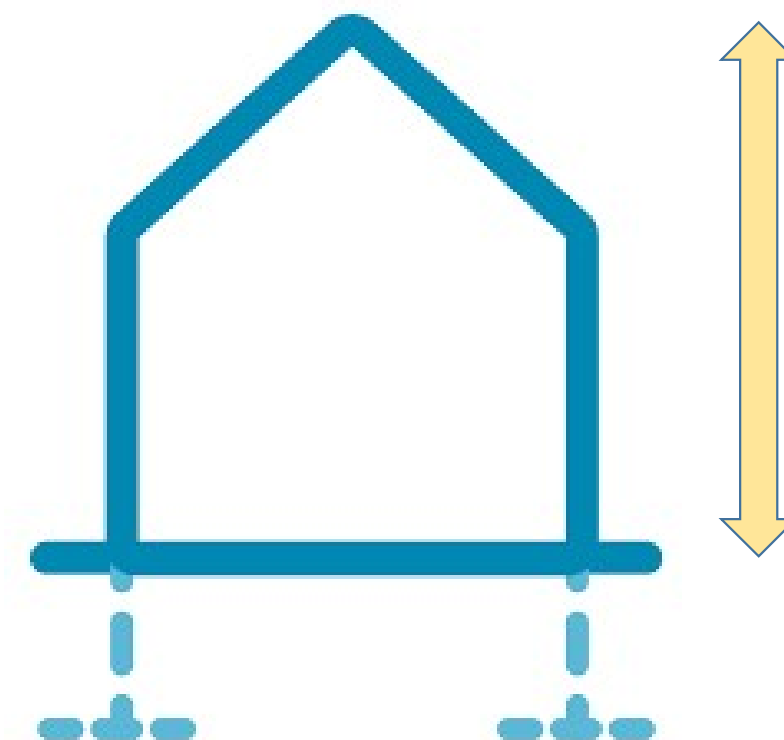


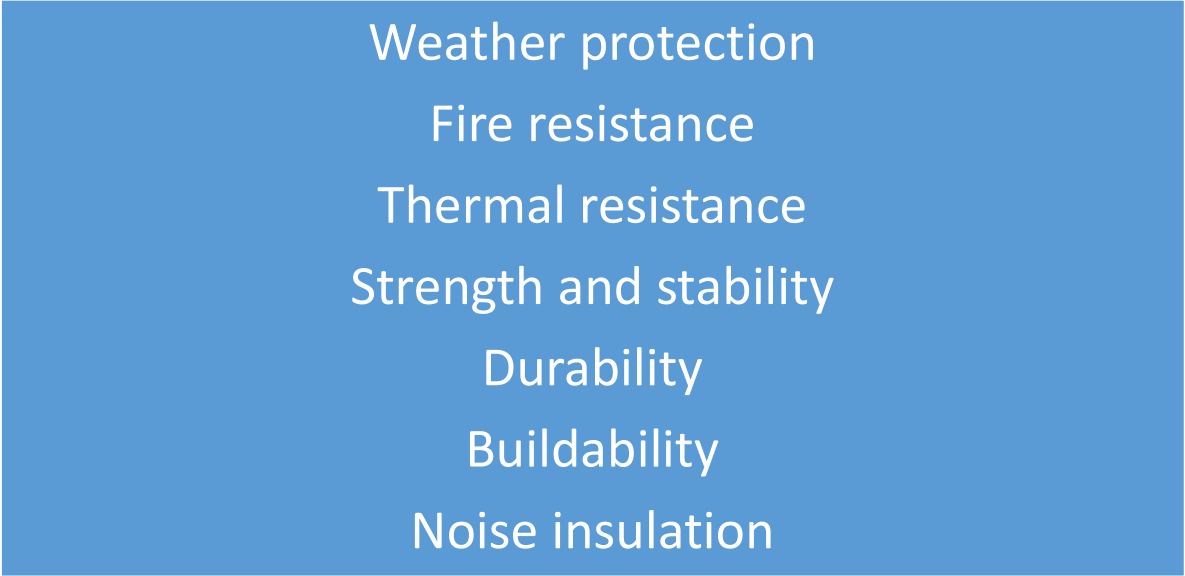
## Superstructure : Fundamentals of Construction Technology



# EXTERNAL WALLS

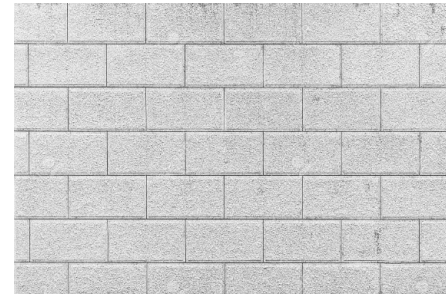
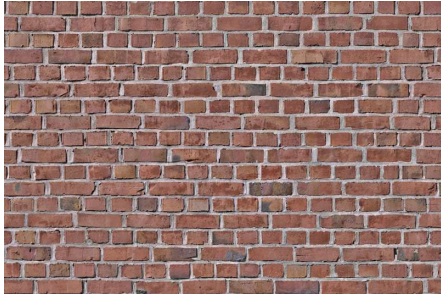


## FUNCTIONAL REQUIREMENTS OF EXTERNAL WALLS



- Weather protection
- Fire resistance
- Thermal resistance
- Strength and stability
- Durability
- Buildability
- Noise insulation

## SOLID WALLS



Built with brick, stone or block



Load-bearing and non-load bearing

## SOLID WALLS

Traditional construction. Pre 1919 solid walls

1919?

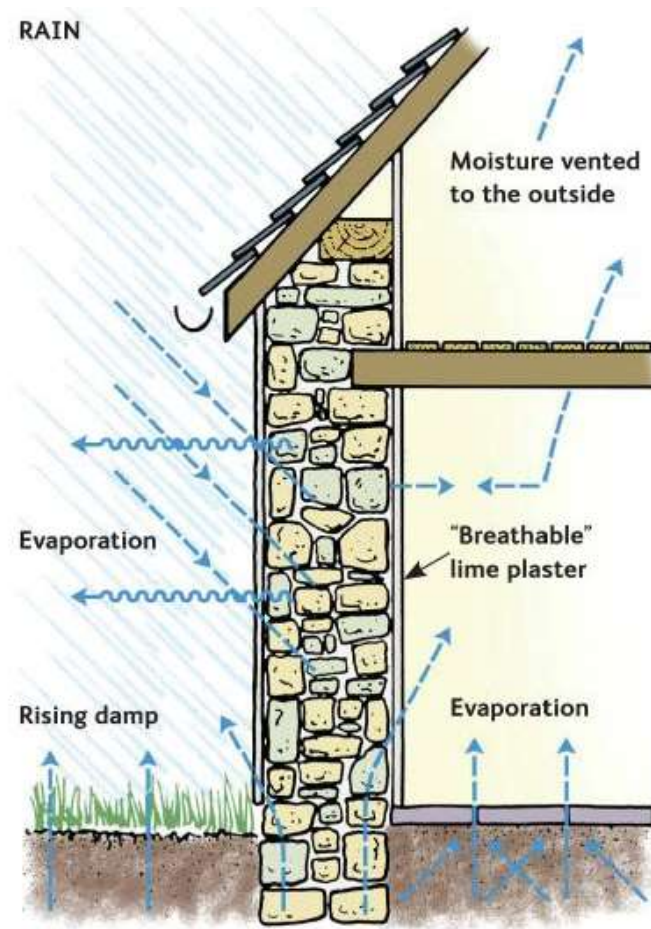


## SOLID WALLS

Traditional construction. Pre 1919 solid walls

Characteristics:

- Thick walls
- Random rubble
- Lime mortar
- Shallow foundations
- No DPC



## **SOLID WALLS**

Traditional construction. Pre 1919 solid walls

Earth walls – Rammed Earth



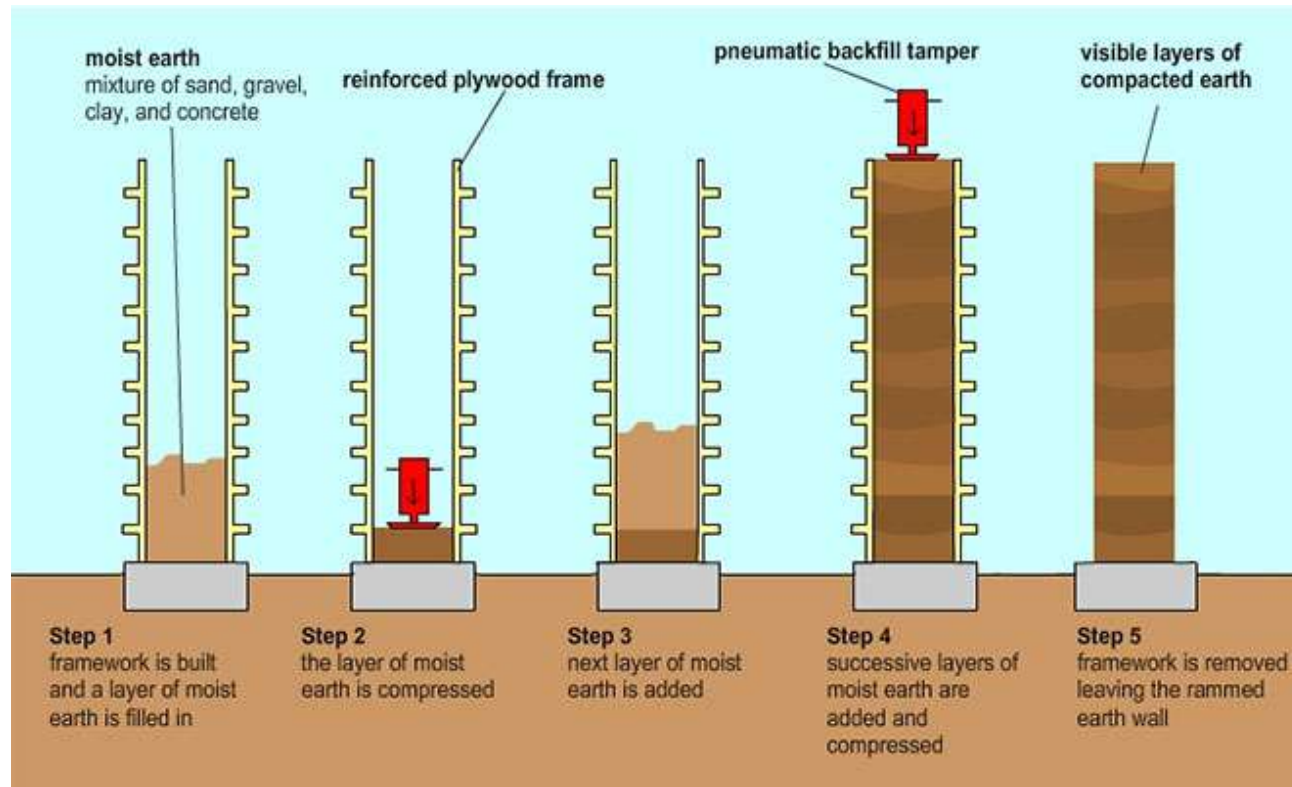
## SOLID WALLS



## SOLID WALLS

Traditional construction. Pre 1919 solid walls

Earth walls – Rammed Earth



## **SOLID WALLS**

Traditional construction. Pre 1919 solid walls

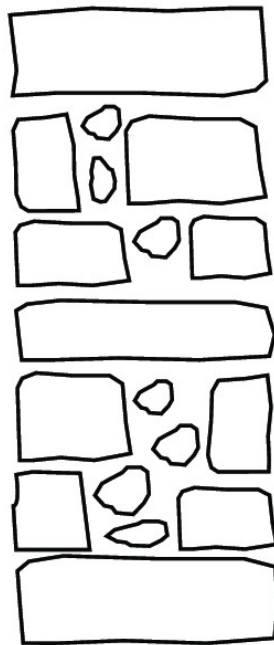
Random rubble



## SOLID WALLS

Traditional construction. Pre 1919 solid walls

Random rubble



Earthquake  
resistant

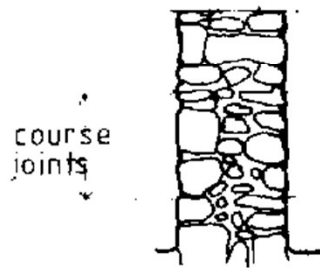


Earthquake  
prone

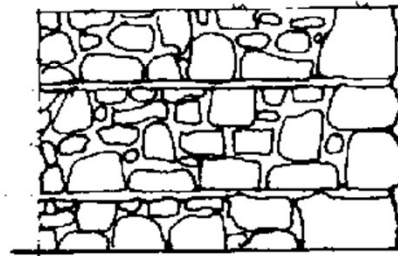
## SOLID WALLS



PLAN



SECTION



ELEVATION

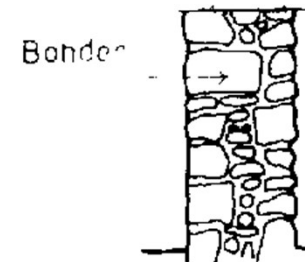


Coursed

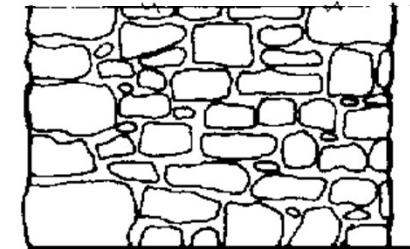
Bonder



PLAN



SECTION



ELEVATION



Uncoursed

## SOLID WALLS

Traditional construction. Pre 1919 solid walls

Ashlar



## SOLID WALLS

Traditional construction. Pre 1919 solid walls

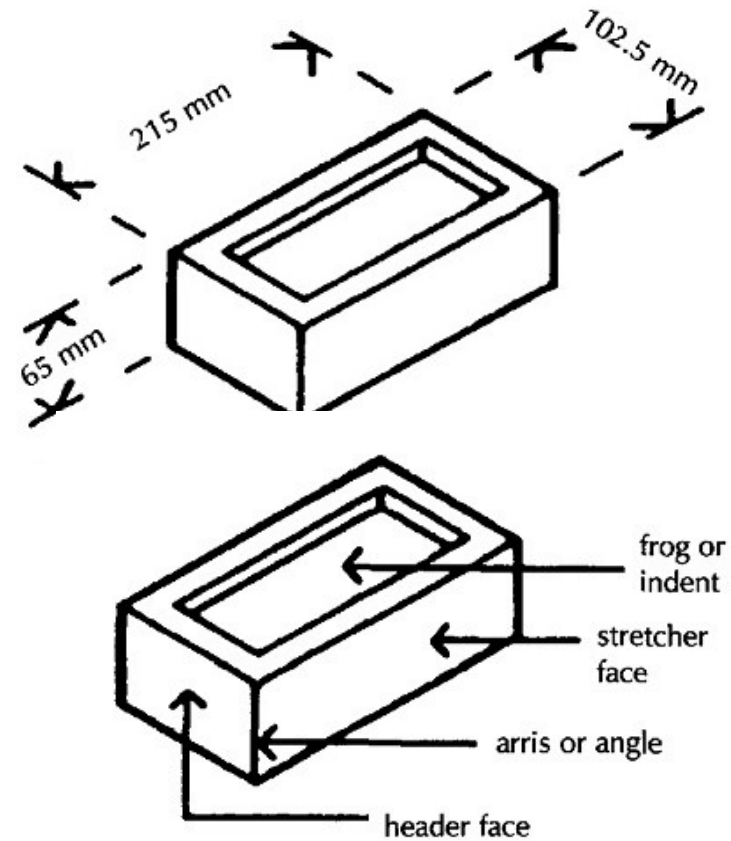
Brickwork



## SOLID WALLS

### Brickwork. Materials

- **Nominal size** :- A standard metric brick has coordinating dimensions of **225 x 112.5 x 75 mm** (9" x 4.5" x 3")
- **Architectural size** :- Working dimensions (actual dimensions) of **215 x 102.5 x 65 mm** (8.5" x 4" x 2.5")



## QUESTIONS

What is the difference between a load-bearing and a non-load bearing wall?

What is a breathable wall?

What is a rammed earth wall?

What is the purpose of a coursed random rubble wall?

How can we achieve a better distribution of loads inside a wall: with random rubble or ashlar?

## EXERCISE

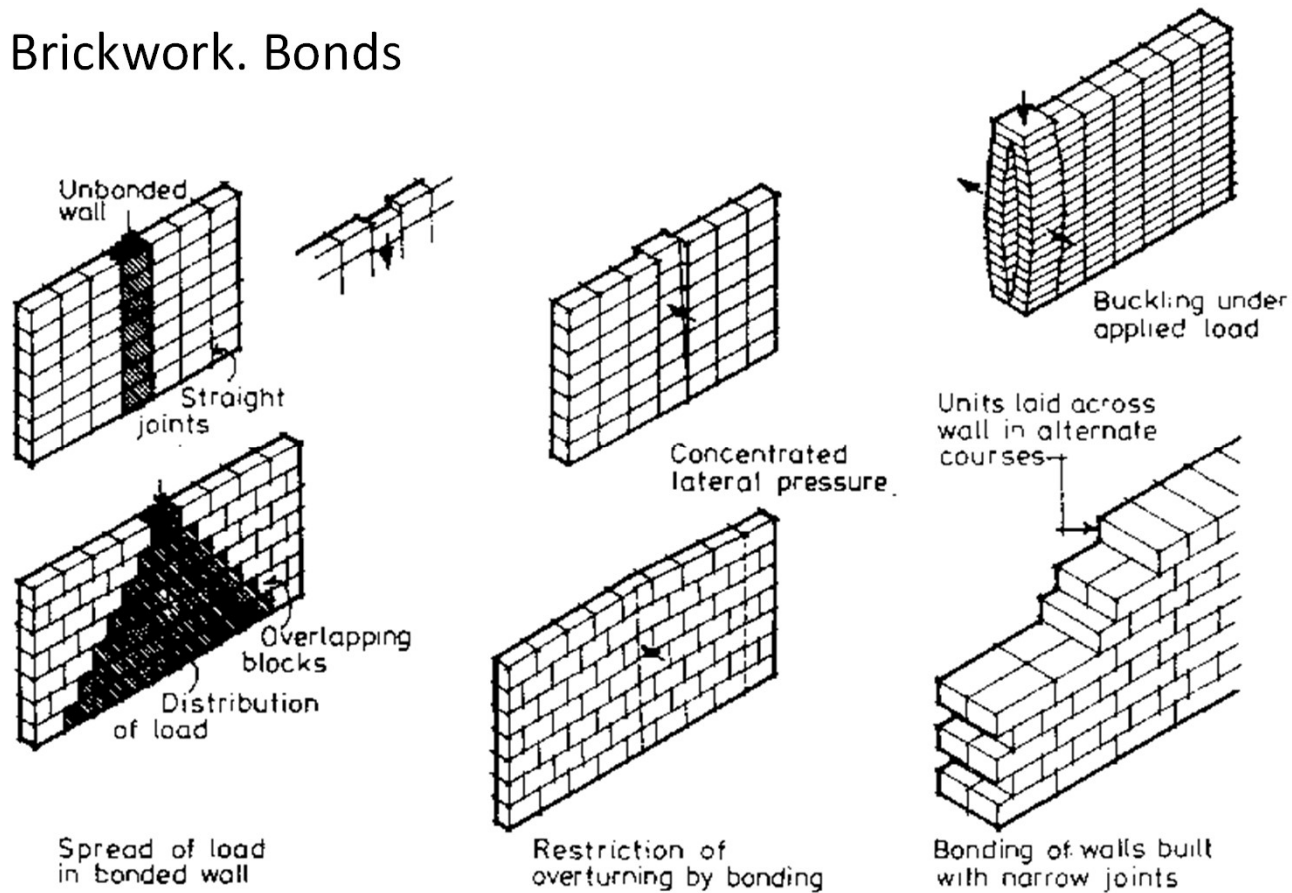
Calculate the number of bricks needed for a 20x3.5m wall surface.

$$\frac{(20,000 \times 3,500)}{225 \times 75} = 4,148.1 \approx 4,150 \text{ bricks}$$

## SOLID WALLS

Traditional construction. Pre 1919 solid walls

Brickwork. Bonds



## SOLID WALLS

Traditional construction. Pre 1919 solid walls

Brickwork. Bonds

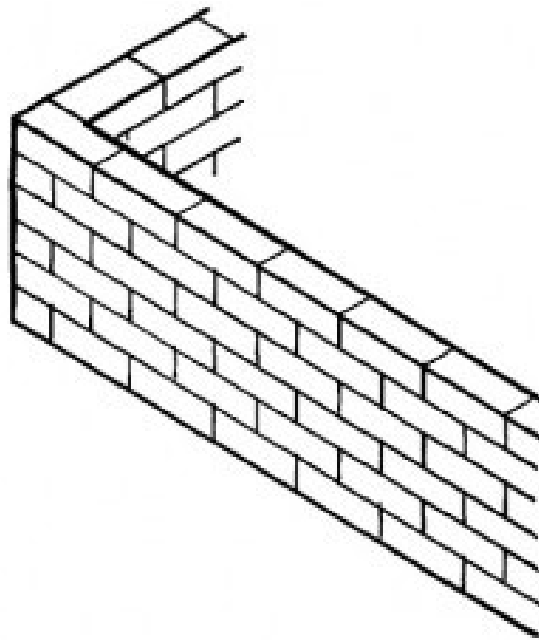


Fig. 52 Stretcher bond.

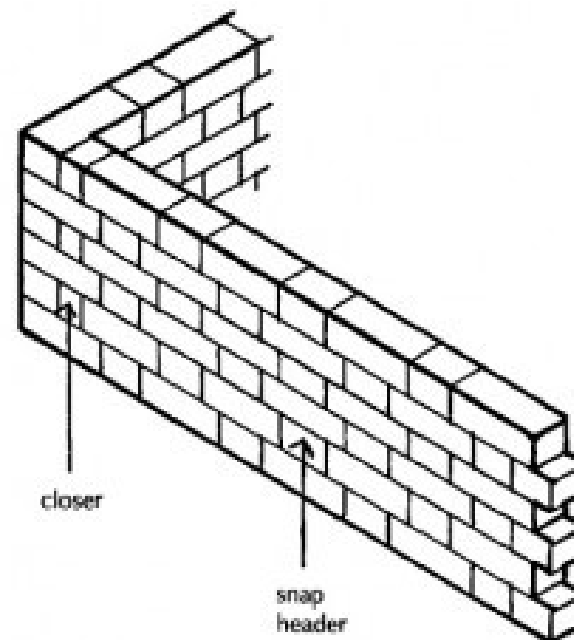
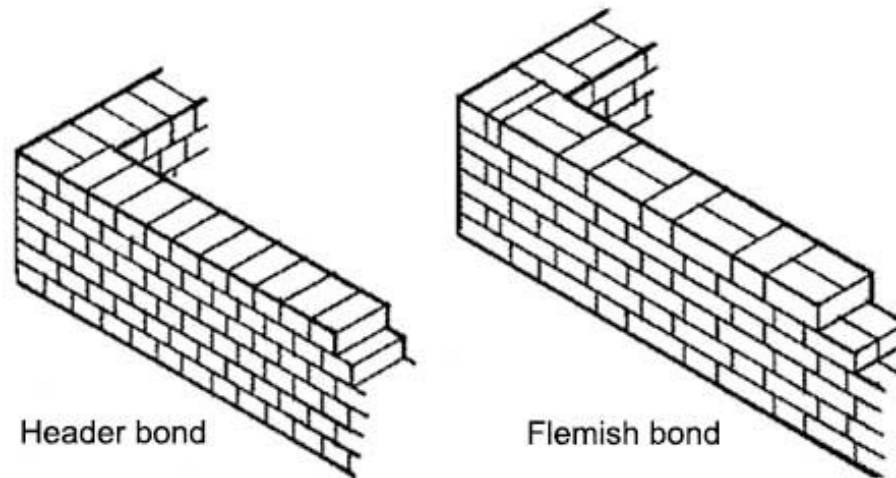


Fig. 53 Flemish bond with snap headers.

## SOLID WALLS

Traditional construction. Pre 1919 solid walls

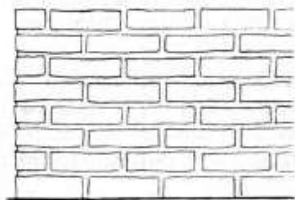
Brickwork. Bonds



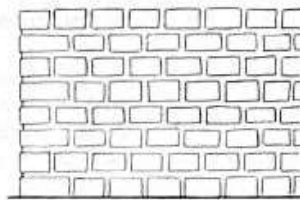
## SOLID WALLS

Traditional construction. Pre 1919 solid walls

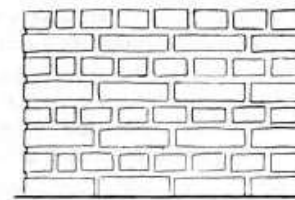
Brickwork. Bonds



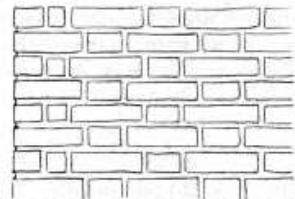
STRETCHING BOND.



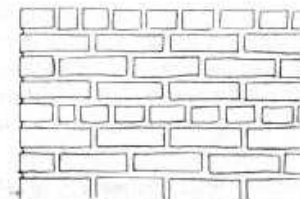
HEADING BOND.



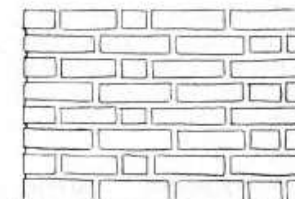
ENGLISH BOND.



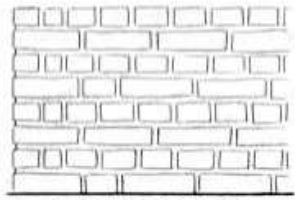
FLEMISH BOND.



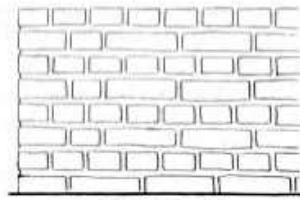
ENGLISH GARDEN  
WALL BOND.



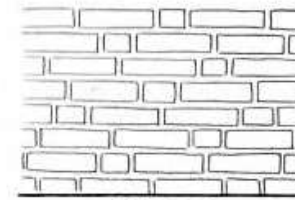
FLEMISH GARDEN  
WALL BOND.



ENGLISH CROSS BOND.



DUTCH BOND.

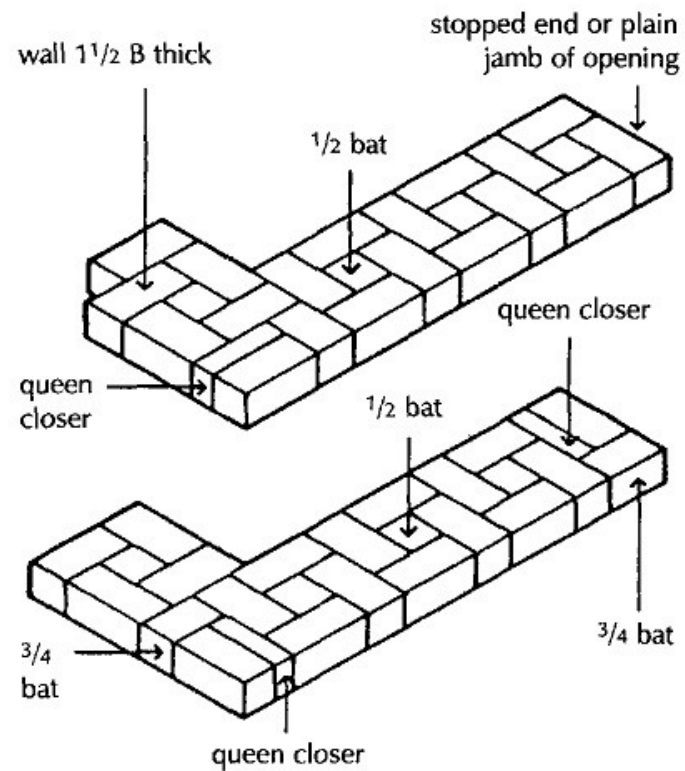
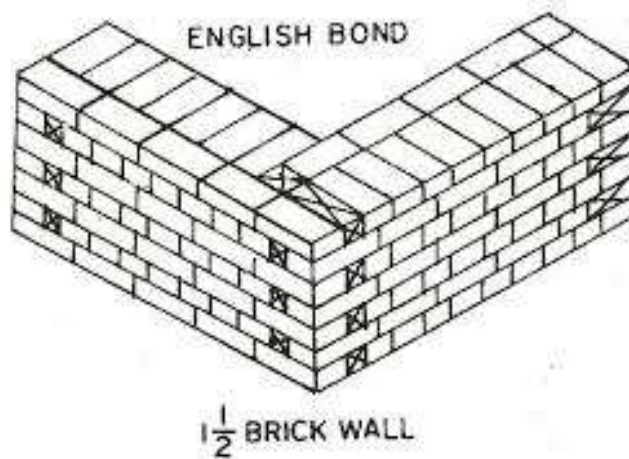


MONK BOND.

## SOLID WALLS

Traditional construction. Pre 1919 solid walls

Brickwork. Bonds

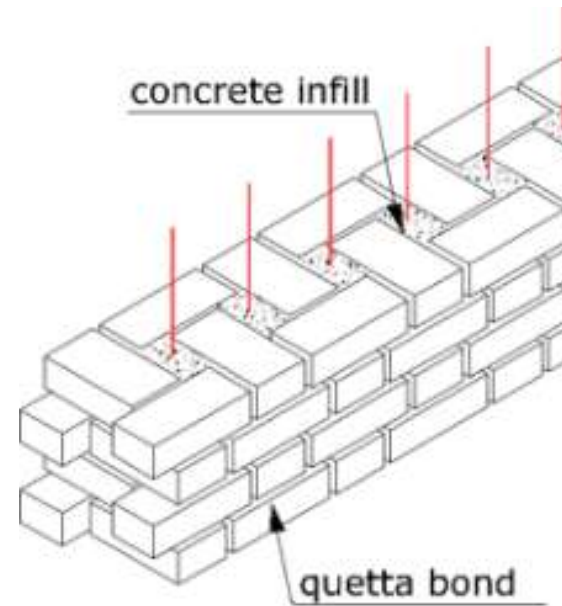
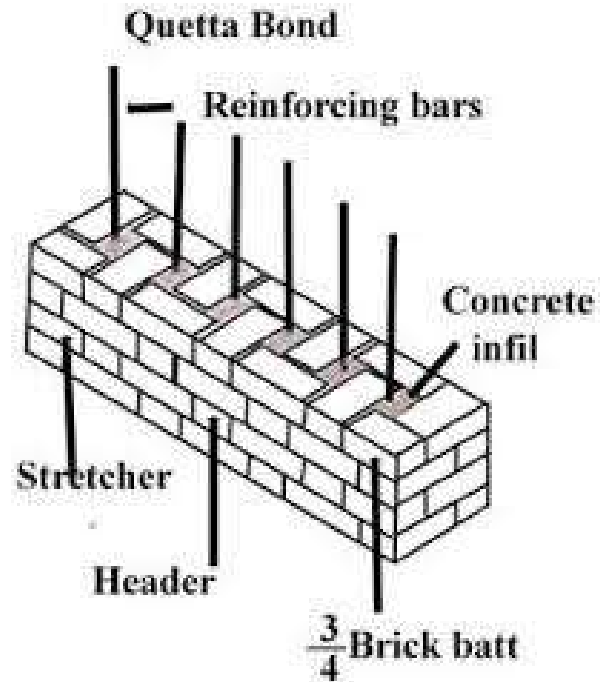


Double Flemish bond.

## SOLID WALLS

Traditional construction. Pre 1919 solid walls

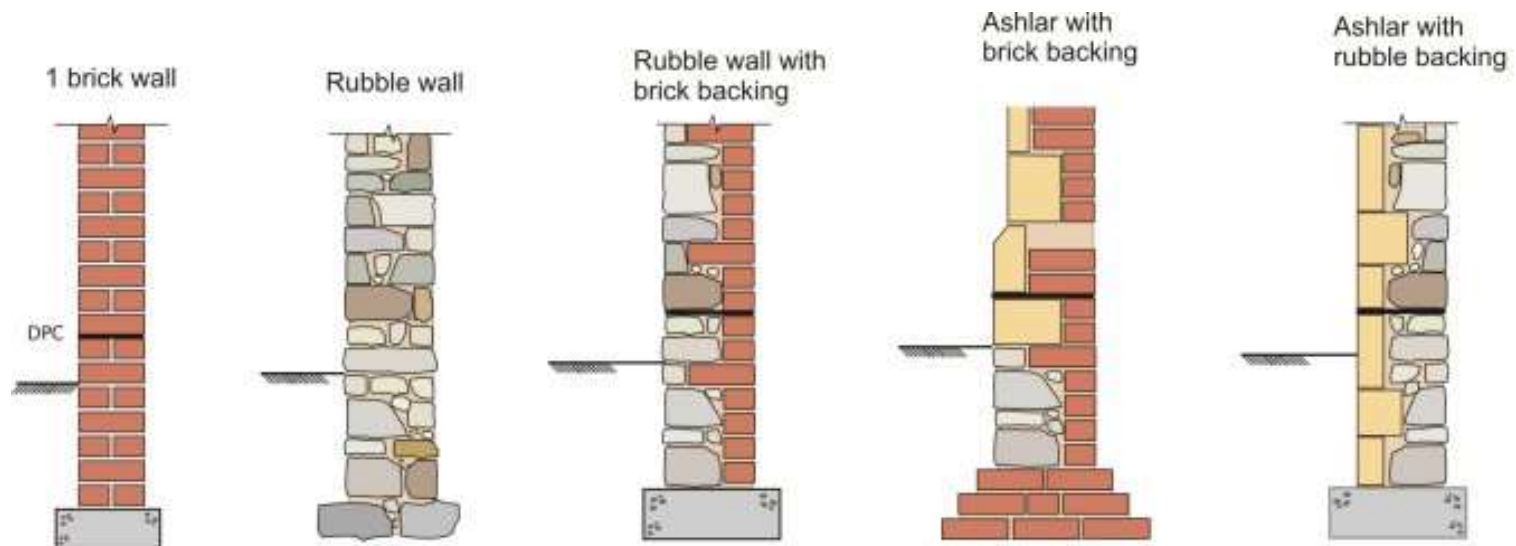
Brickwork. Bonds



## SOLID WALLS

Traditional construction. Pre 1919 solid walls

Combinations



## EXERCISE

Design the bond for a two-brick solid Wall:

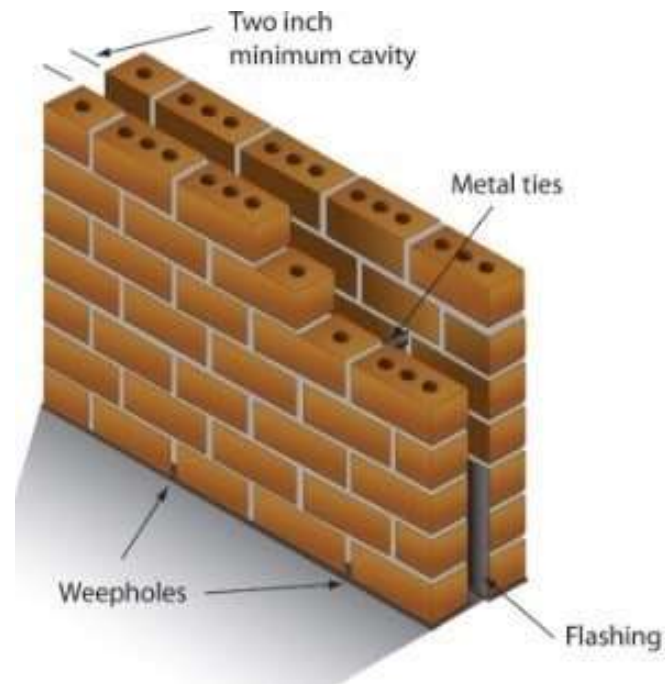
- English bond
- Flemish bond
- Heading bond

## CAVITY WALLS

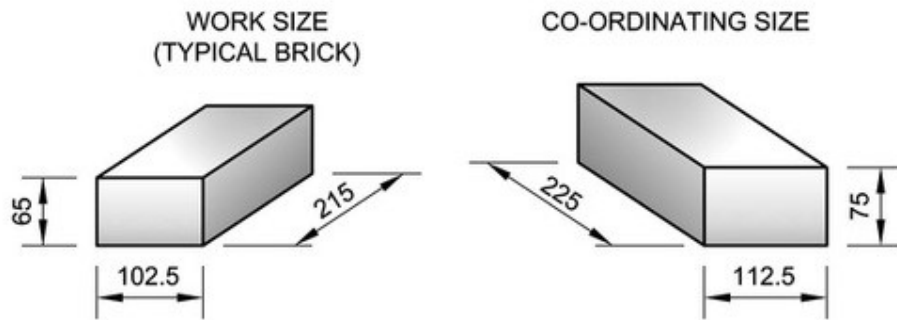
Type of double skin created by two walls and a cavity in between

Purpose:

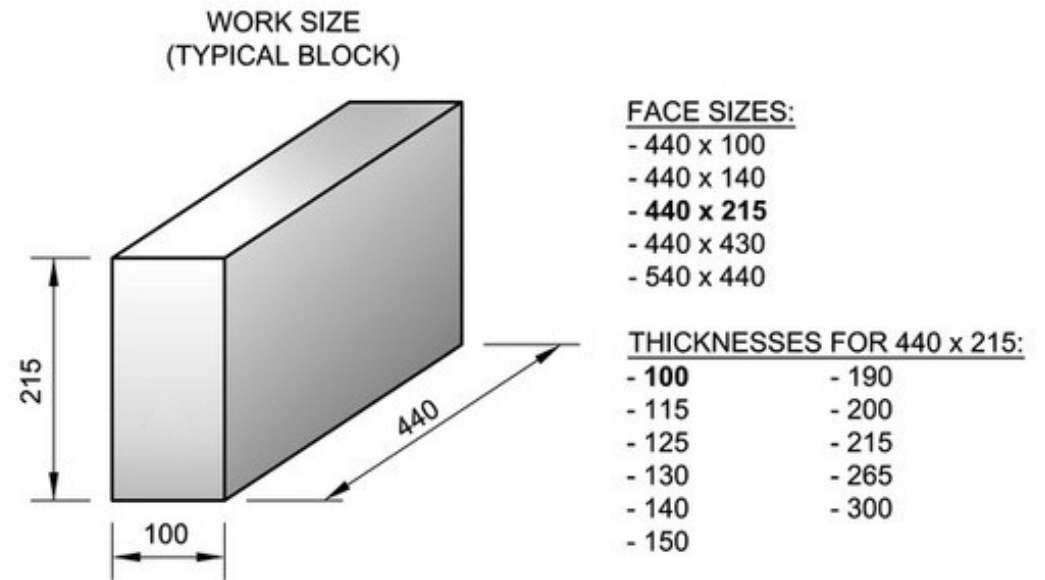
- Weather protection
  - Thermal insulation
  - Noise attenuation
- 
- Two walls joined by metal ties
  - Weepholes to release any moisture or humidity



### BRICKWORK



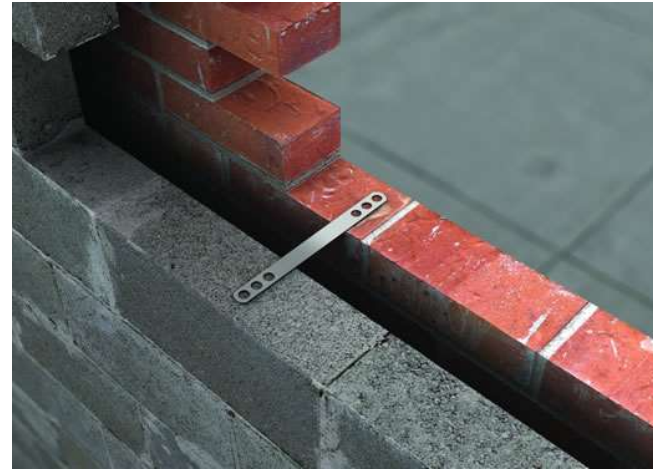
### BLOCKWORK



[ All dimensions are in: mm ]

To obtain the co-ordinating dimensions add the specified joint thickness (normally 10mm) to the height and length of the block

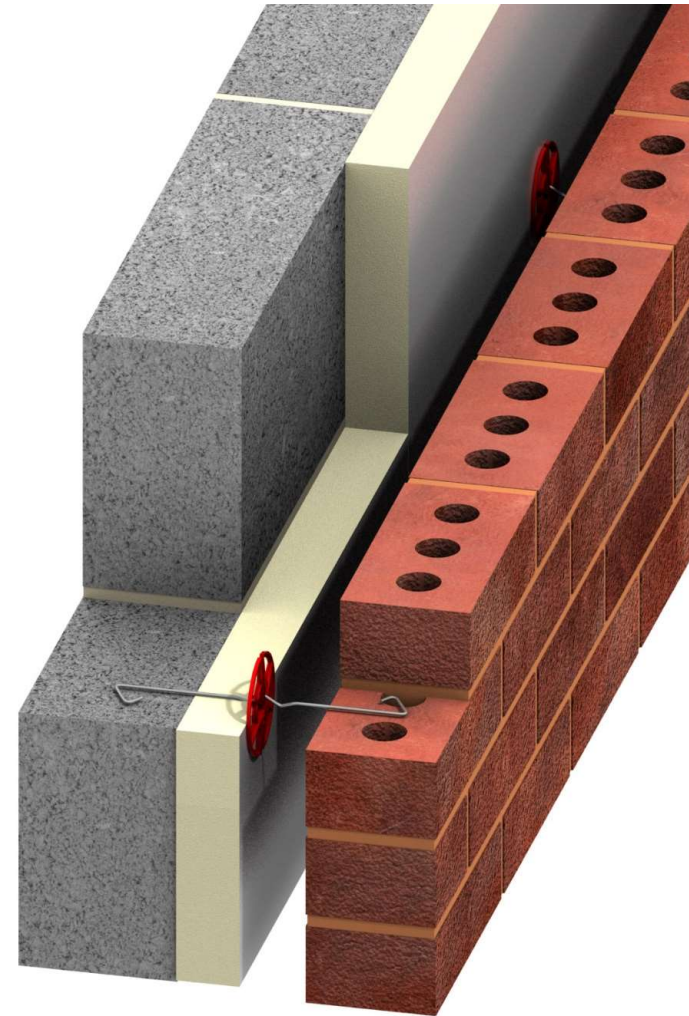
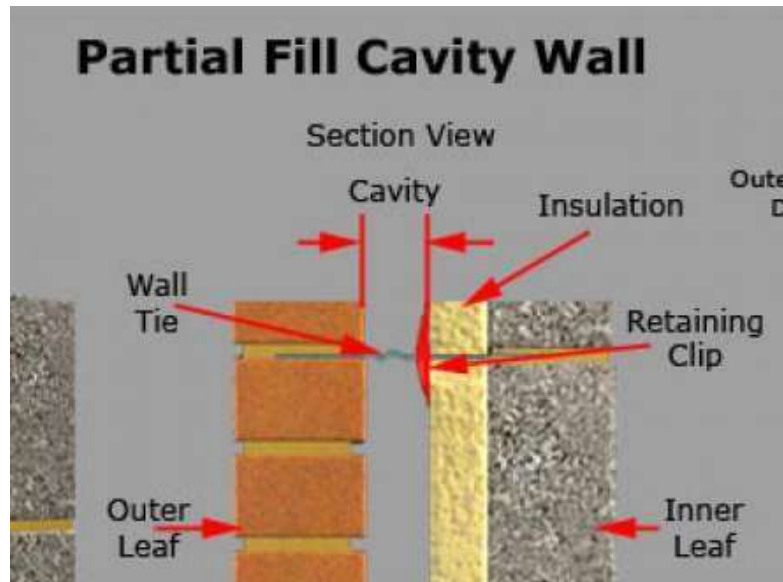
## CAVITY WALLS



- Two walls joined by metal ties
- Weepholes to release any moisture or humidity

## CAVITY WALLS

### Insulation



## CAVITY WALLS

Insulation. Some types



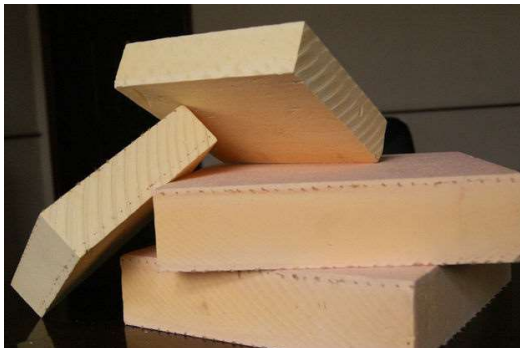
Rock mineral wool



Glass mineral wool



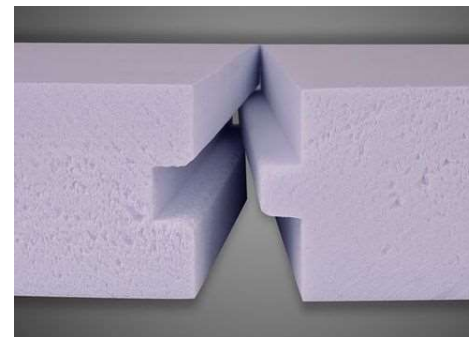
Expanded polystyrene



Phenolic foam



Polyurethane foam

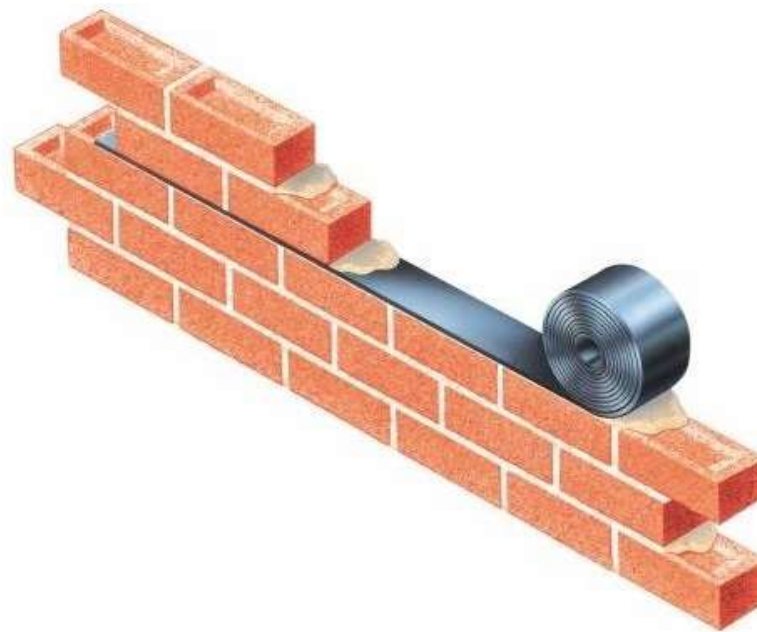


Extruded polystyrene

## CAVITY WALLS

### Damp Proof Course (DPC)

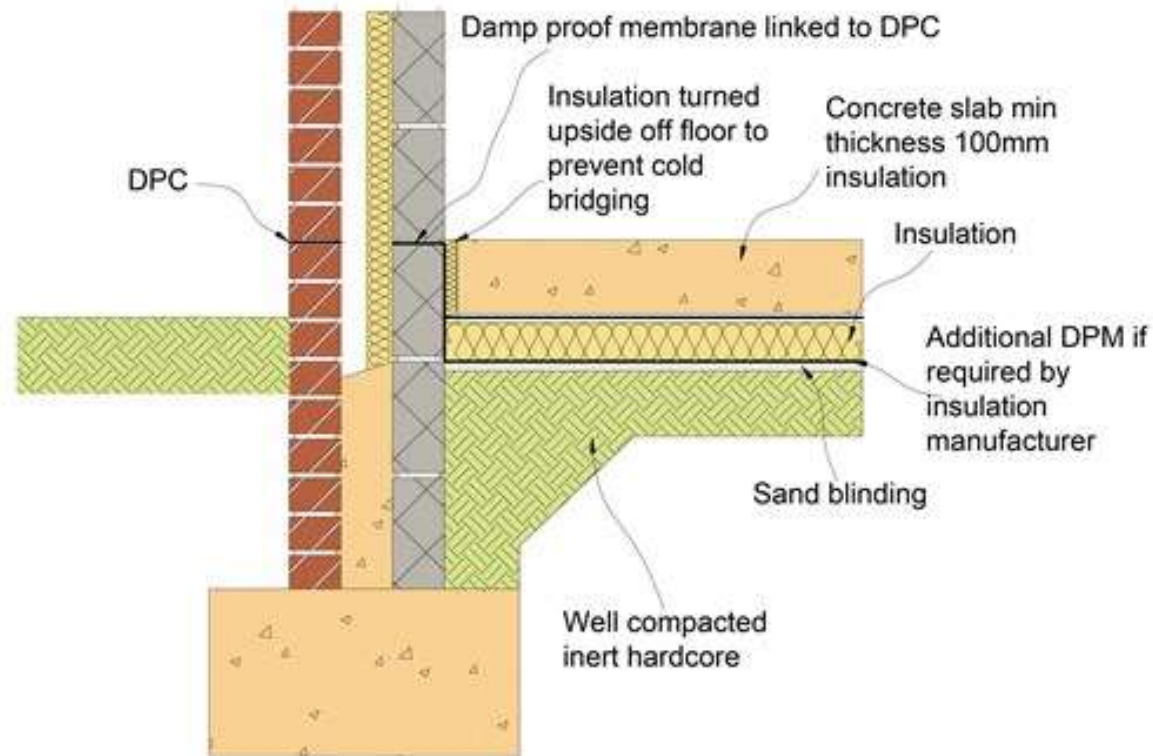
Prevents groundwater from being absorbed by capillarity action in walls



## CAVITY WALLS

### Damp Proof Membrane

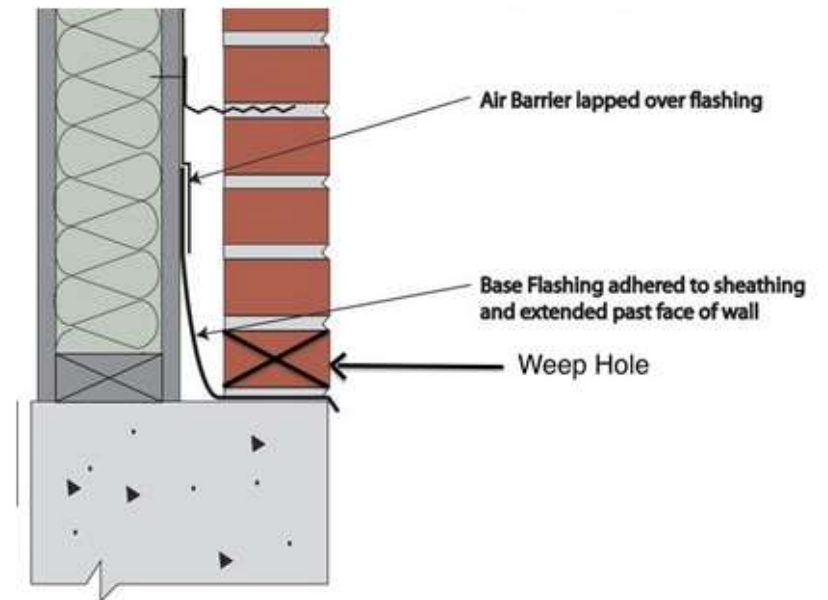
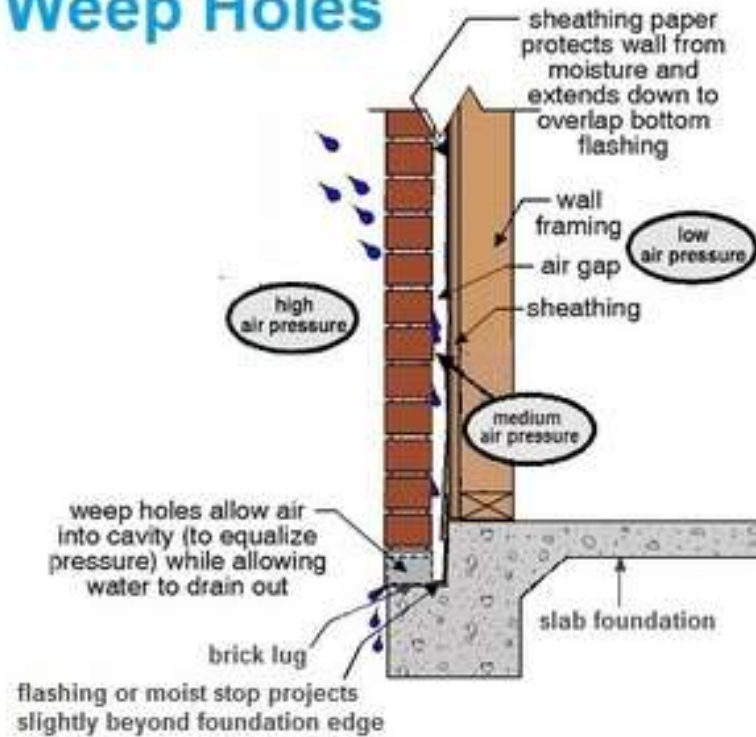
Application in floors



# CAVITY WALLS

## Cavity drainage

### Weep Holes



## CAVITY WALLS

### Cavity drainage



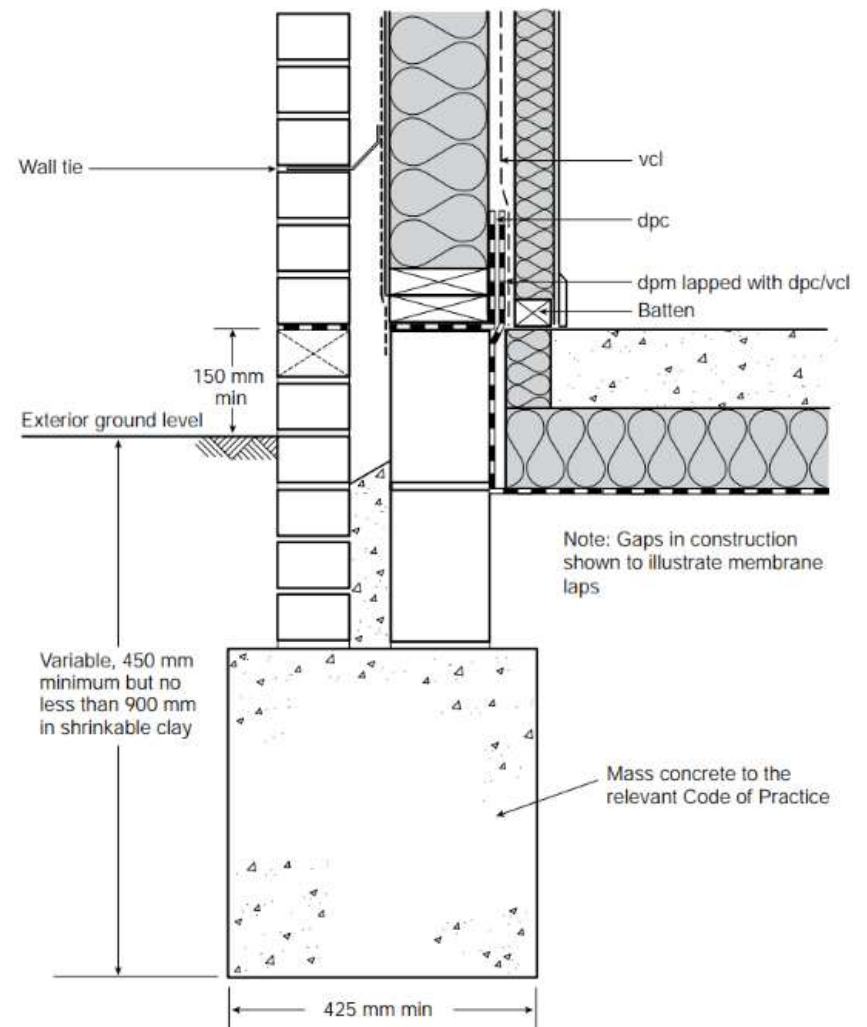
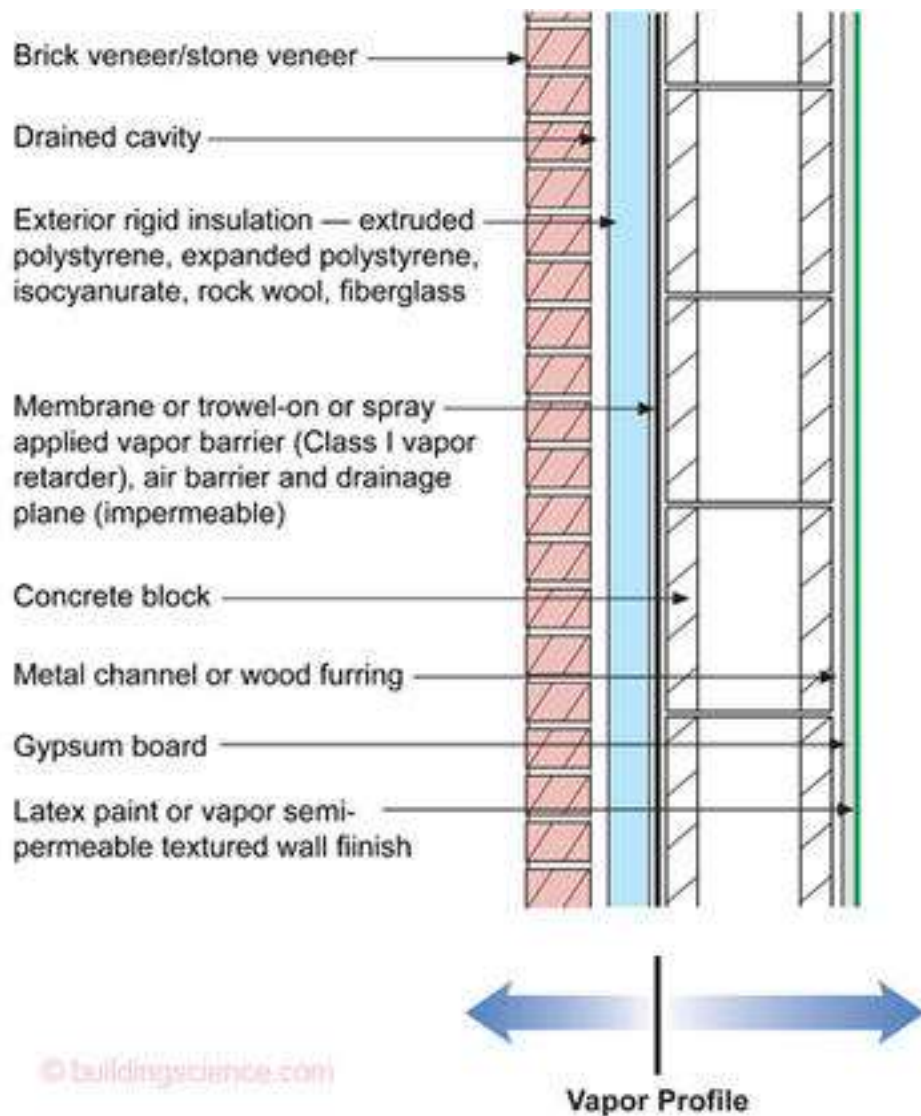
## VAPOUR CONTROL BARRIER / LAYER (VAPOUR CHECK)

Block the warm moisture in a room to enter the wall and affect insulation and other elements inside (structure frame, other layers, etc.)

Not needed in warm climates

**If in the wrong position, it can cause more harm than benefit**  
**Always in the warm side (between insulation and drywall)**

Depending on the type of construction, we may to consider a waterproof, breathable layer.



## EXERCISE

Draw a cross section for a typical brick and block external cavity Wall in Swansea. Include all elements that are necessary for the correct performance.

### FUNCTIONAL REQUIREMENTS OF EXTERNAL WALLS

- Weather protection
- Fire resistance
- Thermal resistance
- Strength and stability
- Durability
- Buildability
- Noise insulation