


**Civil Engineering Construction**  
Chapter 5

**Introduction to Floor**

Dr Mohamad Syazli Fathi

Department of Civil Engineering  
UTM RAZAK School of Engineering & Advanced Technology  
UTM International Campus

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**Introduction**

- In a building, the surfaces which divide a building into different levels or storeys are known as floors.
- The floor just above the ground level is called ground floor, whereas the floor constructed below ground level is known as basement floor.
- Any floor above the ground level, except the terrace or roof of a building is known as upper or suspended floor.




## The functional requirements of a floor

- In any floor system, the functional requirements of a floor are:
  - To provide horizontal uniform surface
  - To support all the loads (dead and live loads) imposed on the surface.
  - In multi-storeys, the floor has other functions than the above.
  - To provide resistance to sound, fire and heat.
  - To provide privacy to the dwellers.
  - The upper floor acts as a ceiling to the lower floor.
  - Space between floors and ceilings will accommodate the building services fixtures such as electrical, telephone wirings etc.




## Classification of Floor

- Floors can be divided into two sections :
  - Ground Floor
  - Upper floor



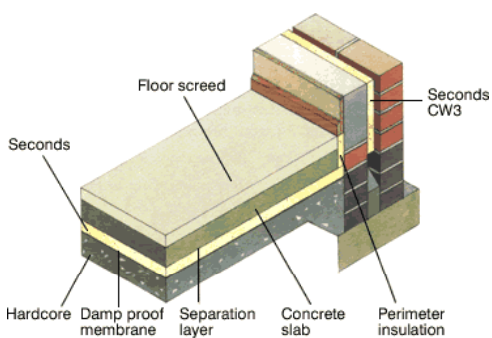
## Ground Floor

- The ground floor is divided into two sections:
  1. Solid floor
  2. Suspended ground Floor



## Solid Ground floor

- Since a ground floor rests directly on the soil when not accompanied by a basement floor, its base usually consists of the following layers.
  1. Hardcore
  2. Blinding
  3. Concrete bed or slab.

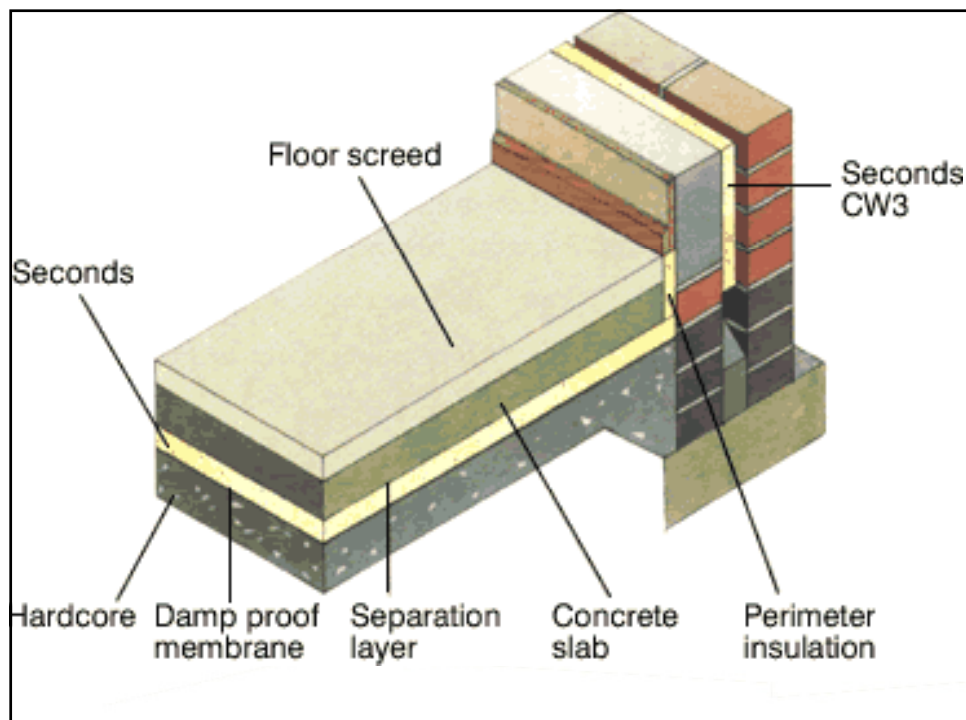


Note:  
Secons - is rigid foam boards Brand

**Please refer Figure 4.1.1 and 4.1.2 at page 159 & 160**

## Hardcore

- Hardcore ; normally 100-150 mm. The most suitable material used are hard, durable and chemically inert materials. Each layer well compacted to prevent settlement beneath the solid floor.
- The purposes of hardcore are :
  1. To fill any small pockets which have formed during oversite excavations.
  2. To provide firm base on which to place a concrete bed
  3. To help spread any point loads over a greater area.
  4. To act against capillary action of moisture within the soil.
  5. To prevent contamination of the lower part of the wet concrete during placing and compaction
  6. To provide any unacceptable settlement beneath the solid floor.





## Characteristics of good hardcore.

- It must be hard
- It must be durable
- It must be inert and will not attack concrete or brickwork mortar.
- It can readily be placed in a compact and dense condition and hence required only limited consolidation.




## Blinding

- Blinding: Blinding is a layer of sand 25-30 mm thick or 50-75 mm of weak concrete(1:12 Mix).
- Purposes :
  - To even off the surface of the hardcore if a dpc membrane is to be placed under the concrete bed.
  - To prevent the dpc from being punctured by the hardcore.
  - To provide a true surface from which the reinforcement can be positioned.




## Concrete Bed

- unreinforced or plain in-situ concrete, 100-150 mm thick
- reinforced concrete, 150 mm minimum.




## Water

- Water/moisture is prevented from entering the building so that :
  - The floor does not rot(eg. Tomber floor)
  - Floor finishes do not damage
  - Fungi does not grow
  - Cleanliness and hygienic can be maintained.
  - Timber furniture does not rot.
- Water can enter the building through :
  - Capillary action
  - Water pressure in the soil below the ground floor
  - Water vapour in the house.
- Water can be prevented from entering the building bu :
  - Constructing the floor level higher.
  - Providing dpc
  - Providing sufficient ventilation.



- Water/moisture can be avoided from entering the building through the ground floor by :
  - using dpc on the ground floor
  - support the floor and not in direct contact with the soil.
- Suitable materials for dpc membranes are:
  - Polythene sheets
  - Hot poured bitumen - 3mm thick minimum.
  - Cold applied bitumen/rubber emulsions – 3 coats
  - Asphalt/pitchmastic.



## Floor screed

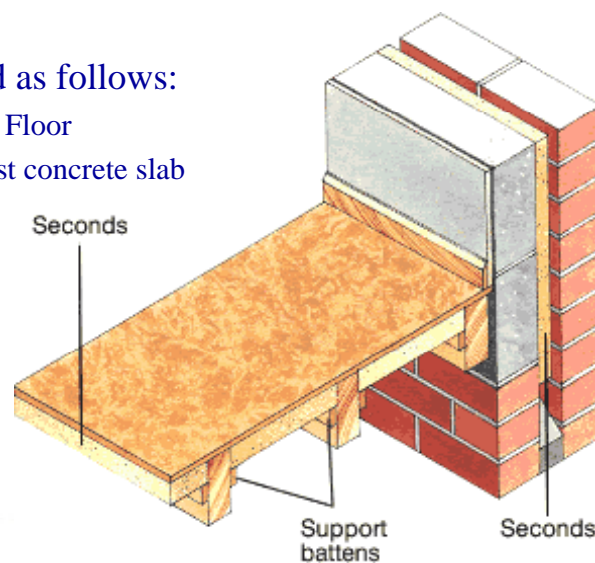
- Must be able to provide a smooth surface on which a floor finish can be applied
- Must be able to level the floor
- Provide falls for drainage purposes

### Construction of solid floor.

- Construction of solid floor.
  - Preparation of surface of sub-grade :
  - Site cleared from turf and vegetation.
  - Top soil (225 mm) should be cut and thrown away.
  - Laying of sand layer – a layer of clean and dry coarse sand 100mm thick is evenly spread over the sub-grade.
  - The hard core is laid (150 mm) and well compacted.
  - Laying concrete bed 75 mm thick (depend on the soil conditions and loads). Concrete mix is 1:2:4
  - The top surface is then levelled
  - Place dpc
  - Pour in final concrete 50 mm thick
  - Place reinforcement if required.
- Notes :
  - Sometimes dpc is not required if the soil at the site has proper drainage for the floor
  - At times the quality of the dpc may be improved by adding other materials, eventhough this is an acceptable method.
  - If no dpc, the minimum thickness of the floor must be app. 100 mm.

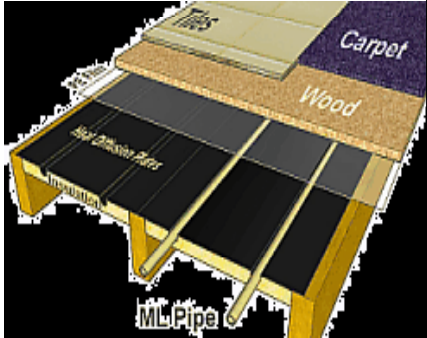
### Suspended Ground Floor

- Can be classified as follows:
  1. Suspended Timber Floor
  2. Steel joist or precast concrete slab floor
  3. R.C.C floor





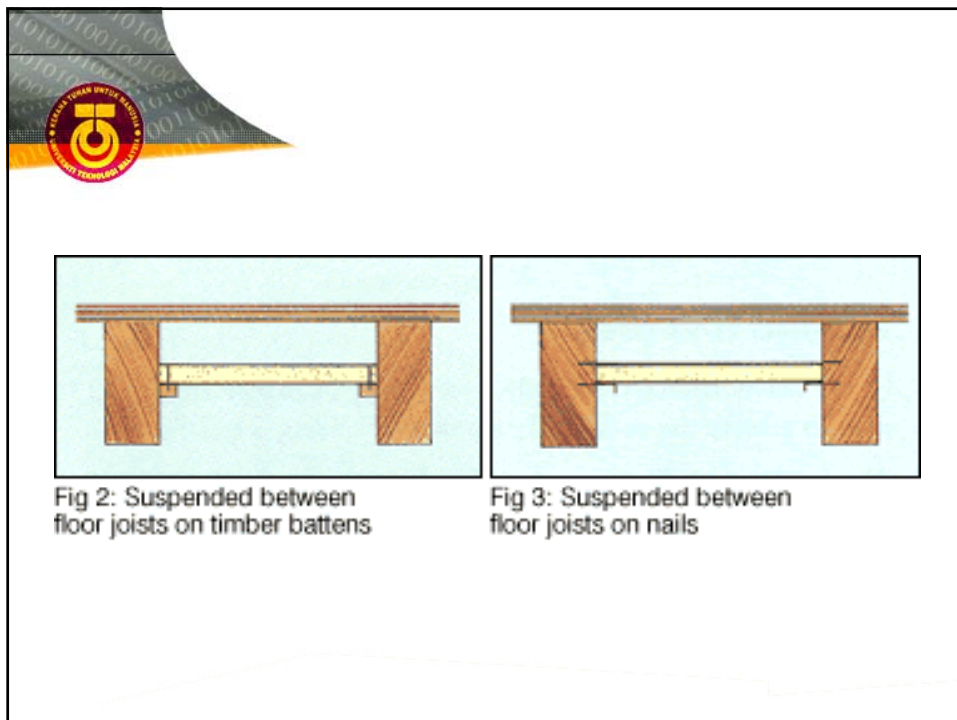
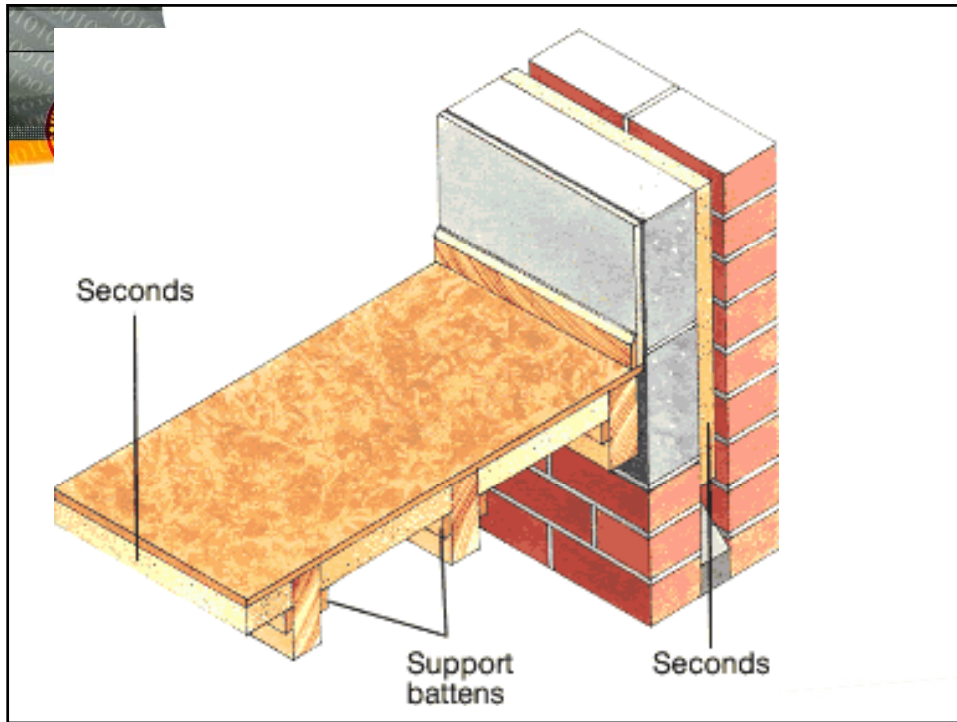
**Suspended Timber Ground Floor.**

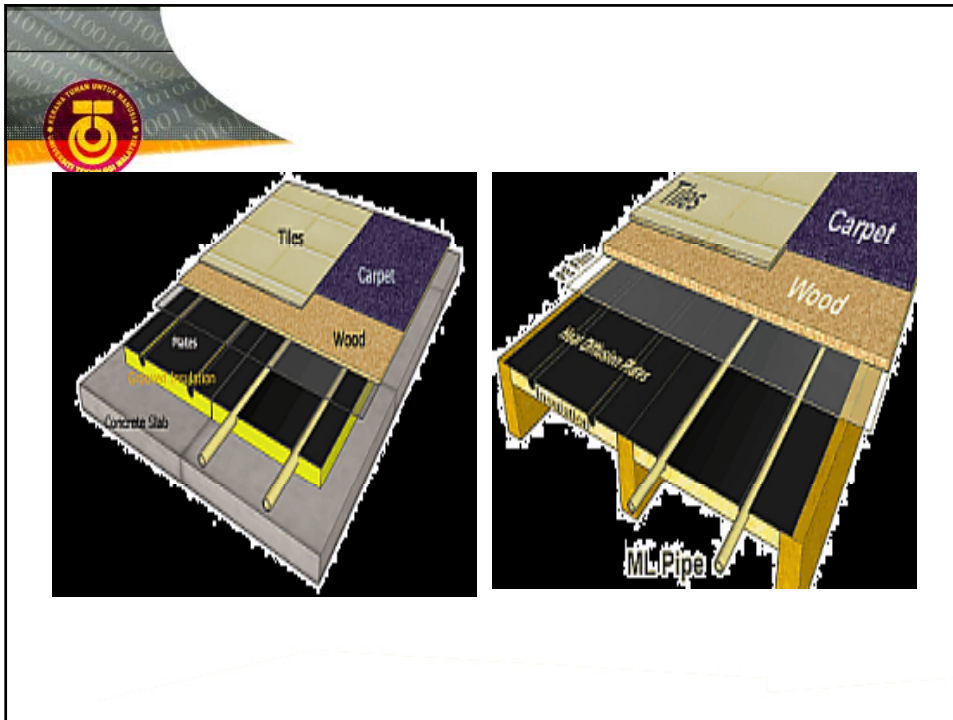


- Advantages:
  - The timber floor does not require other finishes except itself
  - It has a resilient quality
- Disadvantages:
  - The timber can be easily attack by dry rot if the space of the floor is not properly ventilated.
  - The air vent is easily blocked
  - It is not suitable for floor which has to support heavy loads.

**Upper Floor – Suspended Timber Upper floor.**

- Normally is used for residential and commercial buildings. Most upper floors in domestic buildings are constructed of timber floor boarding supported by timber joist.
- The main difference between suspended floors at ground level and those on upper floors is the longer spans of joists in the latter case, with resultant deeper joists.
- The sizes of joist vary with the grade of timber, the dead load, the span of the joists and their spacing.
- Timber upper floors for offices, factories and public buildings are not much used today because the resistance to fire of a timber floor, plastered on the underside, is not sufficient to comply with Building Regulations for all but small buildings. Concrete floors are used instead because of their better resistance to fire and sound transmission.





**The PEXATHERM UFH Pipe-in-Plate system for Timber Floors**

**Floated Timber Floor X-section**

**Suspended Timber Floor Section**

**Suspended Timber Floor X-section**

- Metal heat diffusion grooved plates resting on joists. Insulation with reflective foil below them. Battens between joists supporting insulation. PEX or Pex Alu Pex in plates grooves. Floorboard laid directly on plates with PE sheet in between.

**Timber suspended Floors can be classified into two types :**

- 1. Single Joist wooden Floors.**
- 2. Double joist wooden floors.**

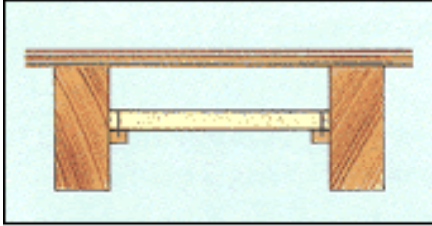


Fig 2: Suspended between floor joists on timber battens

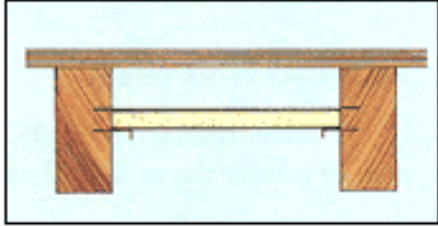


Fig 3: Suspended between floor joists on nails

**Single Joist wooden Floors.**

- The wooden floor having its topping supported by only common joist or bridging joists is called a single joist wooden floor or simply single floor.
- In these wooden floors, the joist are of one continuous length and span from wall, and hence they are known as single joists.
- The bridging joists should be strong and stiff enough to take the load safely without causing deflection. The joists are spaced 300 mm to 400 mm apart. The width of joist can vary from 50 mm to 80 mm.
- The advantages of single joist suspended floor :
  - Single joist wooden floors are easy to construct
  - They distribute the load more uniformly on the walls as the joists are placed at closer intervals.
  - They are cheap.
- Disadvantages Of single suspended floor :
  - Single joist wooden floors are uneconomical for span more than 4m.
  - The joists are liable to sag which may develop cracks in the ceiling
  - They involve a lot of cutting while making an opening in the floor
  - They may transmit their load on window or door lintels as the joists are placed uniformly on the entire length of the wall.
  - They require wall plates for supporting the joists
  - They are not sound proof.
  - The span for single joists wooden floors is generally restricted to 3.75m.

### Suspended timber flooring using either timber floor joists or 'T' beams.



### Double joist wooden floors.

- The wooden floor having its topping supported by bridging along with one or more binders is known as double joist wooden floor or simply double floor.
- Advantages of double joist wooden suspended floors are:
  - Double joist wooden floors are more rigid and hence the plastered ceilings are not liable to crack.
  - They transmit the load at specific points and hence placing of binders over windows or door lintels can be avoided.
  - They are more sound proof.
- Disadvantages of double joist wooden suspended floors are:
  - Double joist wooden floors provide increased depth of floor which reduces the head-room
  - They involve extra labour to joint the various members together.
  - Their increased depth also results in increasing the cost of the building.

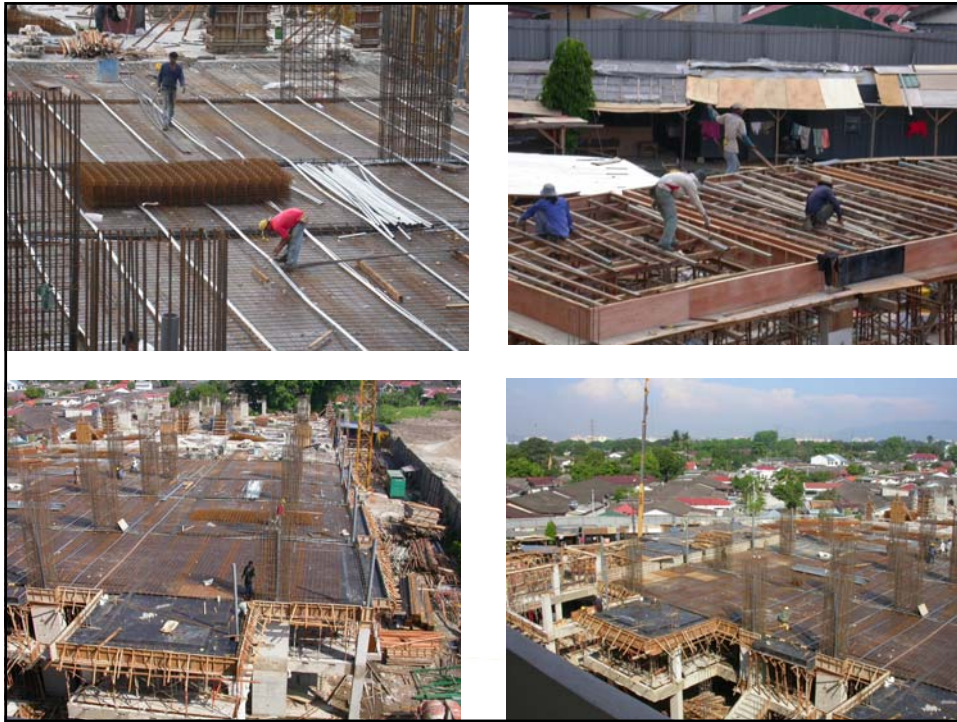




## Reinforced Concrete floors

- Reinforced concrete floors are becoming very common in the construction of modern buildings. They have a better resistance to damage by fire, safely support greater superimposed loads than timber floors of similar depth, provide good lateral rigidity and good insulation against airborne sound.
- In reinforced concrete the steel makes good the inadequacies of the concrete (concrete is weak in tension) and the concrete protects






## Hollowcore Floor Slab System

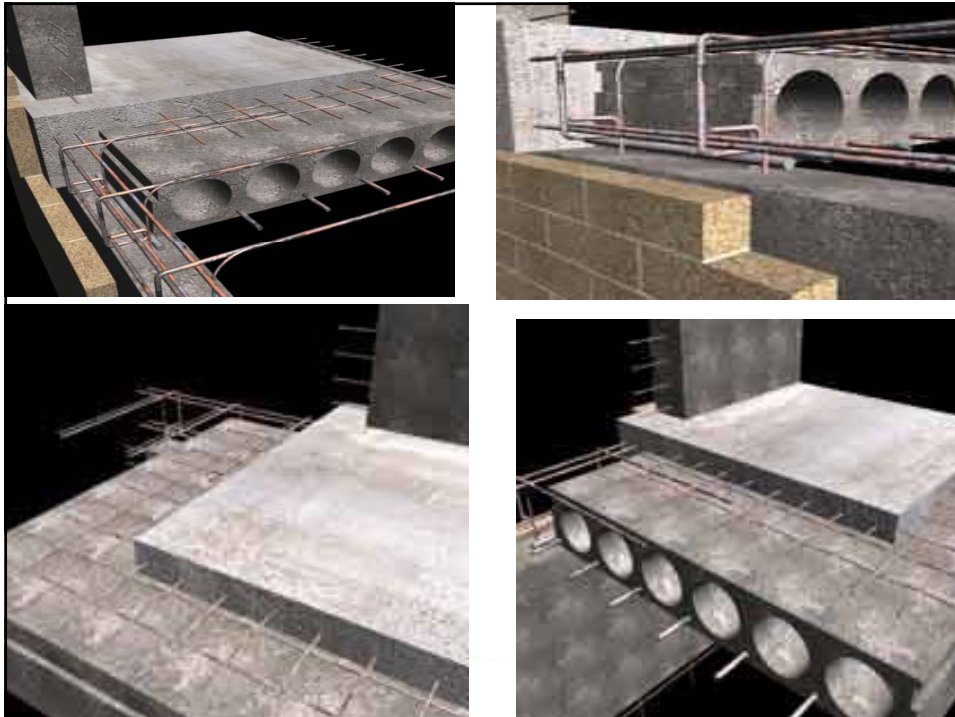

- Hollowcore is a 1200mm wide extruded, pre-stressed, voided concrete slab unit with a reinforced concrete topping.
- Standard unit depths are 200, 300 and 400mm.
- Units are cut to a customised length and may have raking ends.
- Hollowcore is ideally suited for large floor spans with commercial loadings.

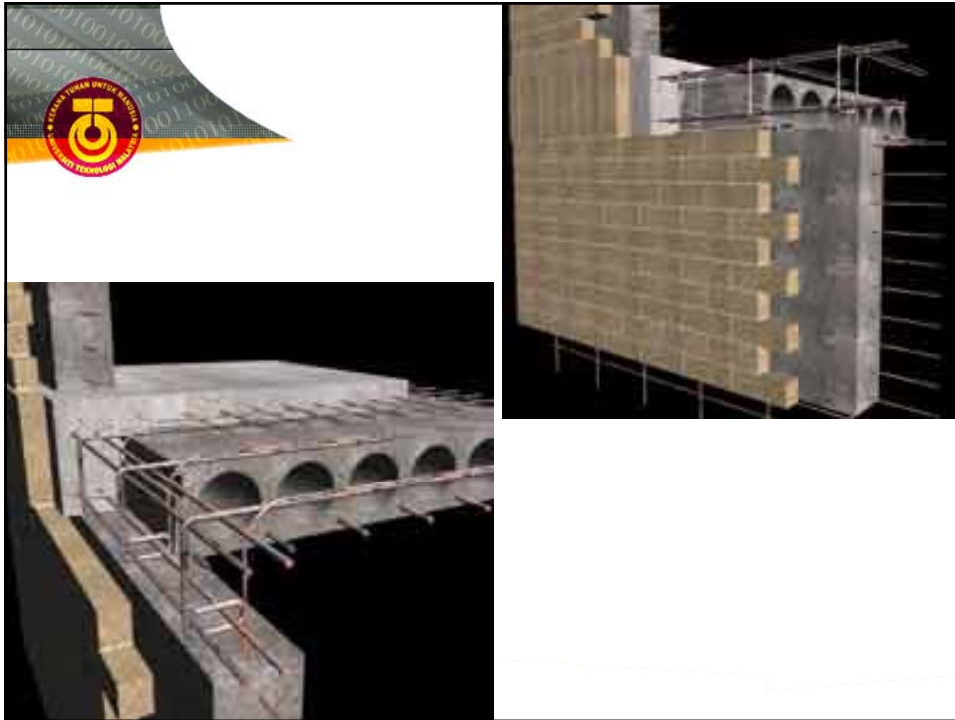






- Hollowcore slabs are made very efficiently, they are very conservative in relation to materials.
- Hollowcore is extruded and does not rely on formwork to create the slabs.
- Also hollowcore uses half the amount of concrete normal floor slab systems use, yet it can still span long distances, 200mm hollowcore can span just under 12m.
- This makes the material very good for a variety of construction types.





- The extruded Hollowcore Floor Slab is very light weight, weighing 320kg/m. This makes for very fast construction. The slabs are trucked on to site and can be lifted straight into place on the structure. Once the slabs are in place the rest of the construction moves along very fast, formwork is erected and reinforcing is laid. The next process is to pour the in-situ concrete topping pad. This is a very important part of the hollowcore detail as this concrete combines all the elements together to make one rigid structure. From start to finish the process of constructing a hollowcore flooring system is very quick!
- Hollowcore floor slab systems have very good acoustic properties. Hollowcore has an STC rating and an IIC rating of 55dB. The thermal properties of hollowcore slabs have an R value of 0.9. This is quite low, but concrete has always had a very low thermal resistance. Structural concrete 200mm thick has an R value of 0.13, the pervious value of 0.9 has taken into consideration floor coverings.