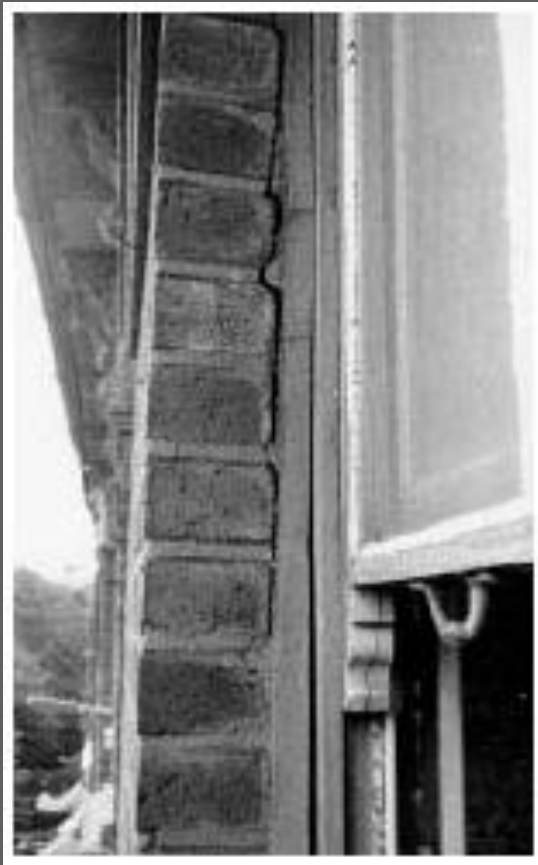


Built Environment Portfolio

Construction
Technology I



External Walls



Building failures are often attributed to designer's lack of knowledge of the basic performance requirements of buildings and how these relate to specification and detailing of the elements of construction

External Walls

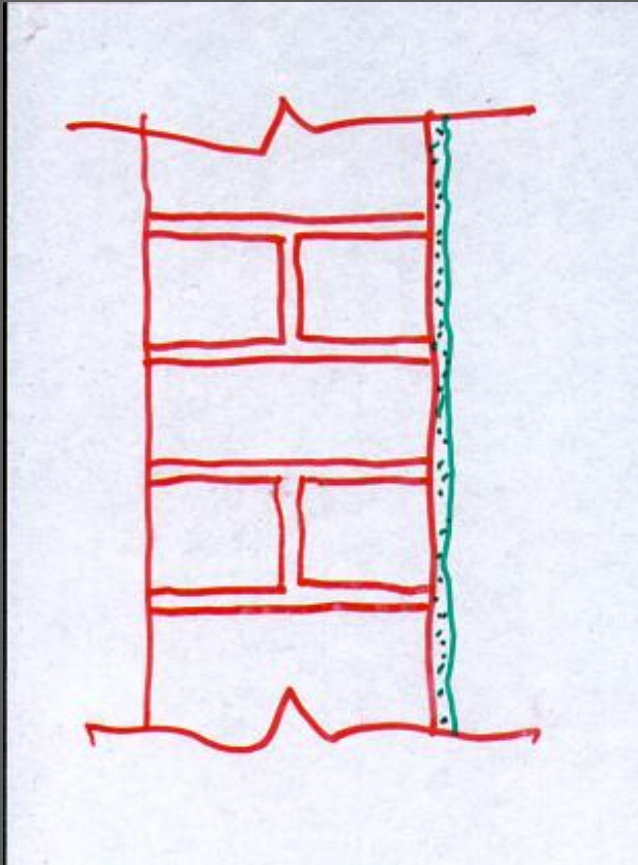
Performance requirements for external walls:

- Strength and stability
- Durability
- Weather protection
- Thermal & sound insulation
- Fire
- Security

Practicality!



External Walls



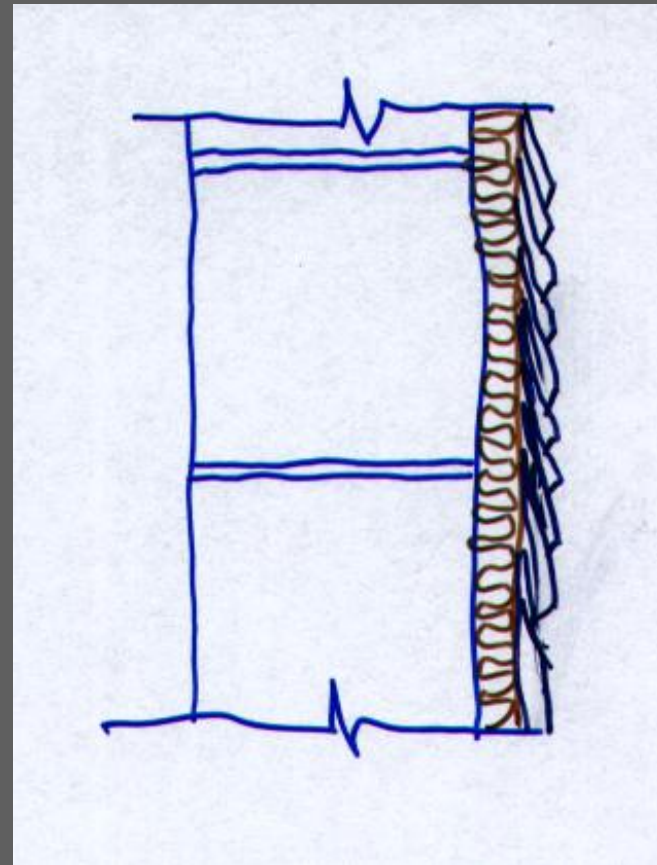
Solid construction

Consider thermal / weather
performance!!

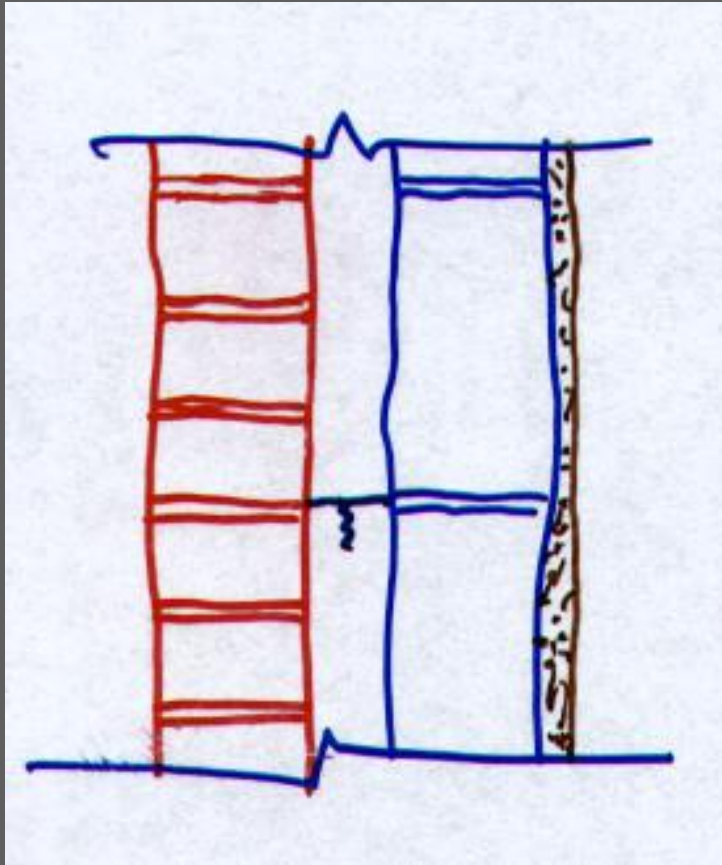
External Walls

Cladding

Consider differing
materials, fixings
compatibility....!!



External Walls



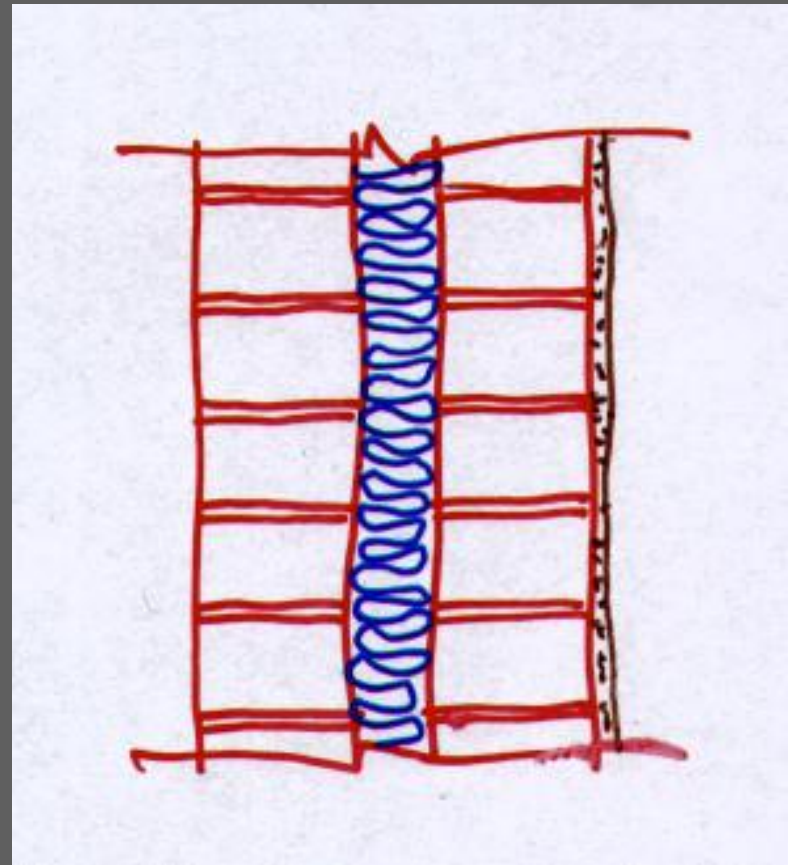
Cavity system

Consider materials, skills
tolerances, stability...!!

External Walls

Layered

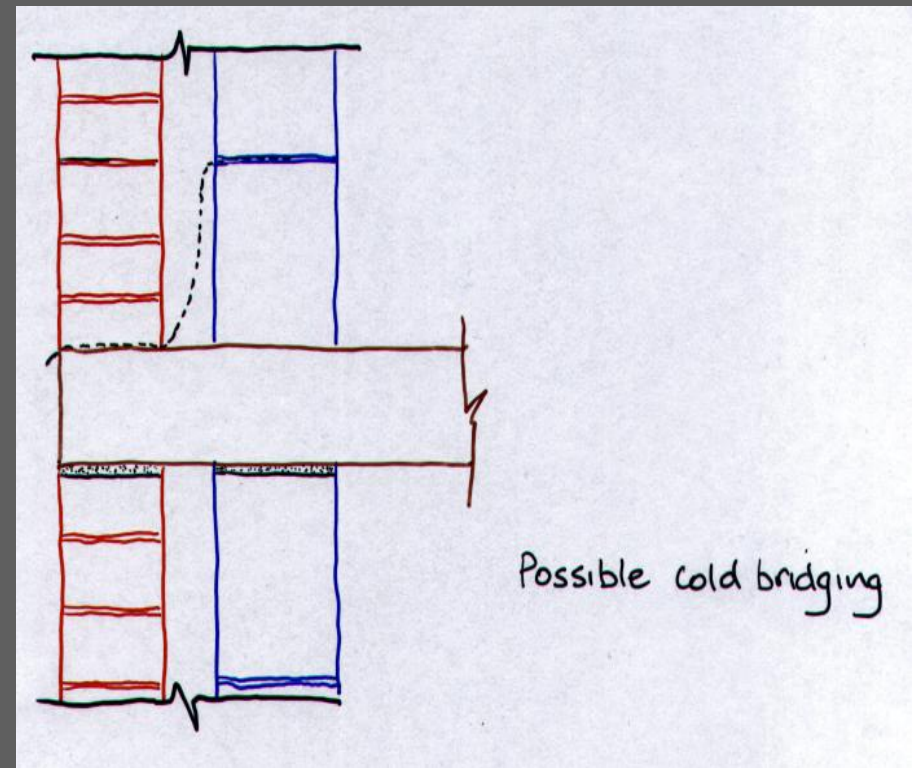
Consider materials, their
compatibility, accuracy,
stability, water
penetration and skills...!!



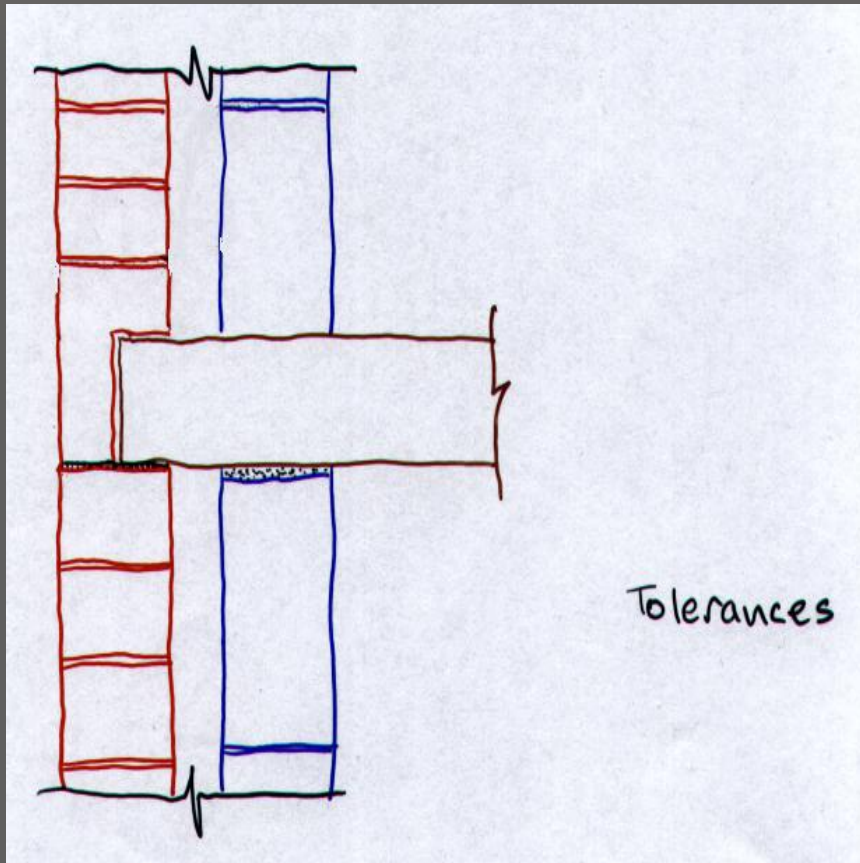
External Walls

Consider the issues here...

- Cavity
- Cold bridging
- Dpc
- Differential movement
- Others?



External Walls



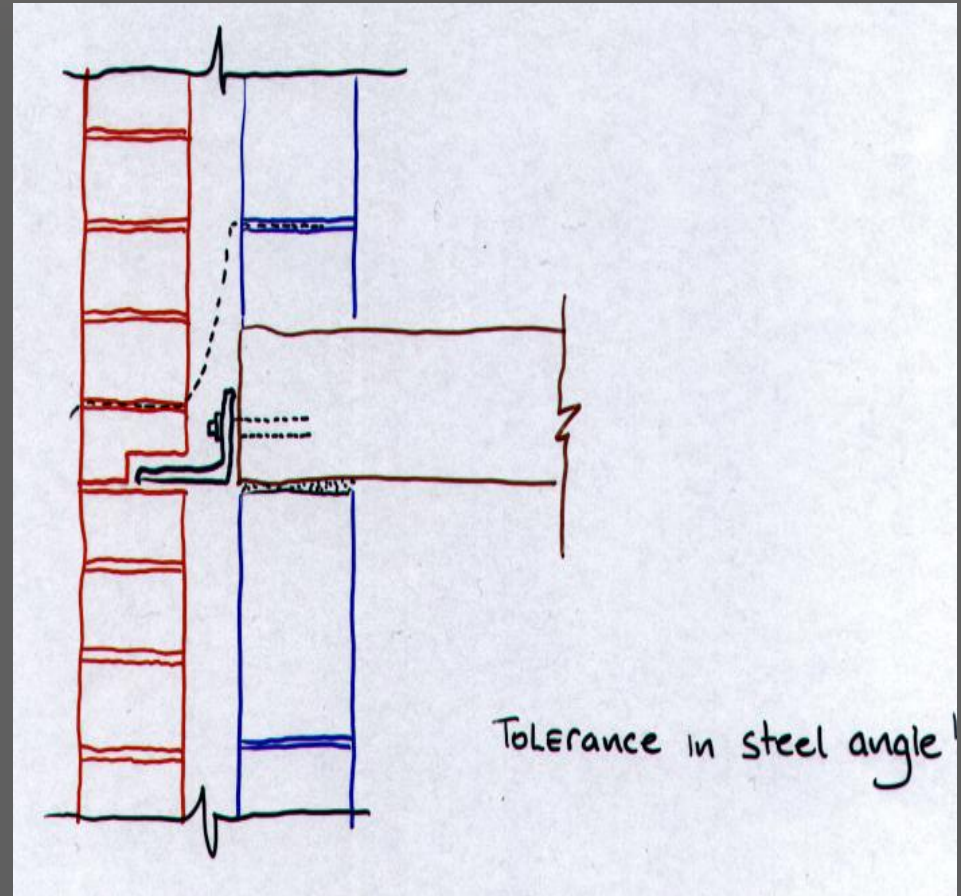
Similar issues here, but...

- ⇒ Over-sailing slab
- ⇒ Accuracy
- ⇒ Tolerances
- ⇒ skills

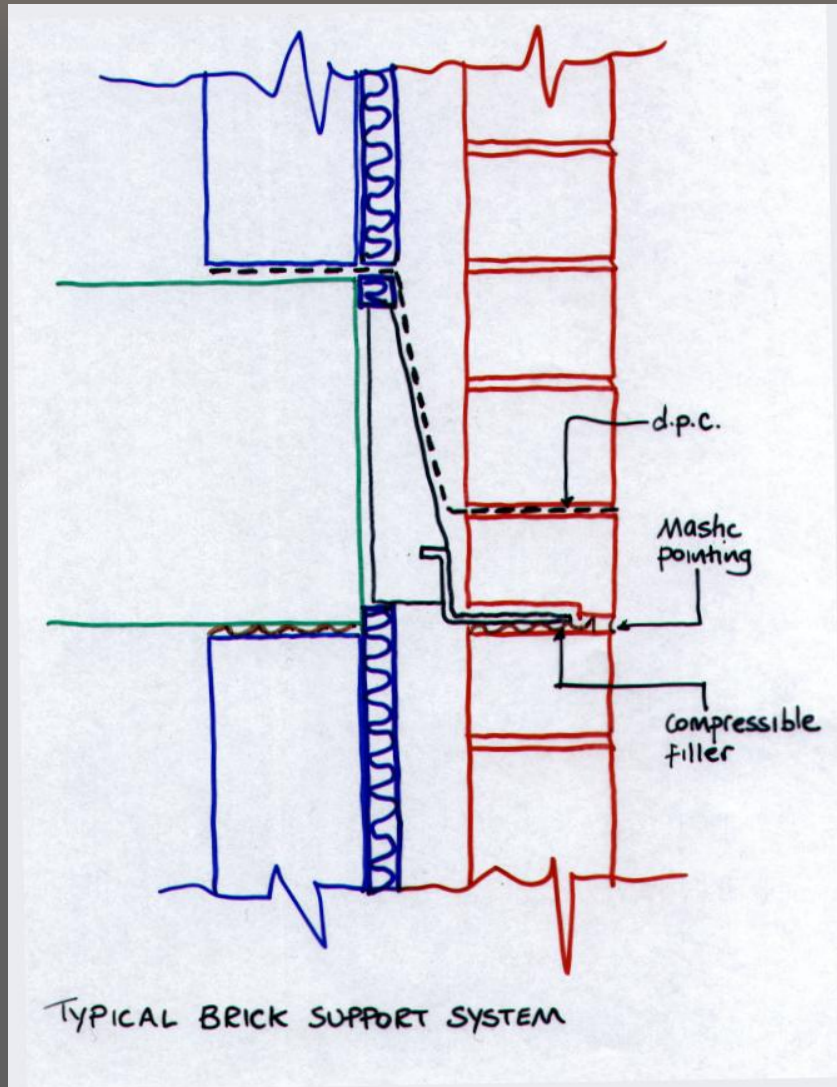
External Walls

Challenge now directed to steel...

- Fixings
- Durability
- Accuracy
- Movement



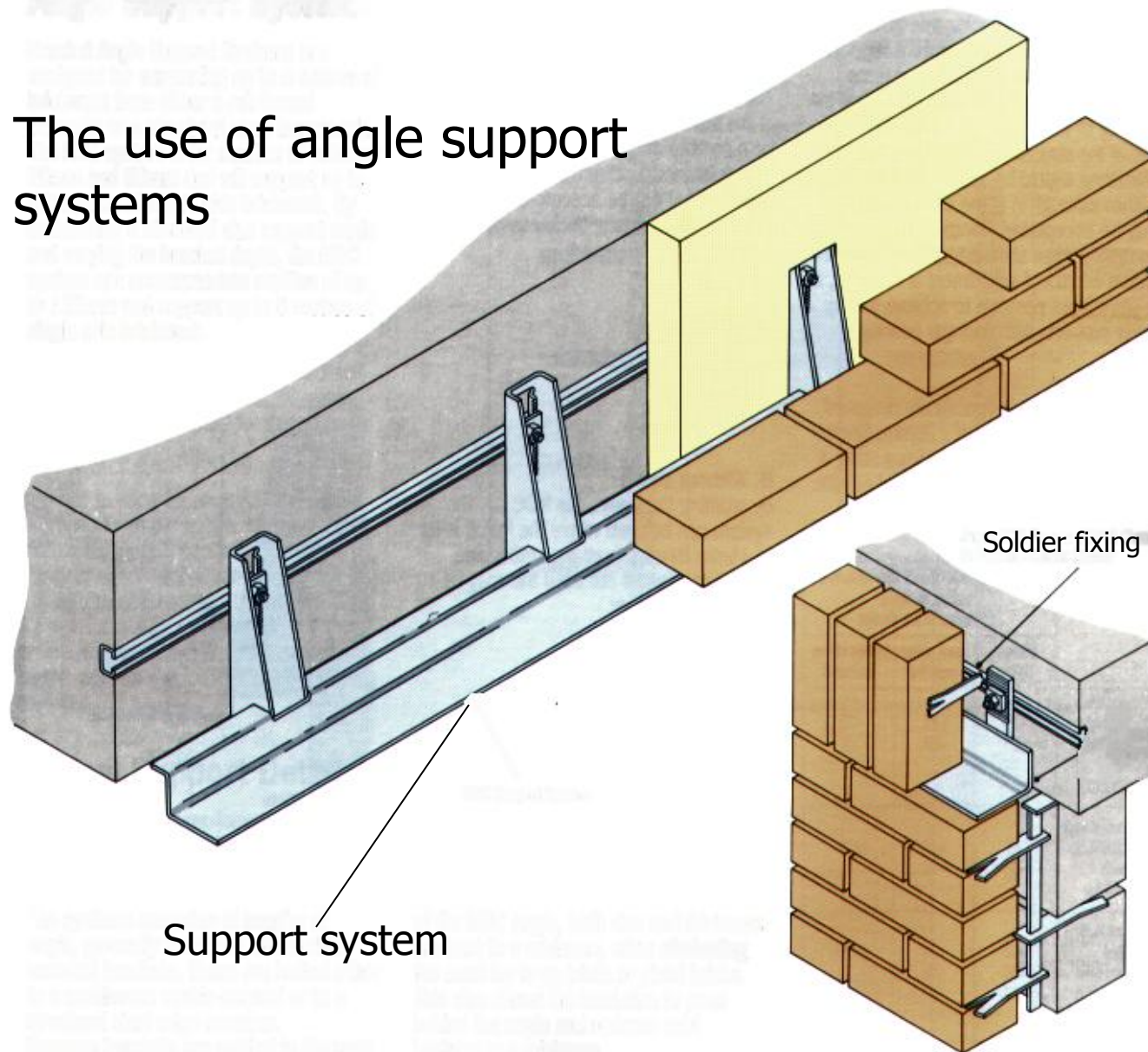
External Walls



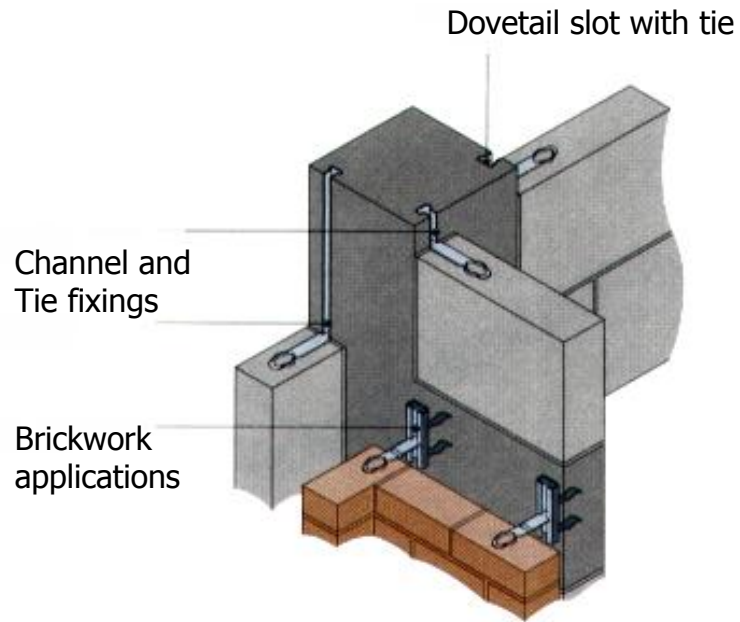
A possible solution!

What are the challenges here?

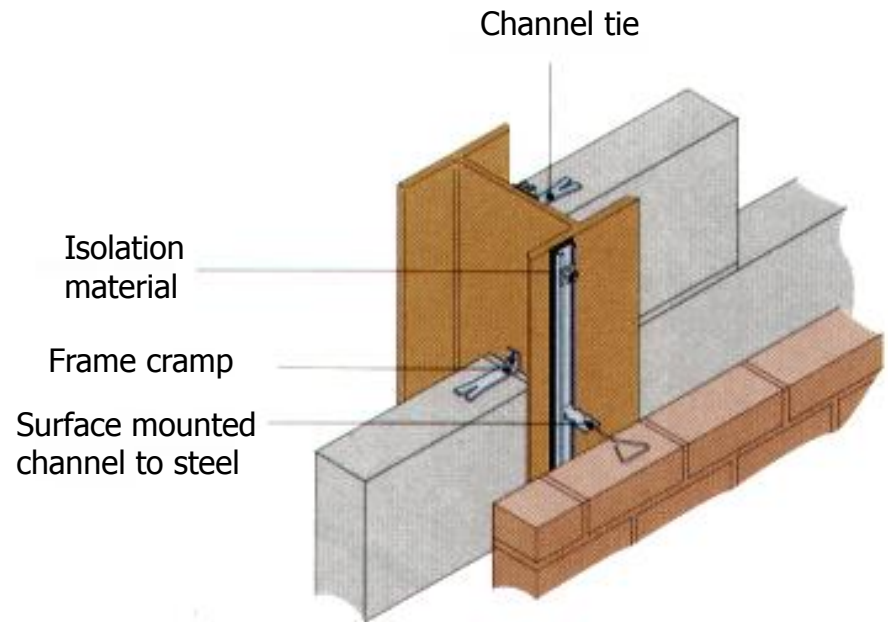
The use of angle support systems



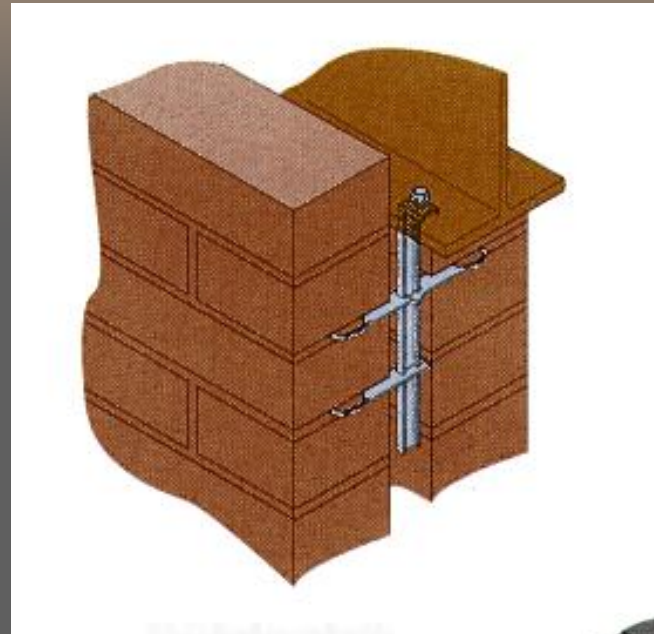
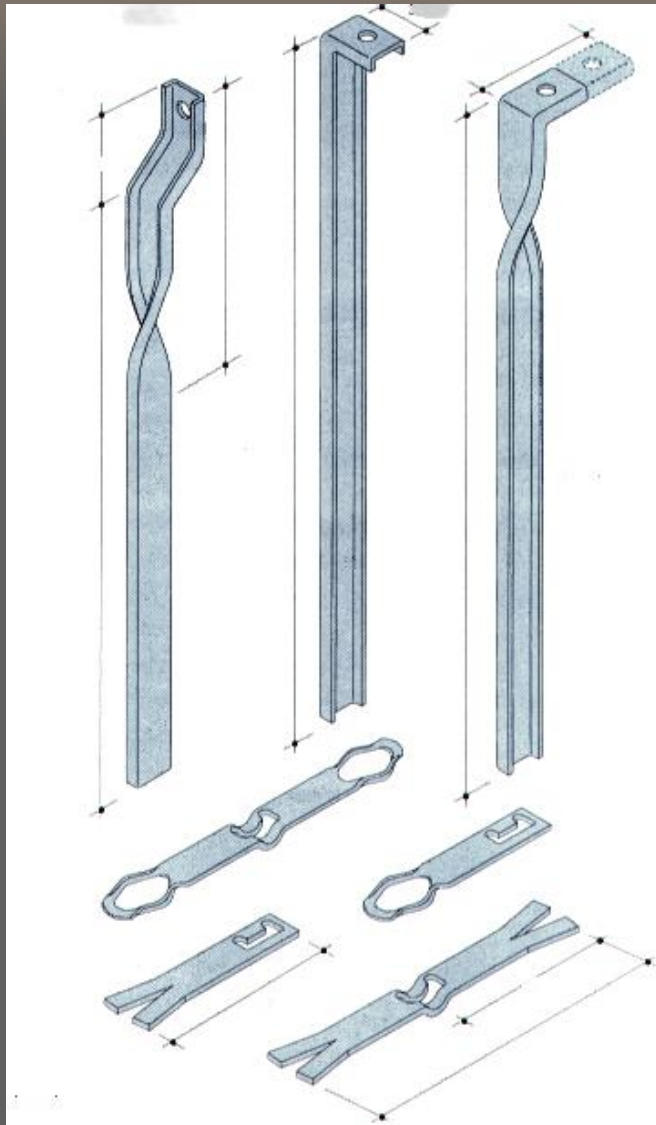
Masonry fixings to Concrete



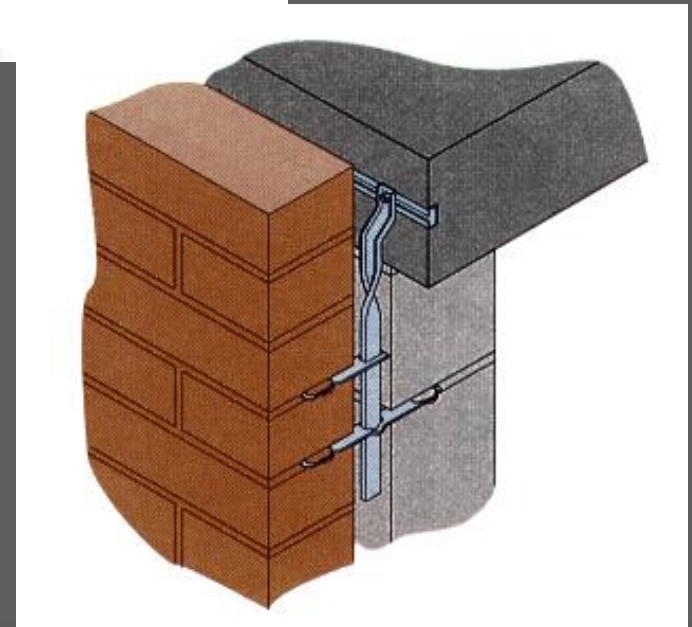
Masonry fixings to steel



Restraint fixings



Masonry
and steel



Masonry and
concrete

External Walls

Strength and stability are considered the dominant factors when designing walls.

The Building Regulations embody the requirements for walls...

(1) The building shall be constructed so that the combined dead, imposed and wind loads are sustained and transmitted by it to the ground

(a) safely; and

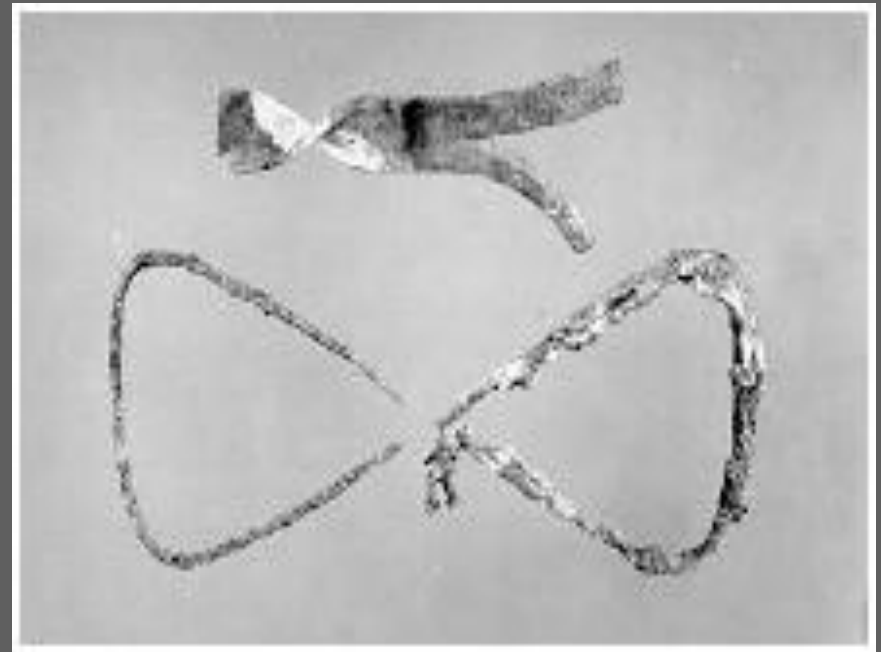
(b) without causing such deflection or deformation of any part of the building, or such movement of the ground, as will impair the stability of any part of another building

(2) In assessing whether a building complies with sub paragraph (1) regard shall be had to the imposed and wind loads to which it is likely to be subjected in the ordinary course of its use for the purpose for which it is intended.'

External Walls

Consideration needs to be given to:

- All loads
- Material choice
- Mortar classification
- Water absorption of the bricks
- Lateral stability
- Wall ties

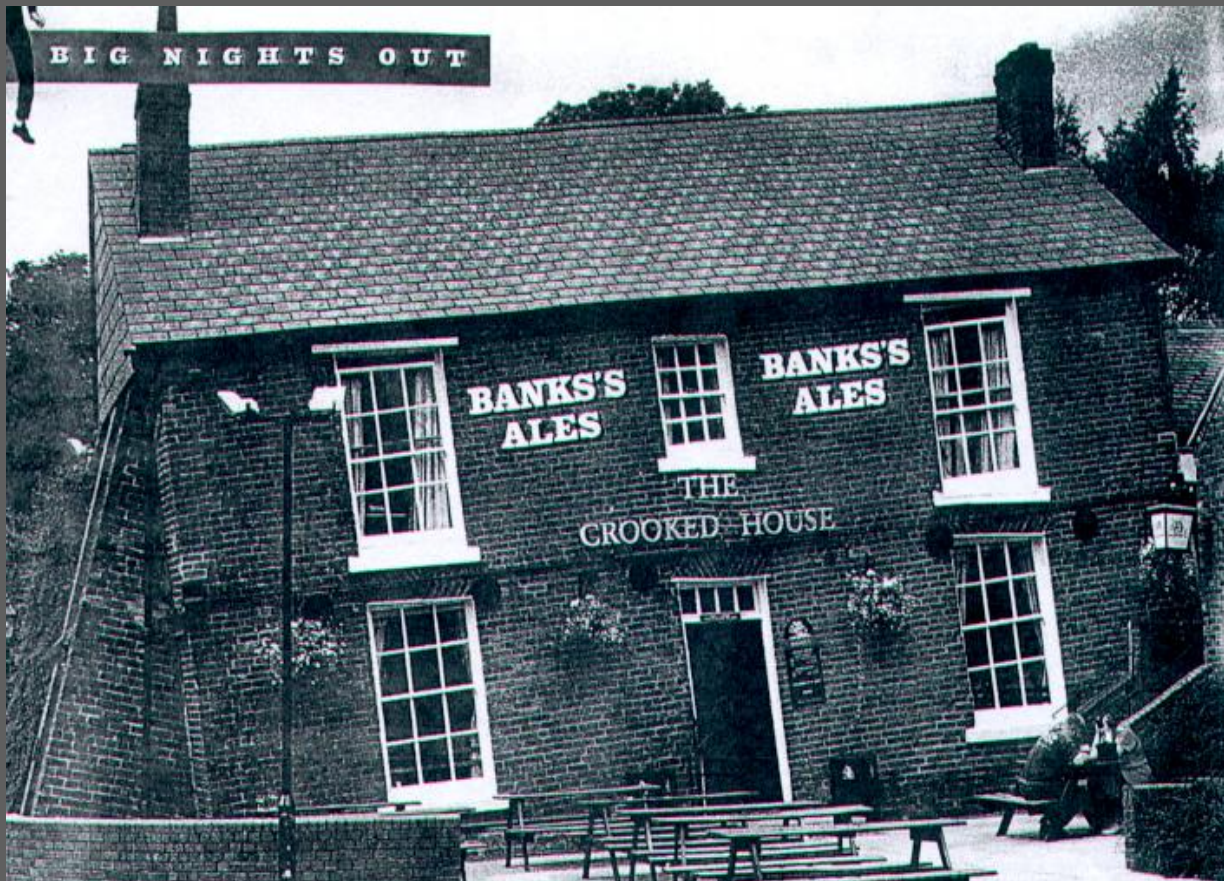


External Walls



Comment on the factors affecting the rain penetration risk to masonry walls

Walls: movement

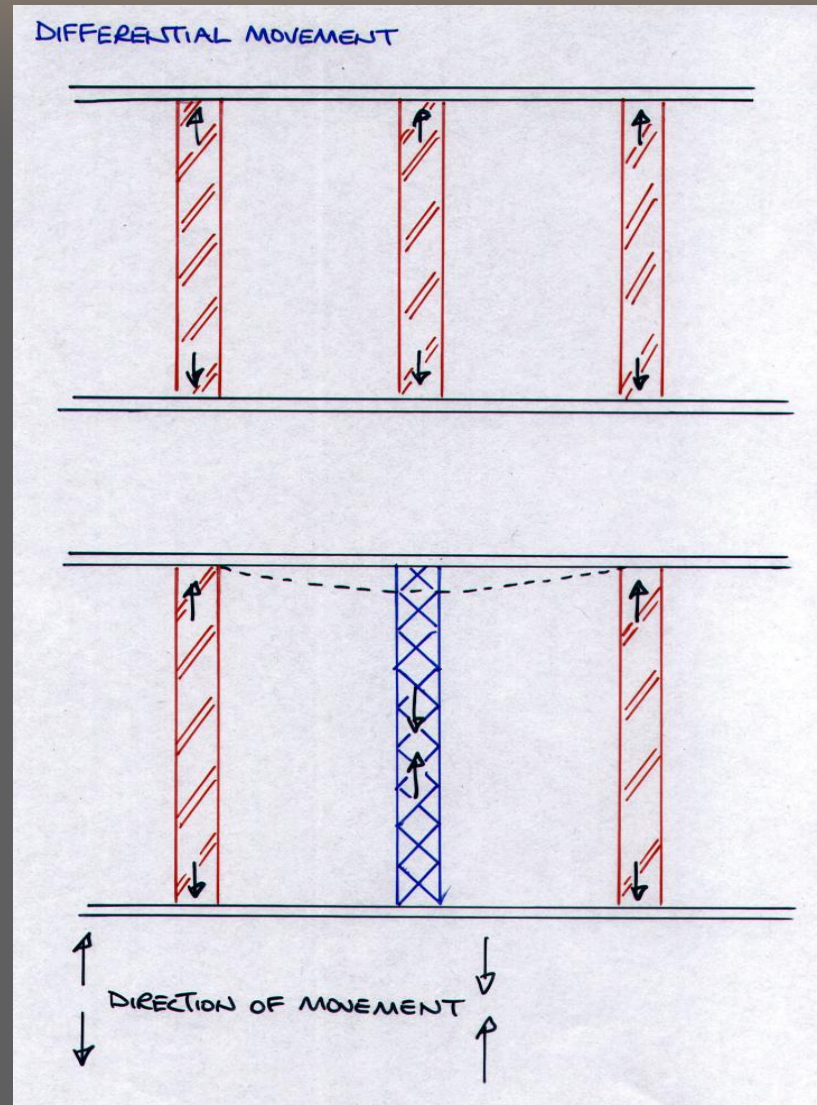


Movement:

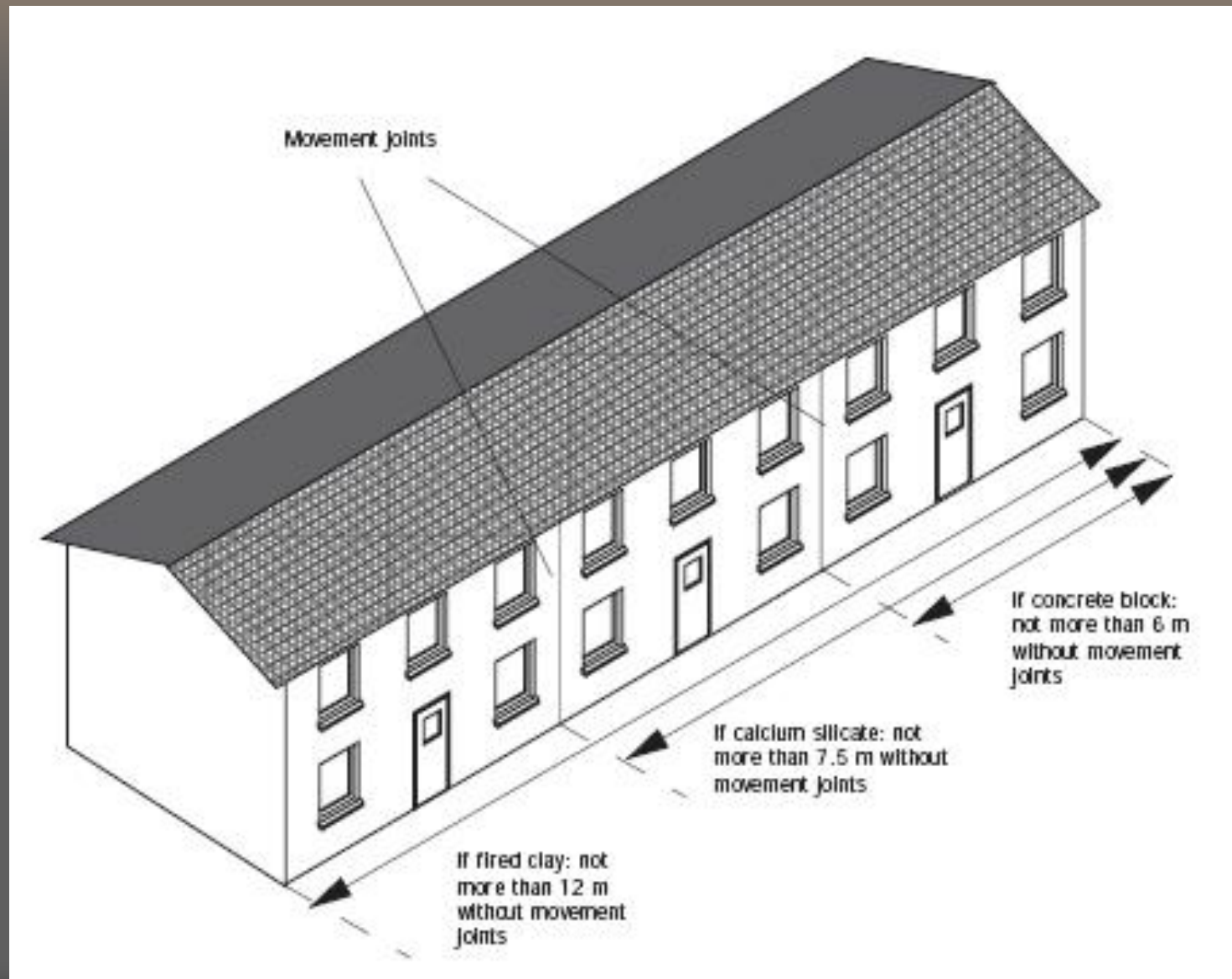
- Reversible
 - Temperature change
 - Changes in moisture content
- Irreversible
 - Chemical action
 - Ground movement
 - Differential settlement

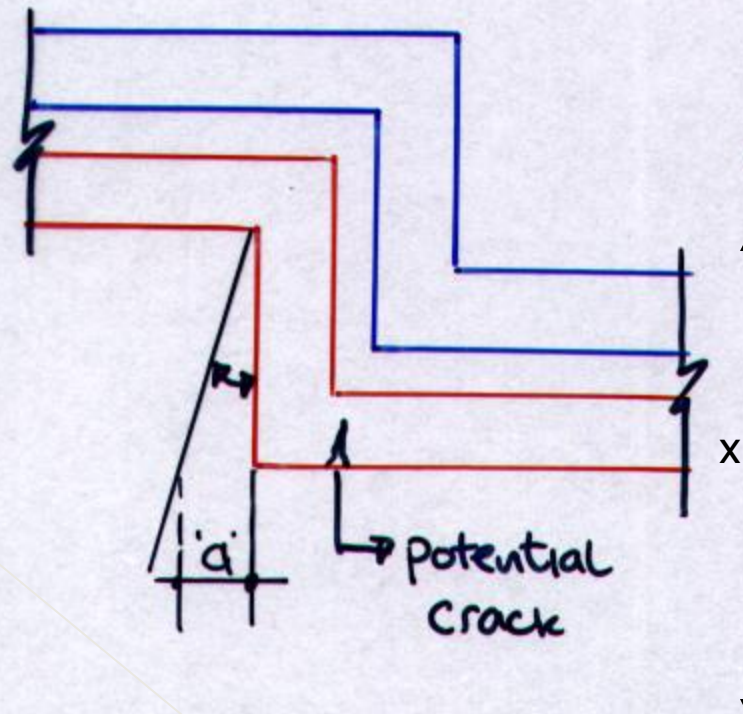
Walls: movement

Differential movement can be minimised by keeping the elements of the same material



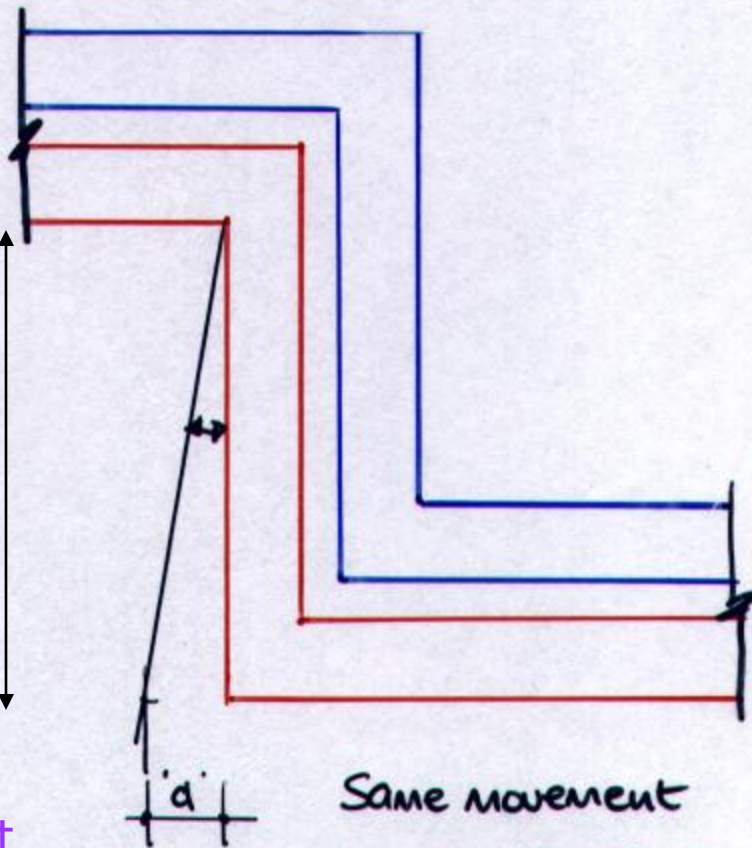
The use of movement joints in masonry walls





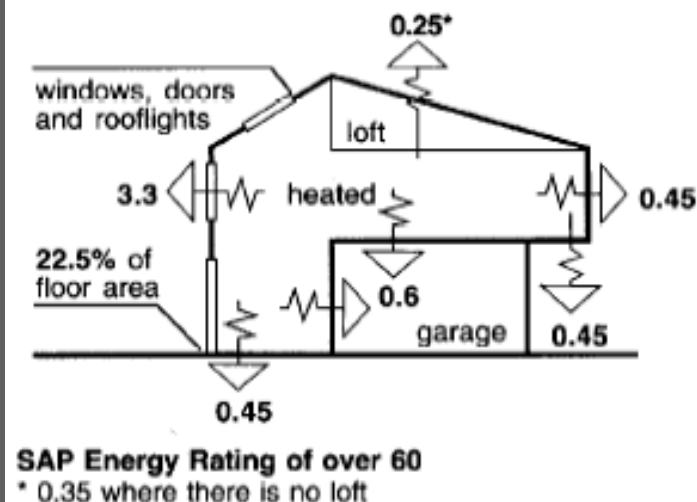
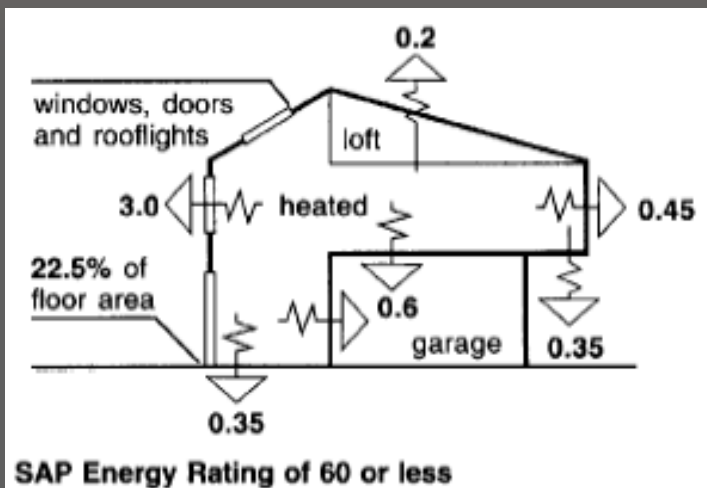
Design out excessive movement

Distance x: minimum 800mm



Same movement
as short return
but less rotation
so less risk of
cracking.

Walls: thermal & moisture

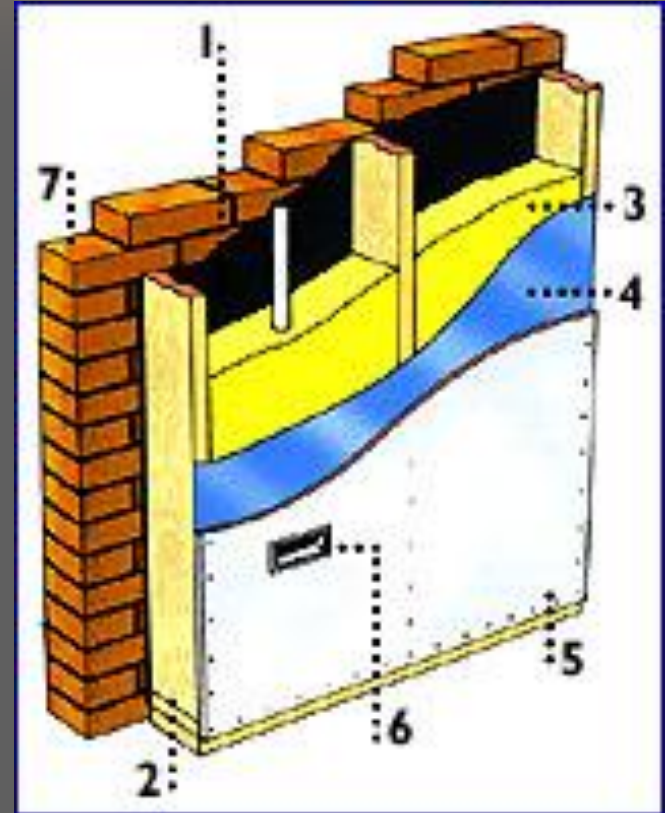


Key issues...

- Fabric heat loss
 - Building regulations
- Insulation location
 - Inside
 - Outside
 - Between
 - Composite material

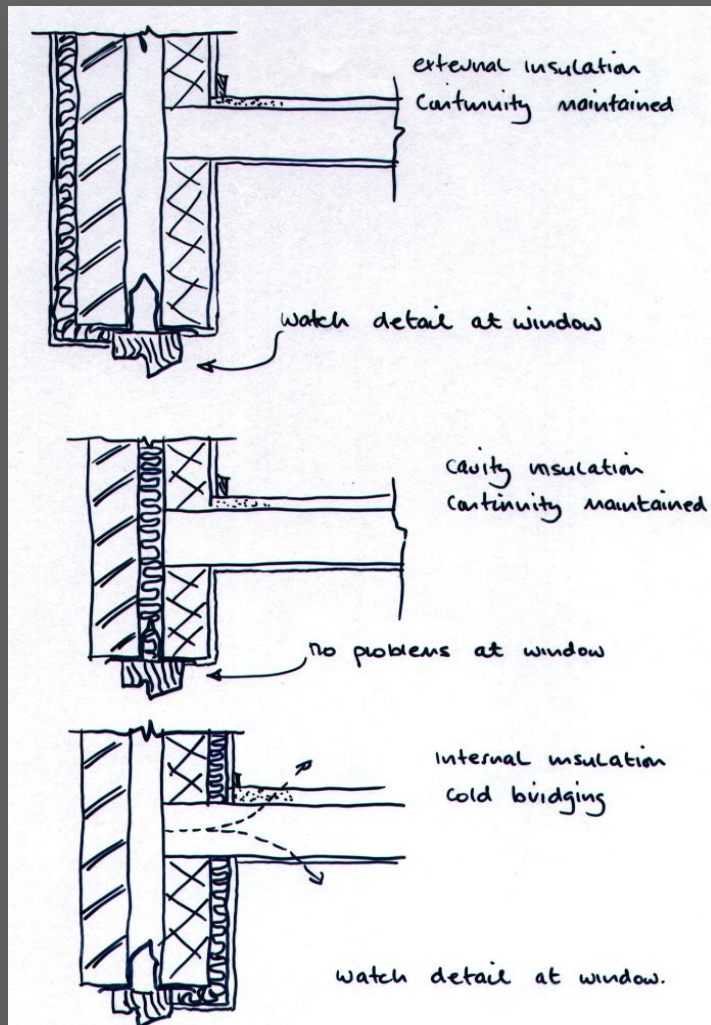
Walls: vapour movement and condensation

- ⇒ Not of major concern in masonry owing to the permeability of the materials
- ⇒ Vapour barrier may assist – must be placed on the warm side of the insulation
- ⇒ Ideally, permeability of materials should increase towards the outside face of the wall



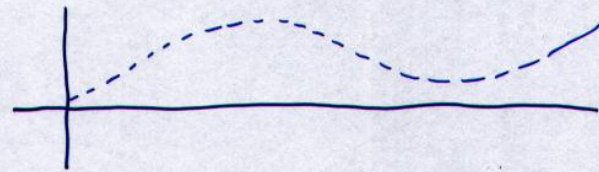
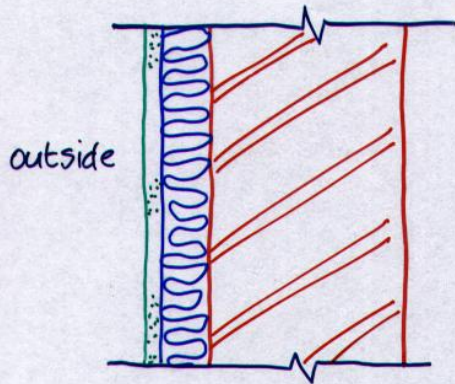
1. Moisture barrier
2. Timber frame
3. Insulation
4. Vapour barrier
5. Wall board
6. Services
7. External cladding

Condensation and cold bridging

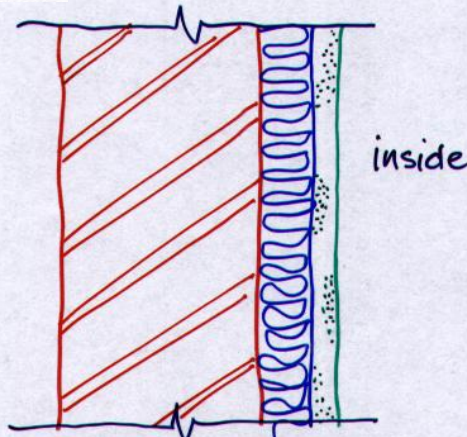


- ⇒ Position of insulation
- ⇒ Surface temperatures
- ⇒ Ventilation
- ⇒ Heat loss
- ⇒ airtightness

Thermal capacity



good thermal
capacity.
Slow to heat up
Slow to cool



quicker to heat up
quicker to cool down



Walls: fire performance

Providing integrity – no
hole burnt through

And

Insulation – reduces heat
transfer

Will give

Stability – will not collapse

Approved document outlines requirements for:
windows, doors and cladding
Cavity walls and seals



External walls: tutorial

1. Investigate other external wall types for both low and medium rise buildings.

Consider the range of materials available and the methods of fixing these to various backgrounds.

2. Compare and contrast the different fixings for use with masonry and steel and masonry and concrete