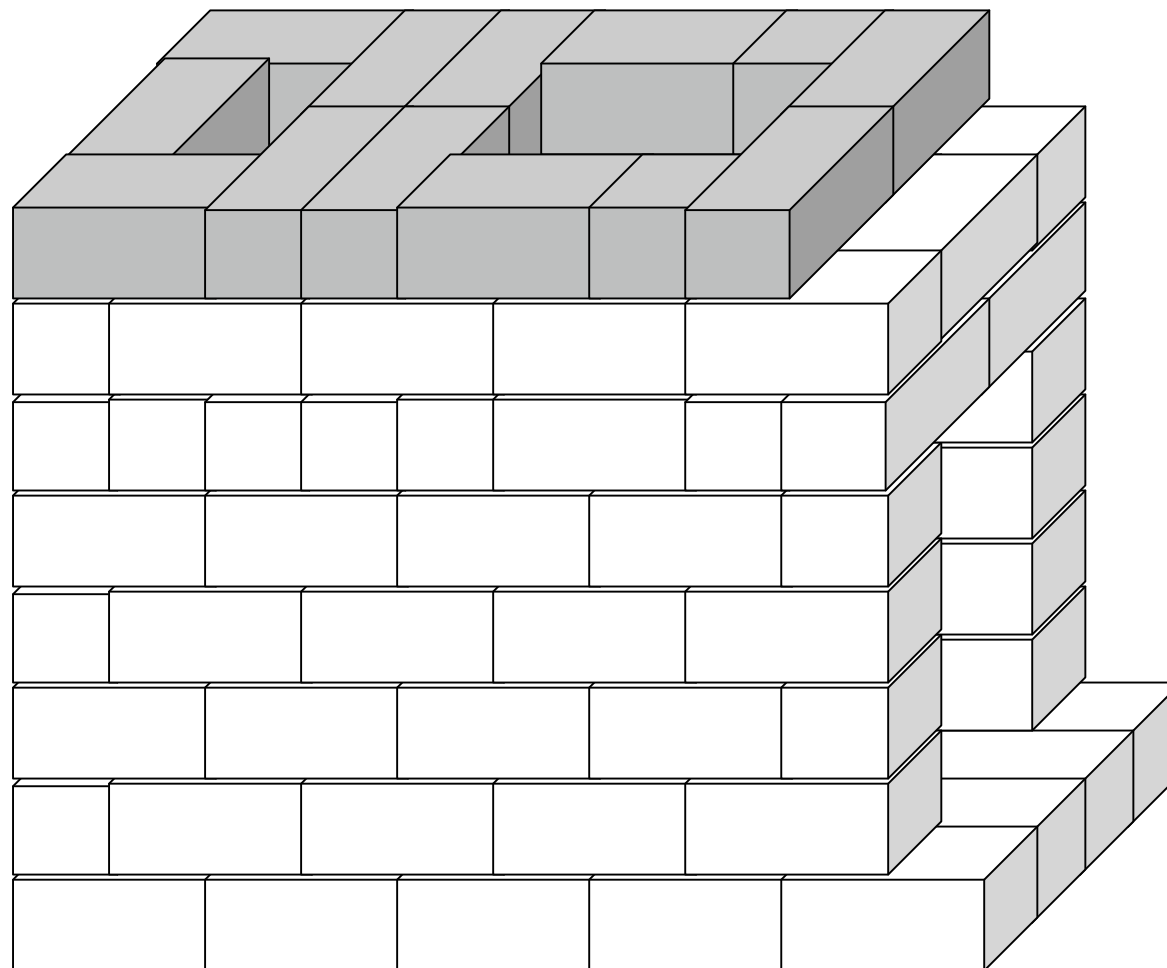
**Make a viewing hole by creating a gap in the cement between layer 6 & 7. Insert a piece of wood that can be removed.**



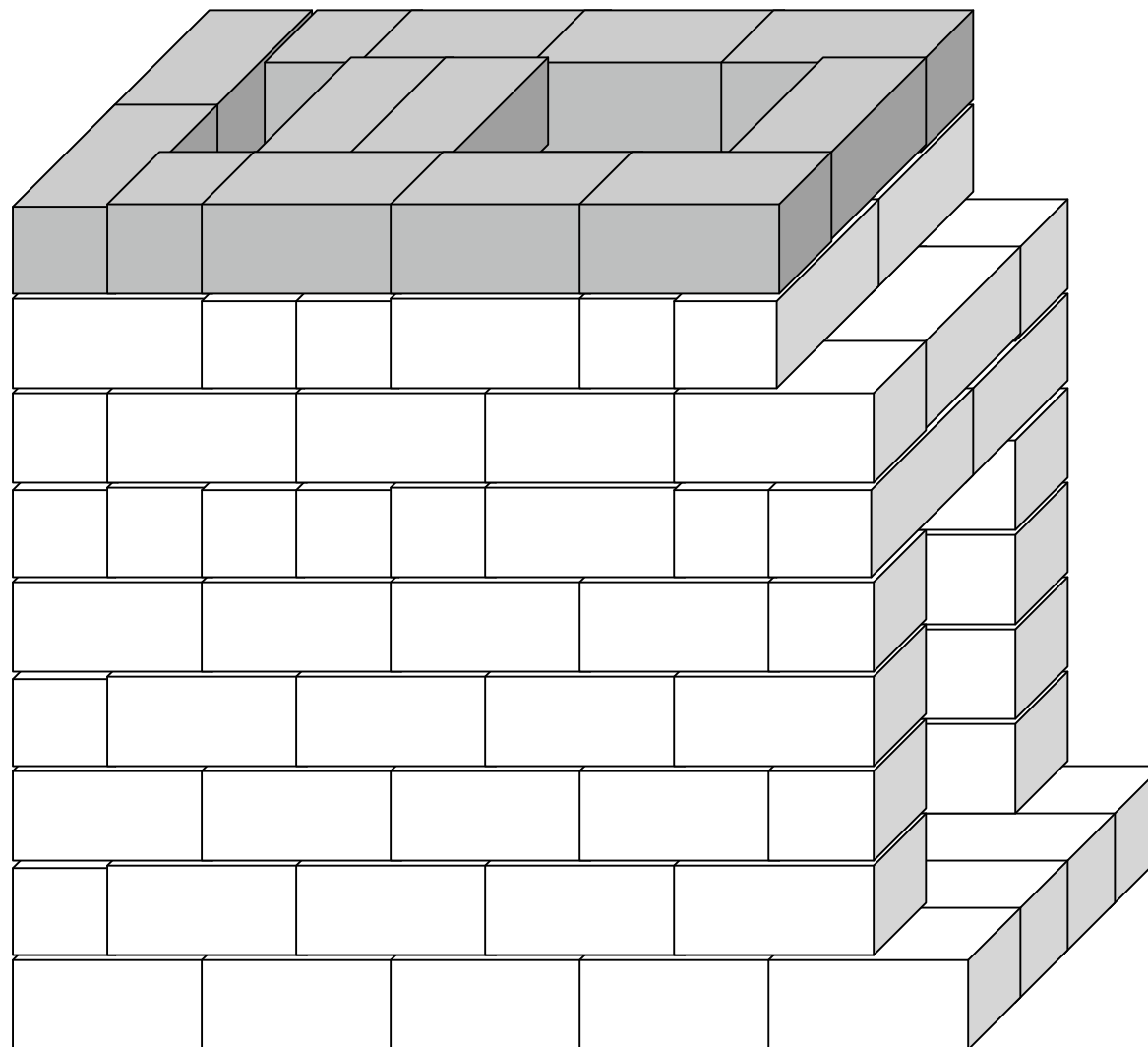
# LAYER 7



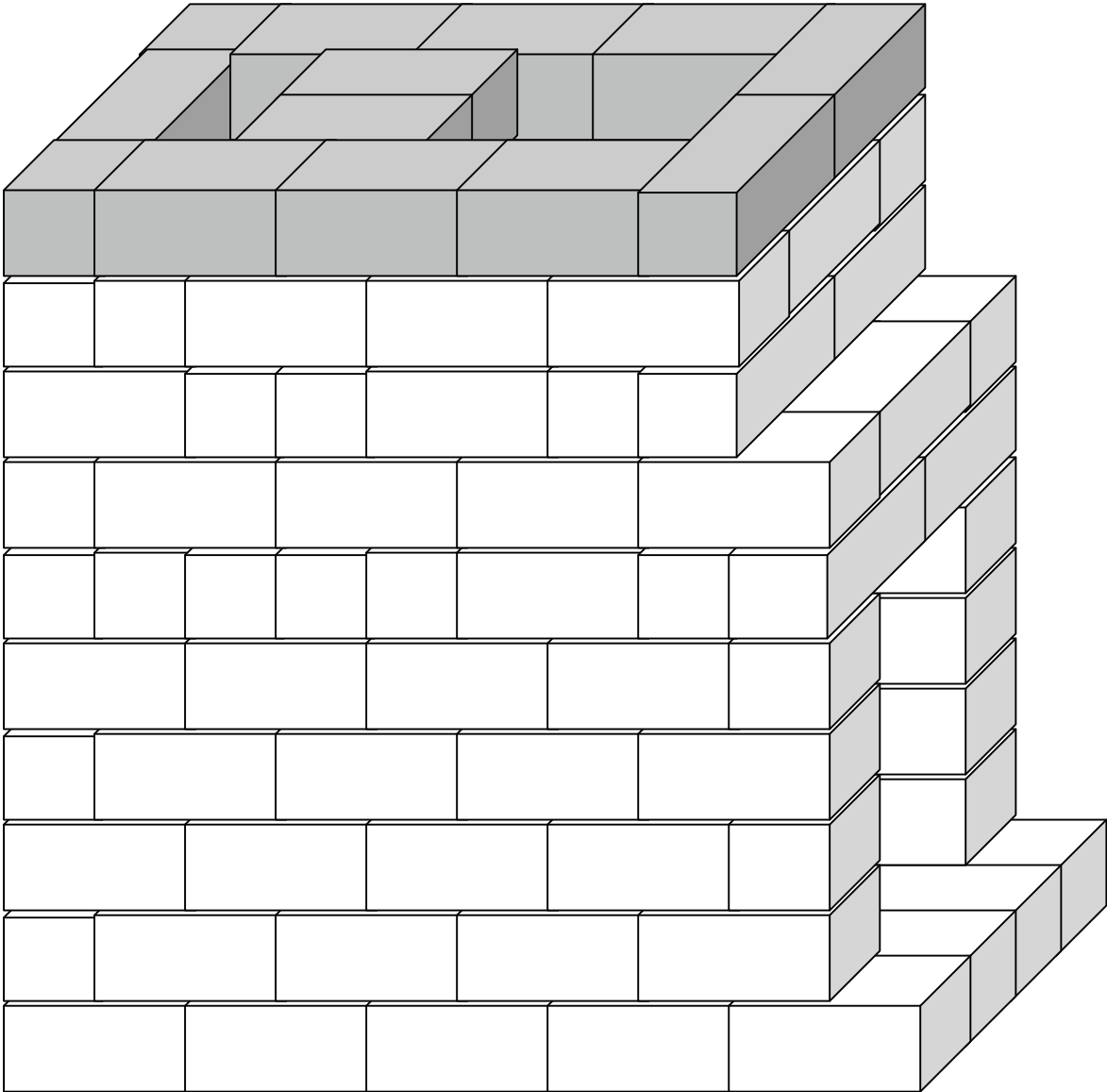
# LAYER 8



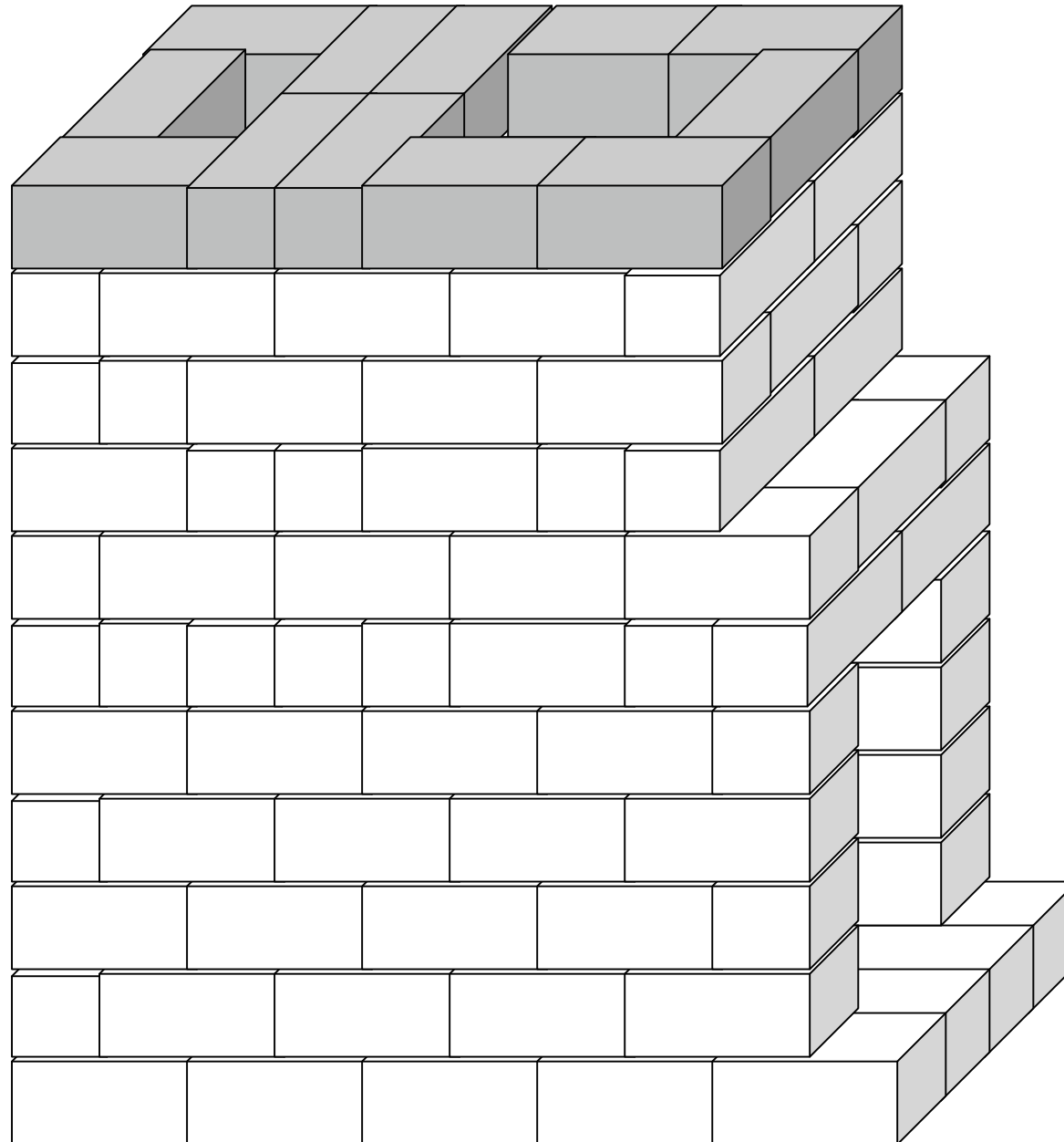
**LAYER**  
**9**



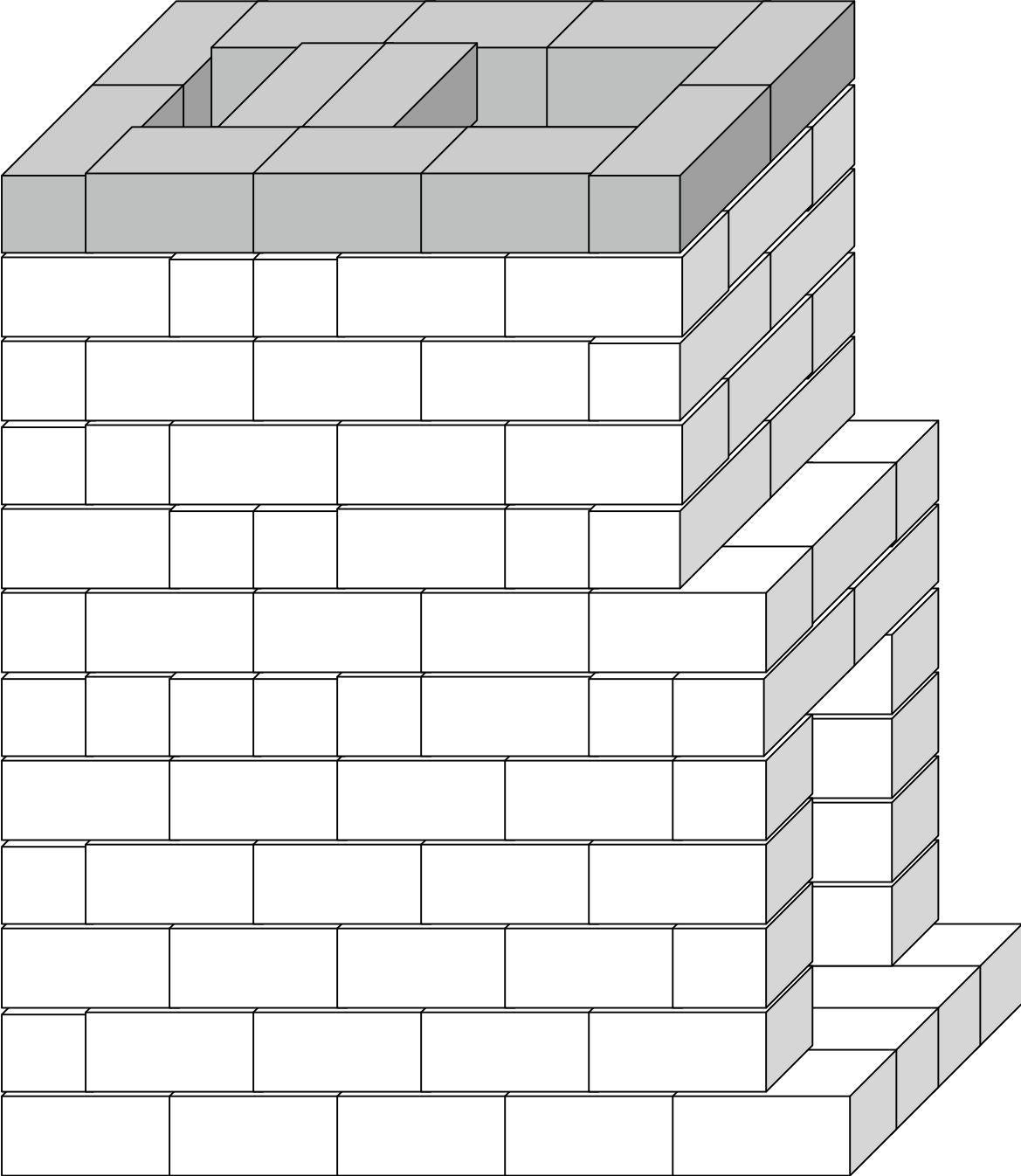
**LAYER  
10**



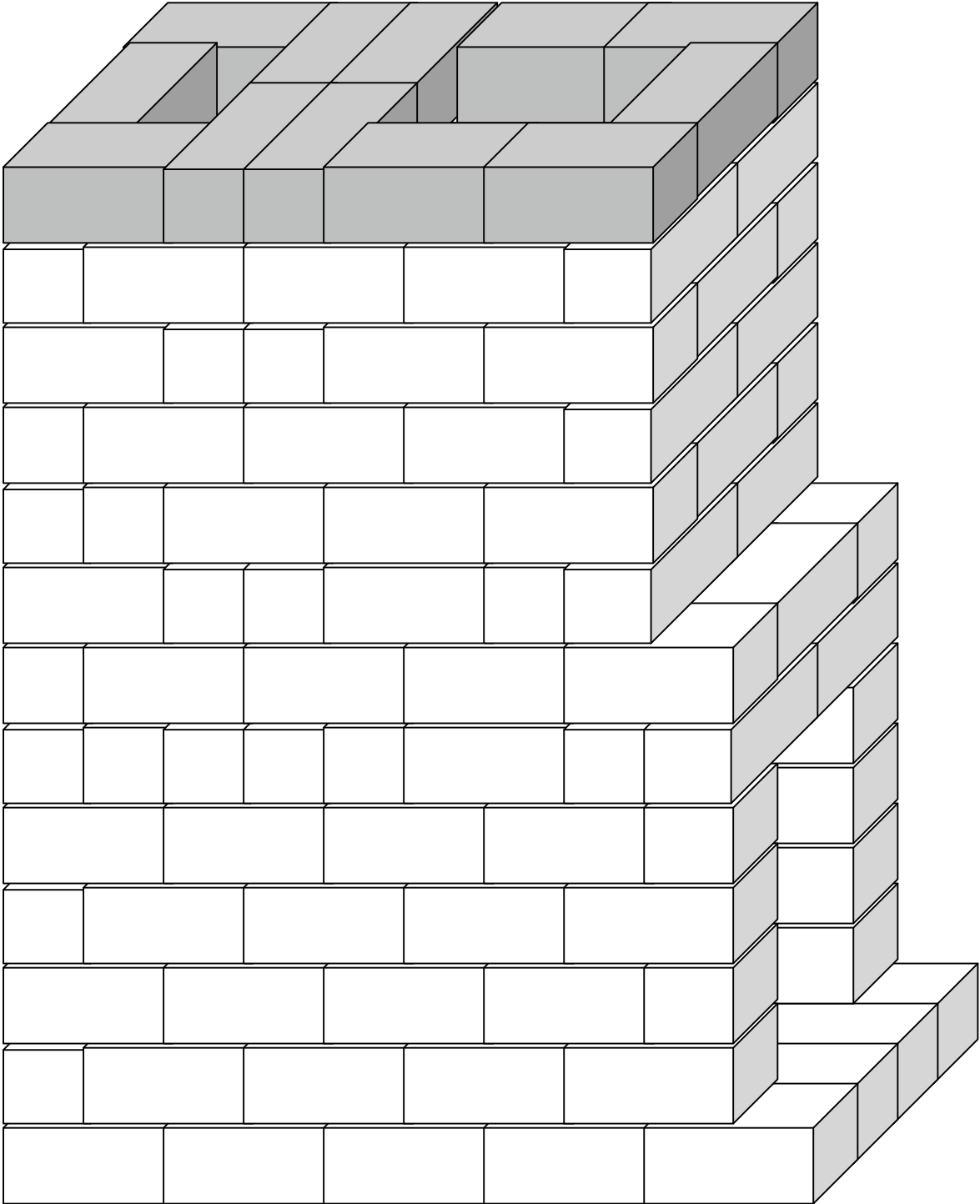
# LAYER 11



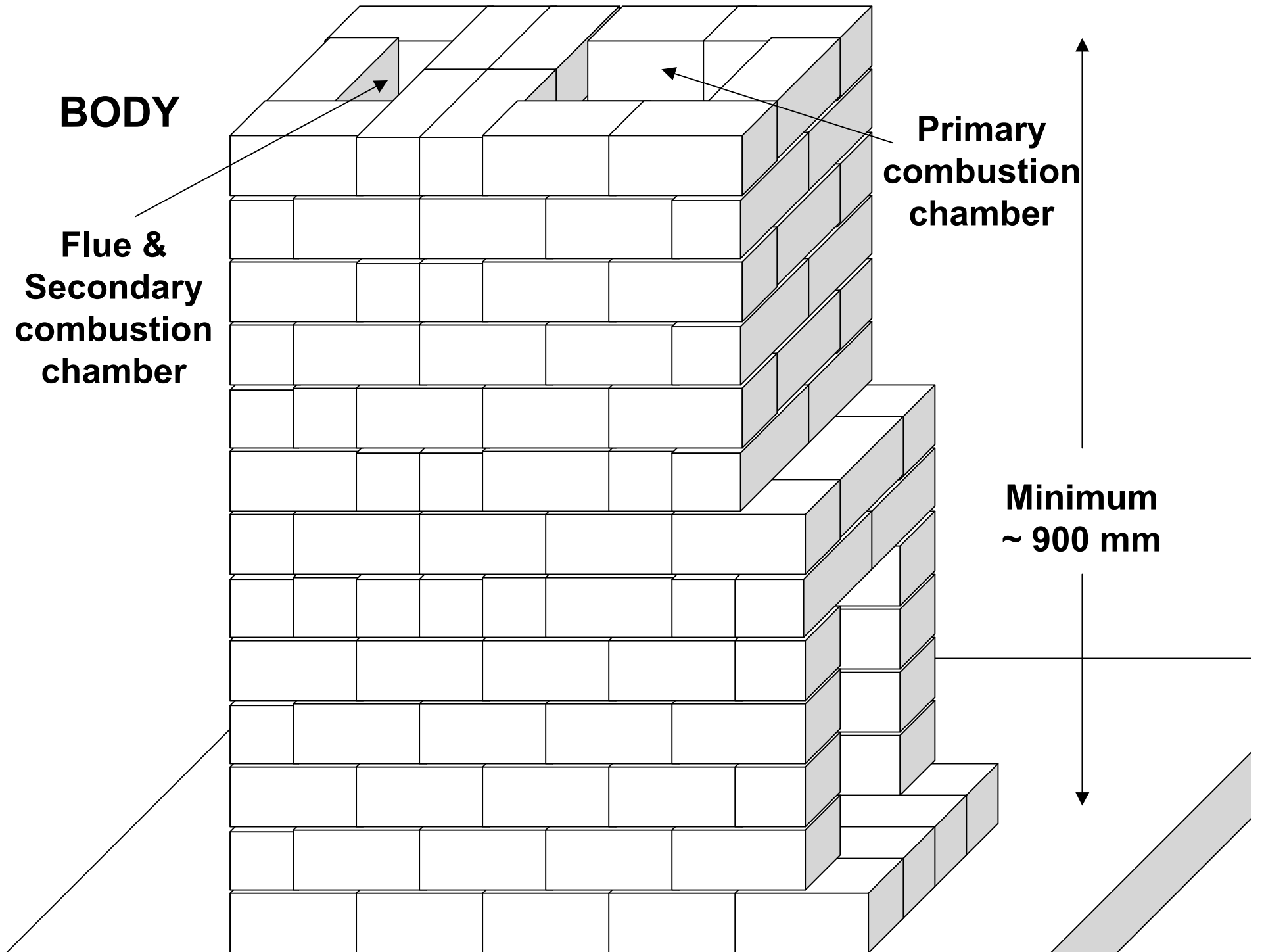
**LAYER  
12**



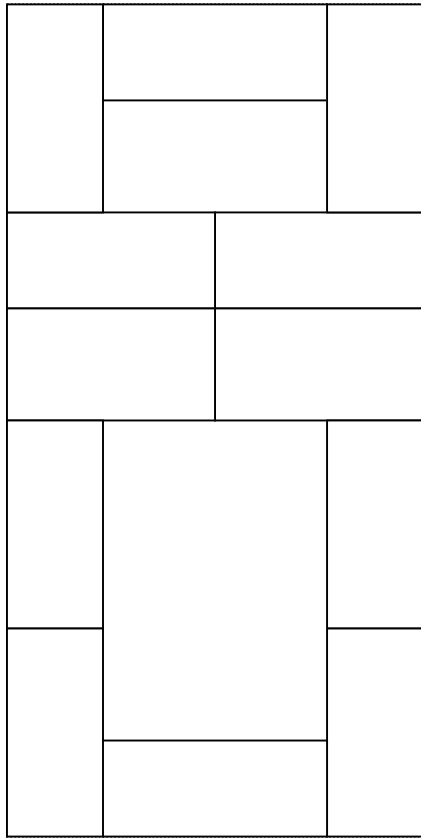
**LAYER  
13**



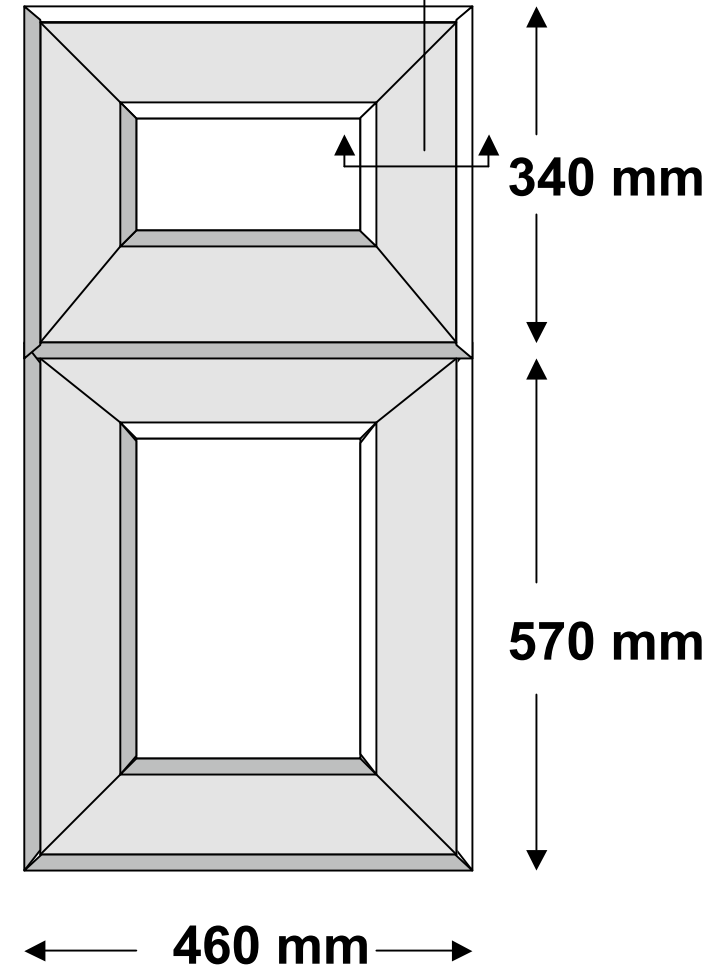
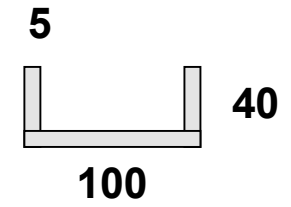




# TOP FRAME

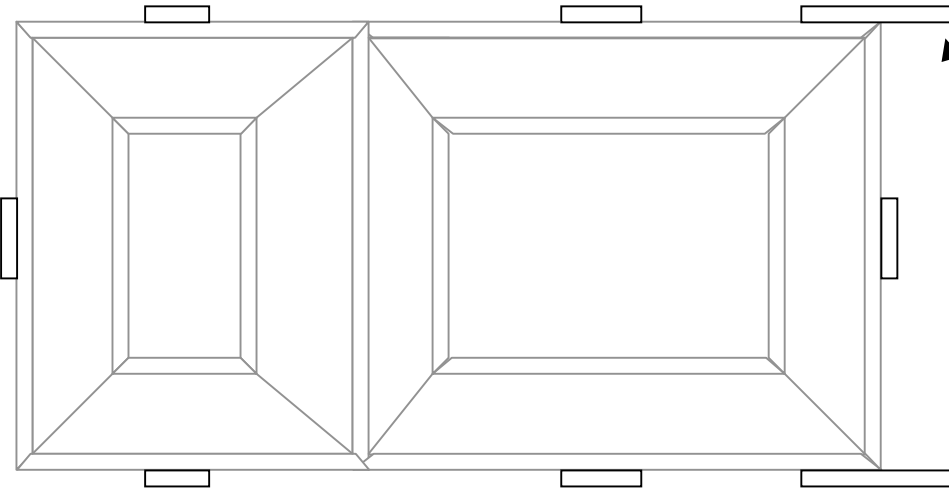


Cross section of  
metal channel

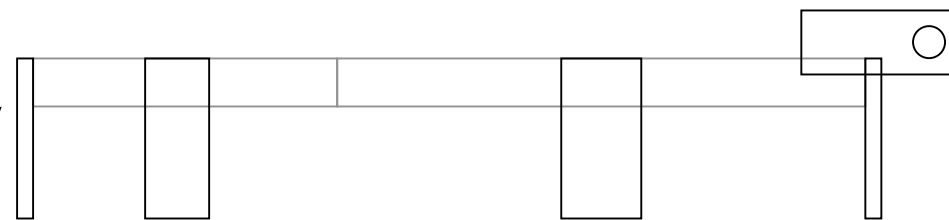


# TOP FRAME

*Plan view*



*Side view*

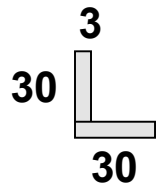


**LOCATORS:** Pieces of metal channel are welded to the top frame as locators

**HINGES:** 3mm metal plate is used for the loading door hinges

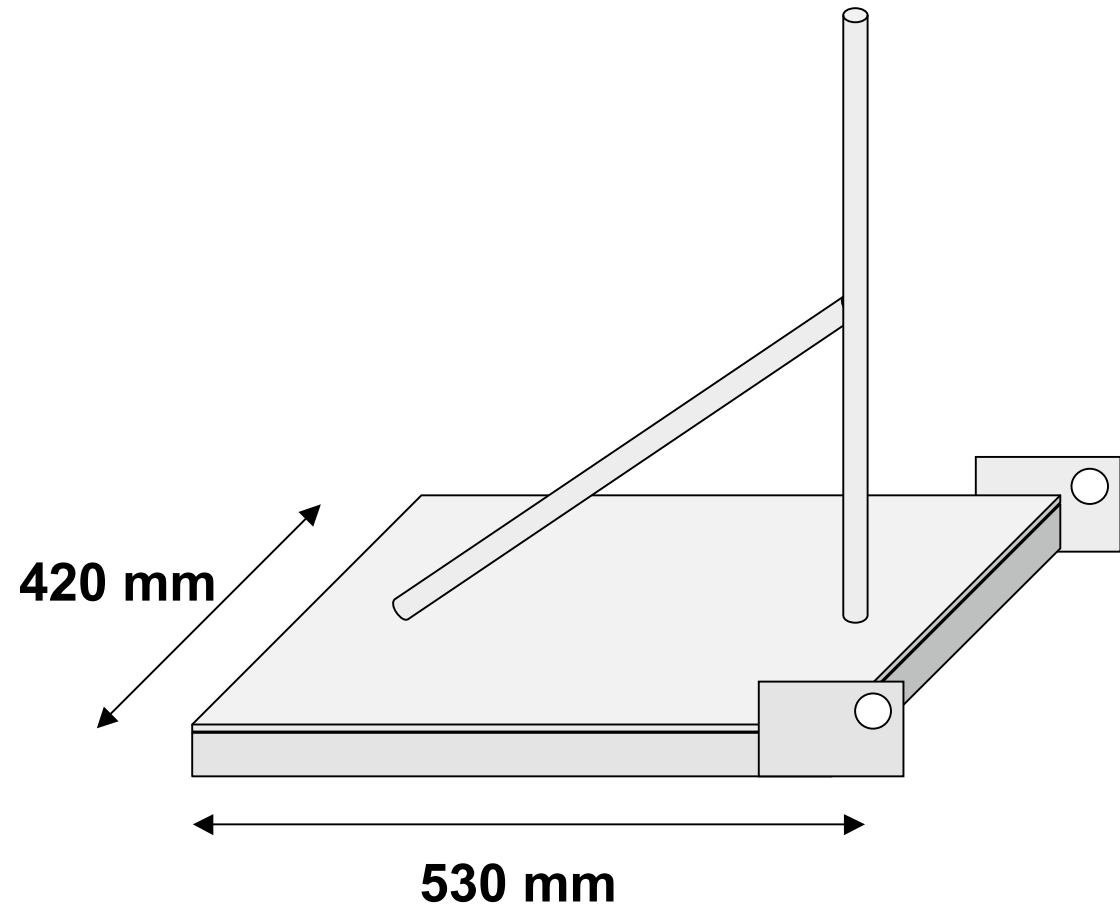
# LOADING DOOR

Underside



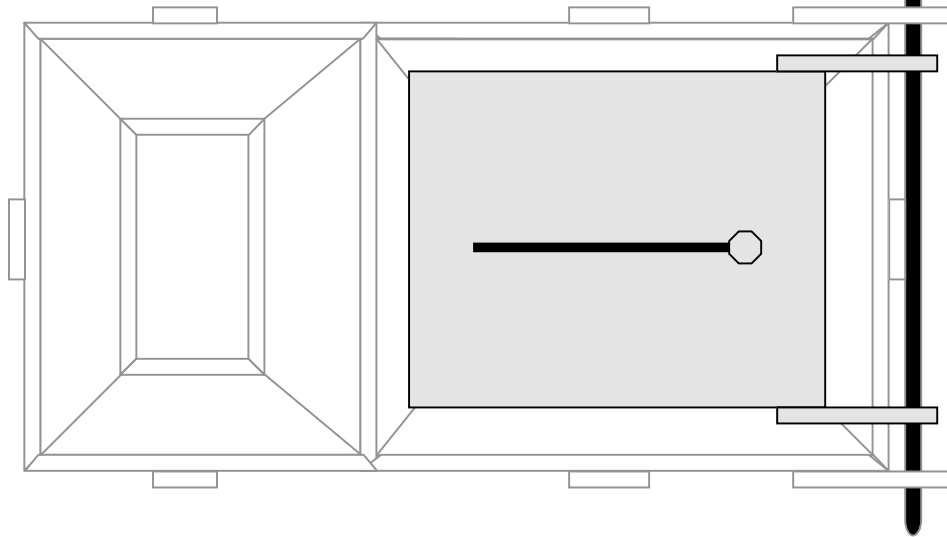
Metal Angle

The loading door is made from a frame of metal angle (30 x 30 x 3) with a plate of 3mm steel welded on top.



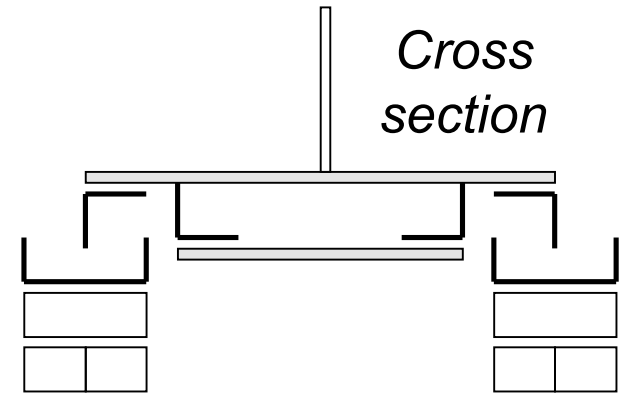
# LOADING DOOR

*Plan view*

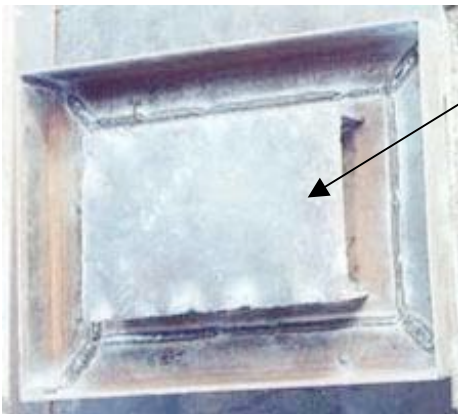


The loading door is hinged with metal bar threaded through the locating holes.

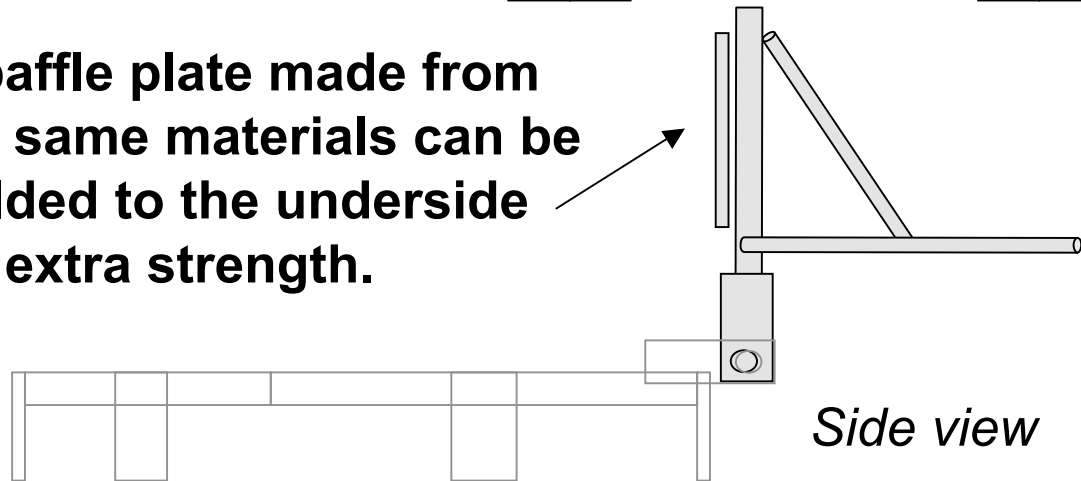
*Cross section*



A baffle plate made from the same materials can be welded to the underside for extra strength.



*Side view*

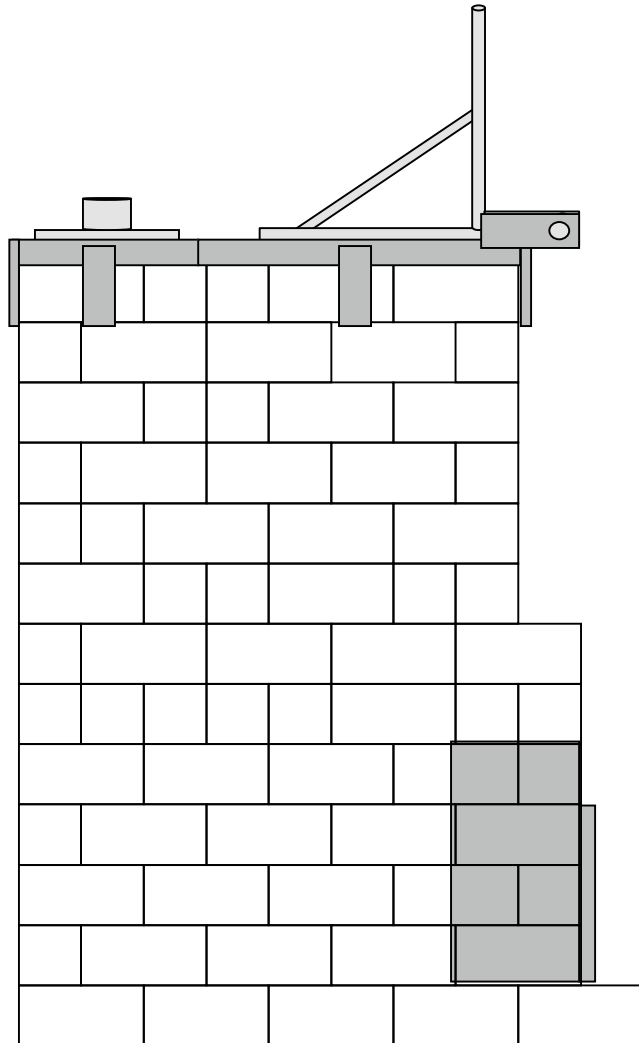


## FITTING THE TOP FRAME TO THE INCINERATOR BODY



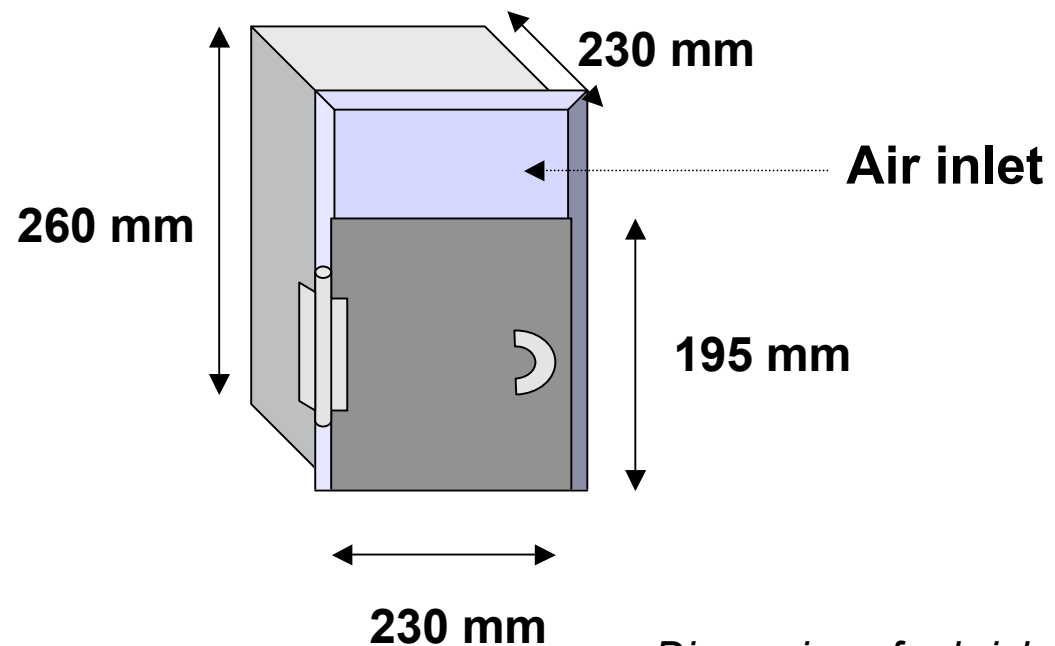
**Seal with  
refractory  
cement**

# ASH DOOR & SUPPORT



The brick arch at the front is supported by a steel tunnel (3mm thickness). Steel angle (30x30x3) welded around the front edge of the tunnel forms the support for the ash door, which is hinged.

The ash door (3mm thickness) covers    of the area of the arch. The remainder forms the air inlet.



*Dimensions for brick size  
(230 x 100 x 65), may need  
to be adjusted*

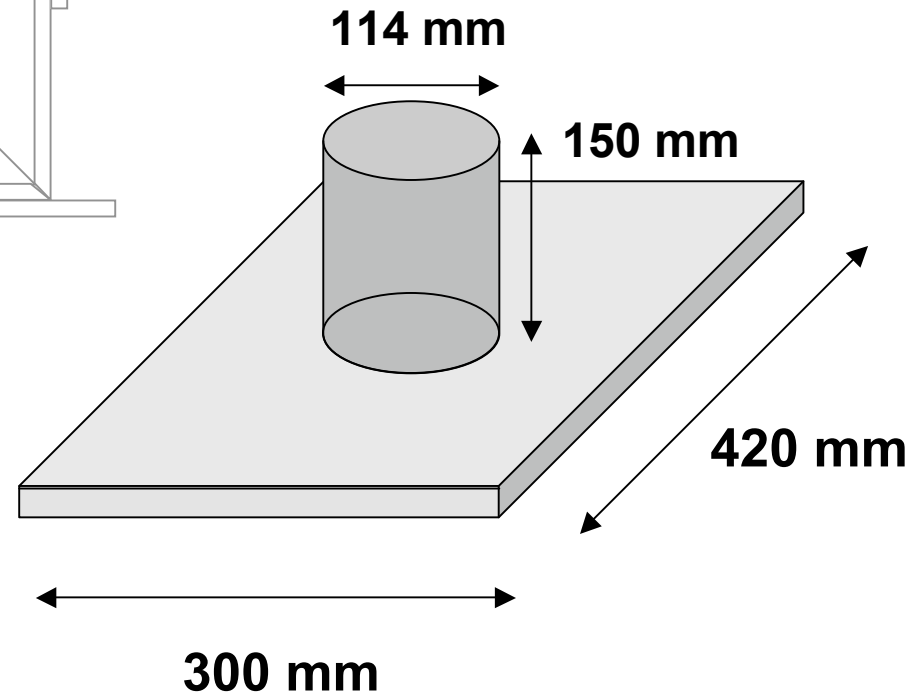
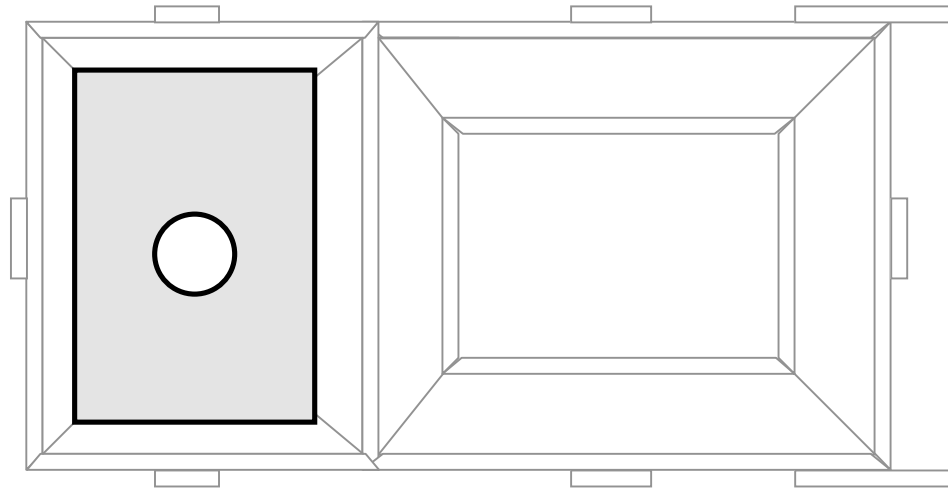
**BODY OF INCINERATOR  
WITH ASH DOOR AND  
TOP FRAME**





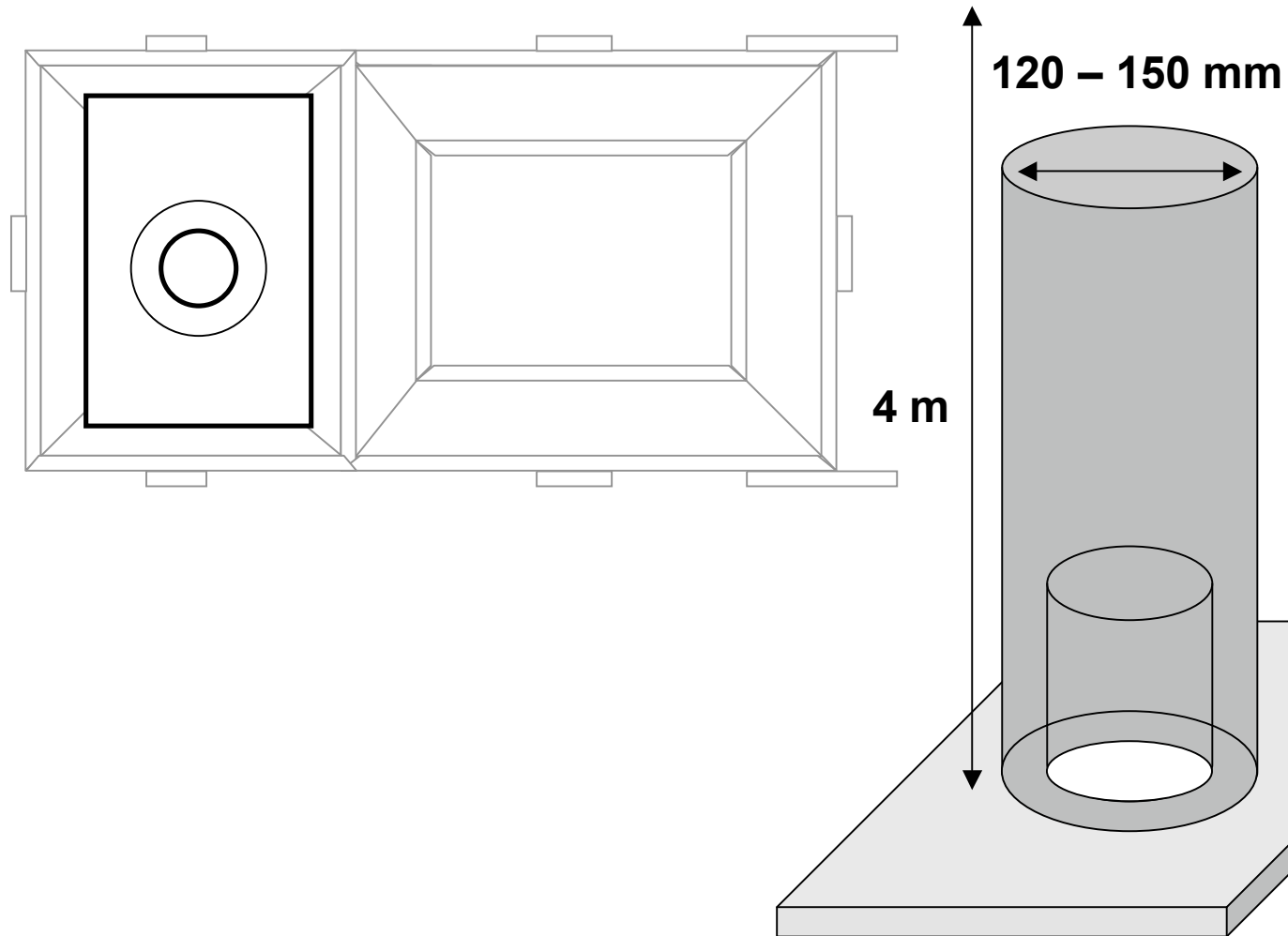
# CHIMNEY SPIGOT

The chimney spigot is made from a frame of metal angle (30 x 30 x 3) with a plate of 5mm steel welded on top and a piece of steel pipe (3mm thickness)



# CHIMNEY

The chimney is made from a steel pipe (3mm thickness). It is sealed to the spigot with fire cement.

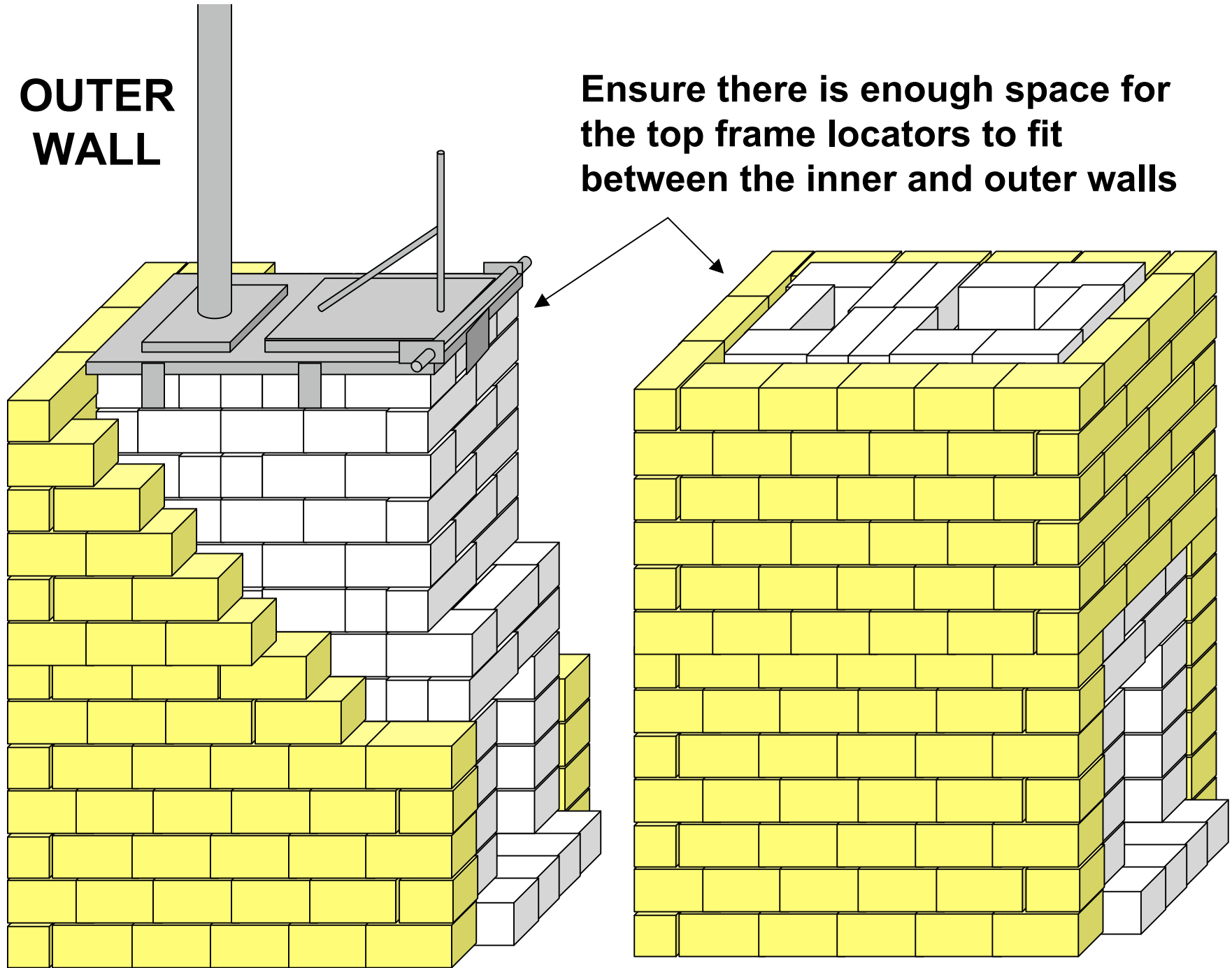


Chimney guard  
for safety ↓



**OUTER  
WALL**

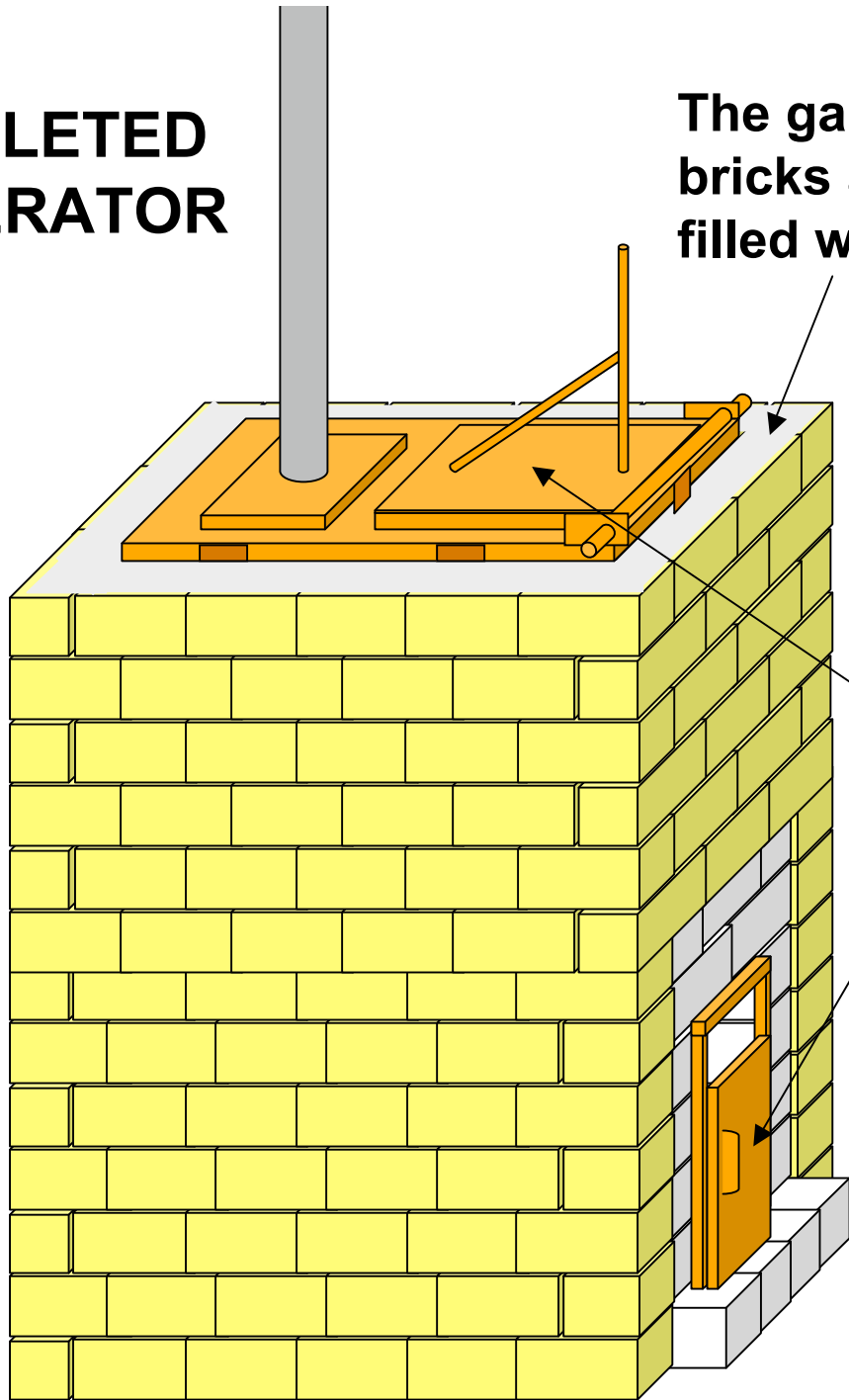
**Ensure there is enough space for  
the top frame locators to fit  
between the inner and outer walls**



# COMPLETED INCINERATOR

The gaps between the refractory bricks and outer wall can be filled with refractory cement

Paint to inhibit corrosion



# SHELTER

**Ensure good seal**

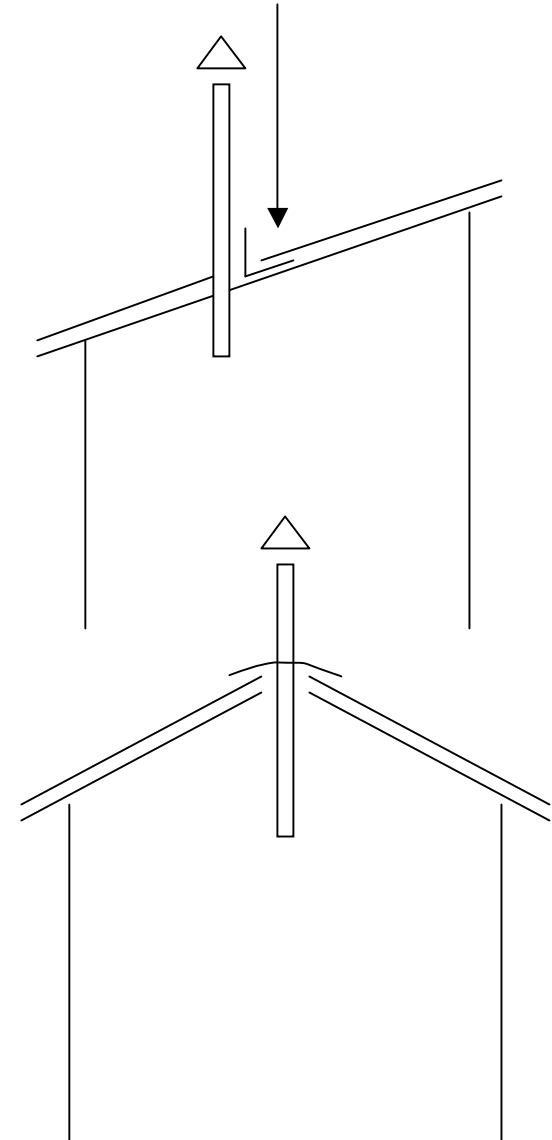
**Rain cap for chimney**

**Sloping roof, made from steel sheet**



**Concrete foundation**

**Channel to divert rain way from chimney**



## Operation

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The incinerator should be started by putting **waste paper, cardboard** or similar easily ignited material over the grate. Burning paper can then be dropped on top, and when a good flame is established, more combustible material added till the combustion chamber is half full. If available, about 100 cc of kerosene, diesel oil or used lubricating oil can be poured on top to speed the heating process. Only dry, non-infected waste should be added for the first 10 minutes or until a fierce flame is established.

The combustion chamber should be **kept at least half full**, and infectious and/or wet waste should be added above dry materials to ensure that it dries before reaching the combustion zone. Additional liquid fuel can be added if it is suspected that the combustion rate is decreasing. Any plastic waste available will also help to raise the temperature of combustion, but both this and the oil will give rise to black smoke if used to excess.

The incinerator will be most efficient if it is operated for fairly long periods once it is ignited. The grate and the flue passage to the base of the chimney must be kept clear by poking a steel rod through the air inlet hole from time to time. It may also be necessary to push down the load from time to time to prevent it “arching” above the grate. **The last load before closing down should be as dry and safe as possible**, so that no unburned material is left.

## Maintenance

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As with any type of equipment, there is a need to perform some regular maintenance to ensure both that the system will continue to work properly and to prolong the life span of the incinerator.

### *Before each operation.*

- Check that ashes have been completely cleared from the grate and floor of incinerator.
- Check that loading door closes properly onto the sand seal in an air-tight manner. Loosen sand if necessary.

### *Annual inspection and rectifications*

Component	Check	Rectify if necessary
Chimney	Vertical fixings	Reset or renew
	Corrosion	Repair any holes or weak points. Replace chimney or section thereof if necessary
Chimney support plate	Corrosion	Replace if necessary
Top sand seals	Cement seal to brickwork. Adequate sand level	Re-seal with refractory cement. Top up sand
Ash door	Corrosion, hinges, catch, blockage in door-frame	Repair and clean as necessary
Brickwork	Missing cement	Replace with refractory cement
	Evidence of thermal damage to bricks	Line inner surface of bricks with 10 mm refractory cement

### **Disclaimer**

Since the safe and successful use of the incinerator, which operates at very high temperatures, is entirely dependent on the building, operation and maintenance thereof, the University and the organizations supplying the drawings and instructions can bear no responsibility for any mishaps to personnel or inadequate technical performance of the incinerator.

### **Information & questions**

Any questions relating to these instructions should be referred to: Professor D.J. Picken (De Montfort University, Leicester, UK)

**Contact formular** available at:

[http://www.mw-incinerator.info/en/601\\_contact\\_us.html](http://www.mw-incinerator.info/en/601_contact_us.html)