

# Concrete Structure

## Formwork

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# Concrete Formworks

What is Formwork?

Formwork is a mould including all supporting structures, used to shape and support the concrete until it attains sufficient strength to carry its own weight.

- It should be capable of carrying all imposed dead and live loads apart from its own weight.
- Formwork is commonly made of
  - Steel
  - Timber

# TIMBER FORMWORK





# STEEL FORMWORK



- Formwork has been in use since the beginning of concrete construction.
- New materials such as steel, plastics and fibreglass are used in formwork.
- Greater attention is being given to the design, fabrication, erection and dismantling of formwork
- Formwork is designed according to The ACI Code

- **Qualities of Formwork**

- It should be water tight.
- It should be strong.
- It can be reusable.
- Its contact surface should be uniform.
- It should be according to the size of member.

- In order to successfully carry out its function, formwork must achieve a balance of following requirements:
  - Containment
  - **Strength**
  - Resistance To Leakage
  - Accuracy
  - Ease Of Handling
  - Finish And Reuse Potential
  - Access For Concrete
  - Economy
- **Containment:** formwork must be capable of shaping and supporting the fluid concrete until it cures.
- **Strength:** formwork must be capable of safely withstanding without distortion or danger the dead weight of the fluid concrete is placed on it, labour weight, equipment weight and any environmental loadings.

- **Ease of Handling:** form panels and units should be designed so that their maximum size does not exceed that which can be easily handled by hand or mechanical means.
  - In addition all formwork must also be designed and constructed to include facilities for adjustments, levelling, easing and striking without damage to the form work or concrete.
- **Economy:** all the formwork is very expensive. On average about 35% of the total cost of any finished concrete unit or element can be attributed to its formwork; of this just over 40% can be taken for material for formwork and 60% for labour.
  - The formwork designer must therefore not only consider the maximum number of times that any form can be reused, but also produce a design that will minimize the time taken for erection and striking.

## **Major objectives considered in formwork:**

- 1. Quality:** Forms must be designed and built with sufficient stiffness and accuracy so that the size, shape, position, and finish of the cast concrete are maintained.
- 2. Safety:** Forms must be built sufficient strength and factor of safety so that they have the capable of all supporting loads.
- 3. Economy:** Forms must be built efficiently, minimizing time and cost.



# Formwork requirements

- Material should be cheap and reusable
- It should be practically water proof, so that it should not absorb water from concrete
- Swelling and shrinkage should be minimum
- Strong enough to withstand all external loads
- Deflection should be minimum
- Surface should be smooth, and afford easy striping
- Light in weight, so that easy to transfer
- Joints should be stiff, so that lateral deformation and leak is minimum



Three stages in the formwork process should be accomplished:

- a) Assembly and erection .
- b) Concrete placement.
- c) Stripping and dismantling.

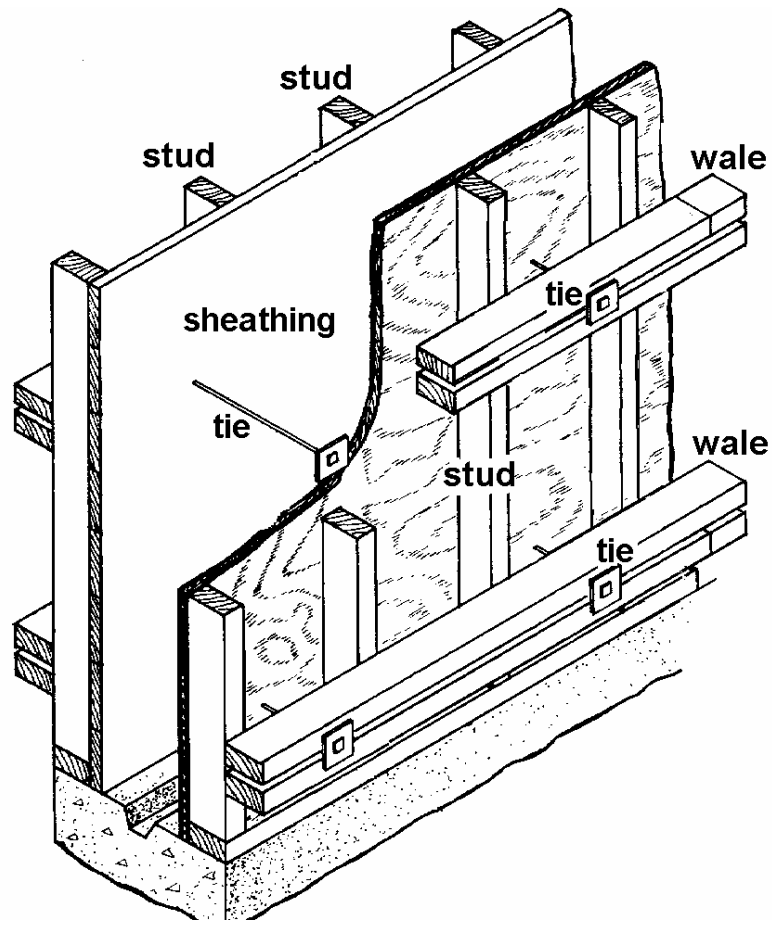
## Formwork detail for different structural members

In concrete construction formwork is commonly provided for the following structural members.

- Wall
- Column
- Slabs & Beams
- Stairs
- Chimneys
- Water tanks
- Towers

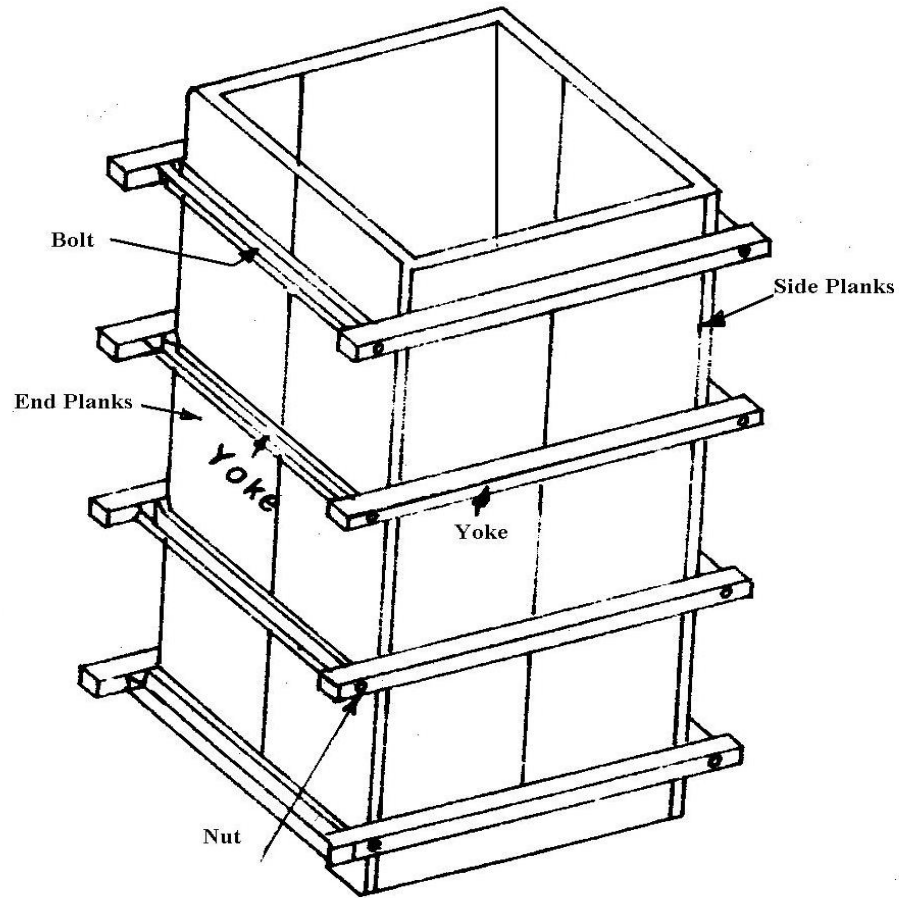
## 7. Form Work

- Formwork for Wall



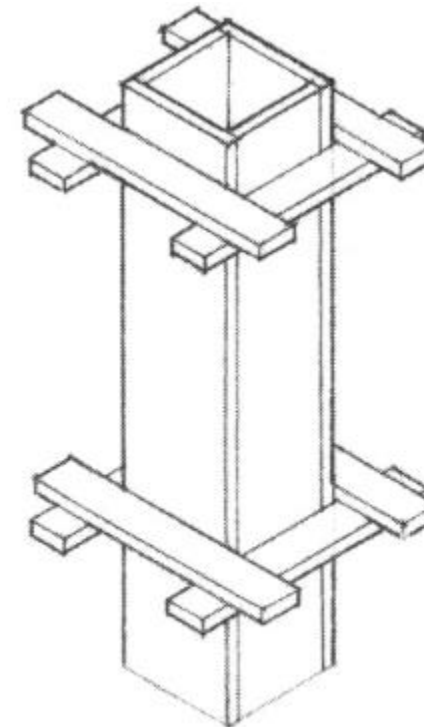
- It consists of
  - Timber sheeting
  - Vertical posts (Stud)
  - Horizontal members (Wales)
  - Ties
- After completing one side of formwork reinforcement is provided at the place then the second side formwork is provided.

- Formwork for Column



Column Formwork (Square Column)

- It consists of the following
  - Side & End Planks
  - Yoke
  - Nut & Bolts
- Two end & two side planks are joined by the yokes and bolts.



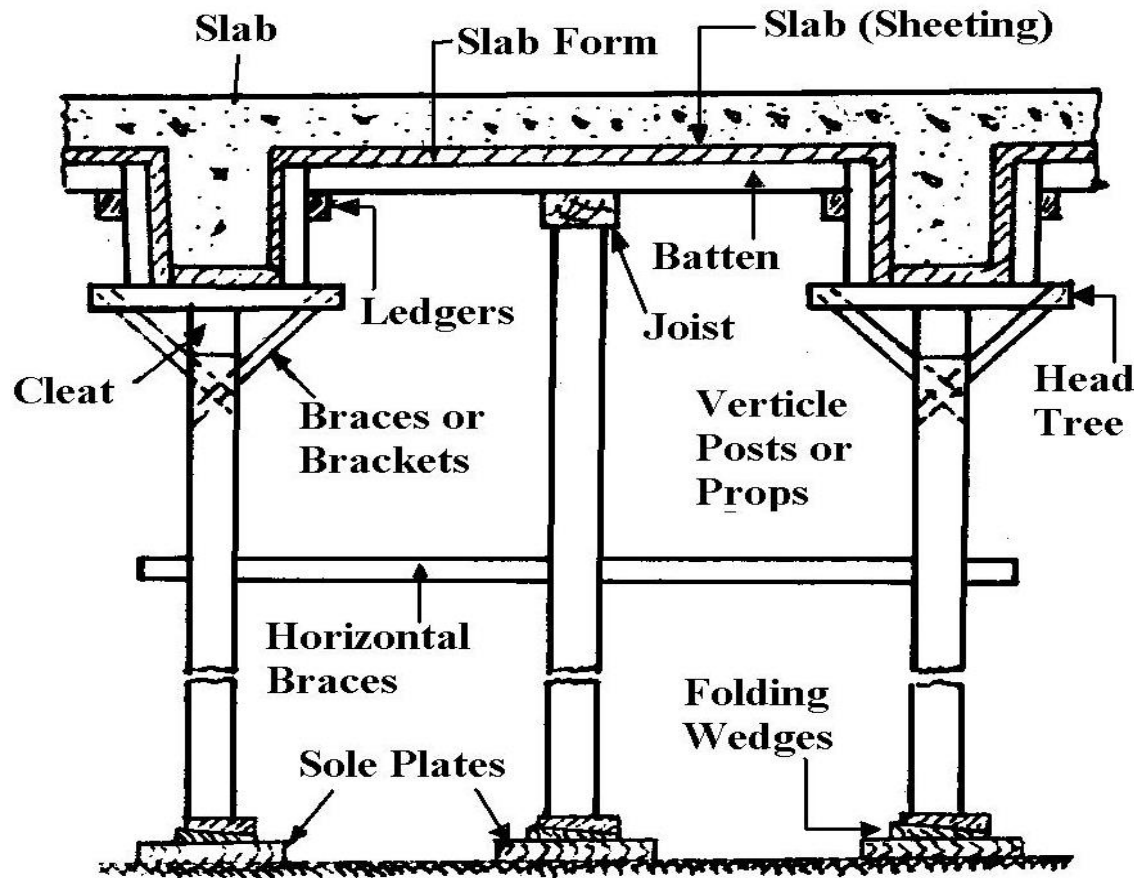


- Formwork for columns



## 7. Form Work

- Formwork for Slabs & beams:

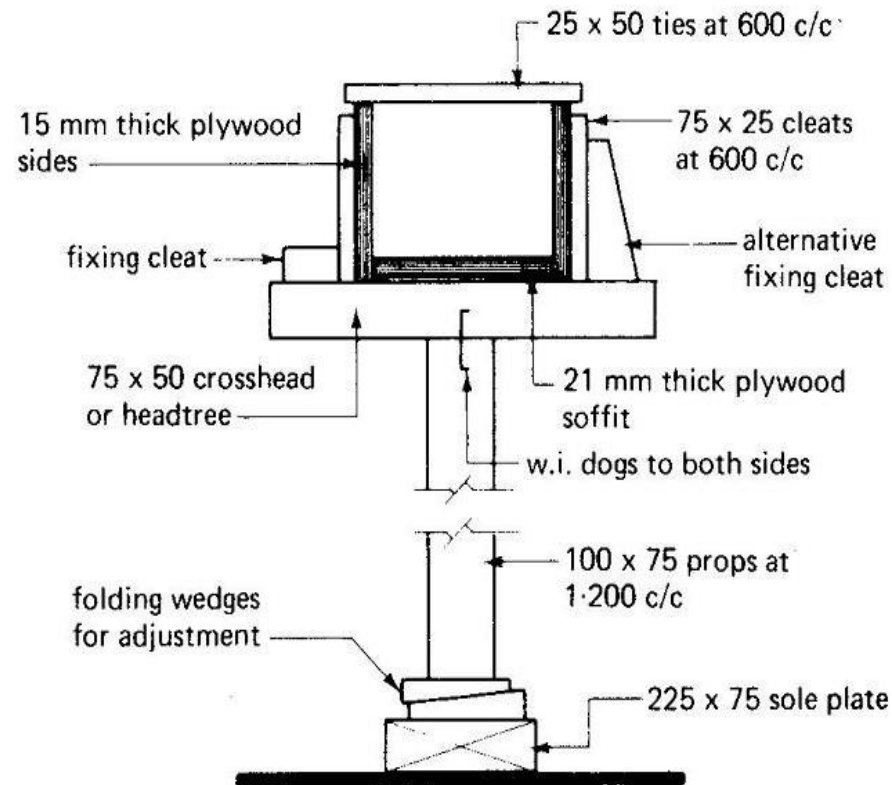


Form Work for concrete Beams & Slabs

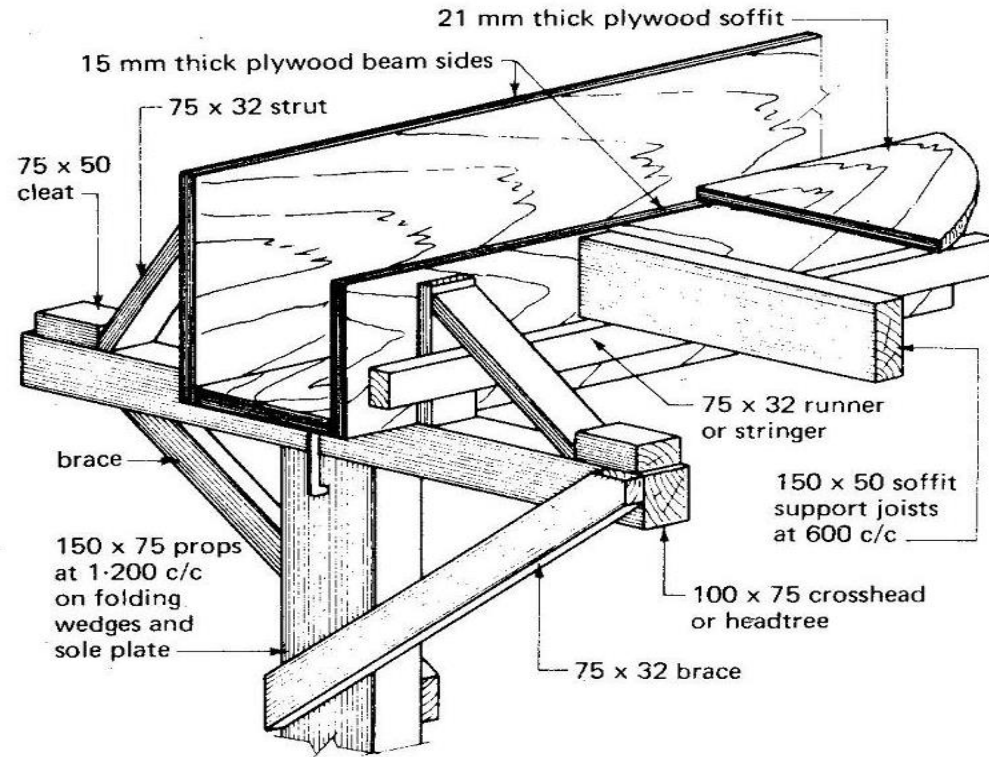
- It consists of
  - Sole plates
  - Wedges
  - Props (shores)
  - Head tree
  - Planks
  - Batten (joist)
  - Ledgers
- Beam formwork rests on head tree
- Slab form work rests on battens and joists
- If prop height are more than 8 feet provide horizontal braces.

## 7. Form Work

- Lintel or Beam Formwork:



Simple beam or lintel formwork



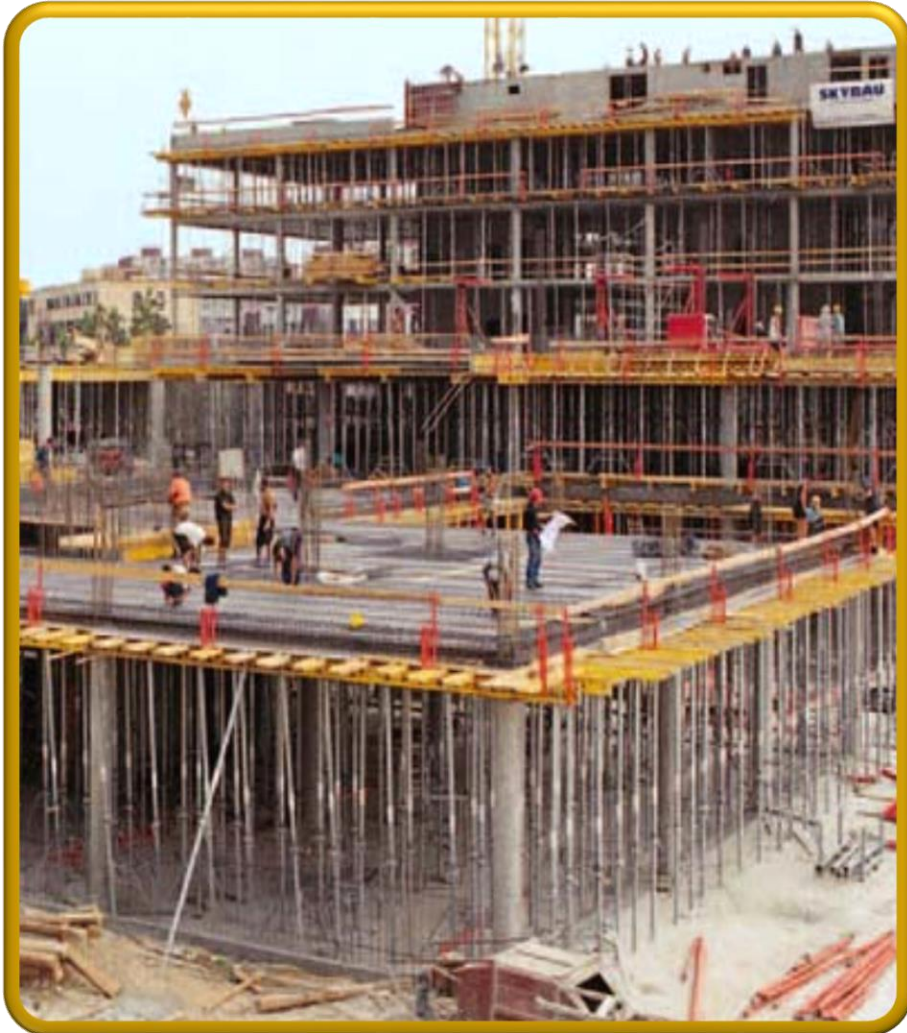
Edge beam and slab formwork

Typical beam formwork



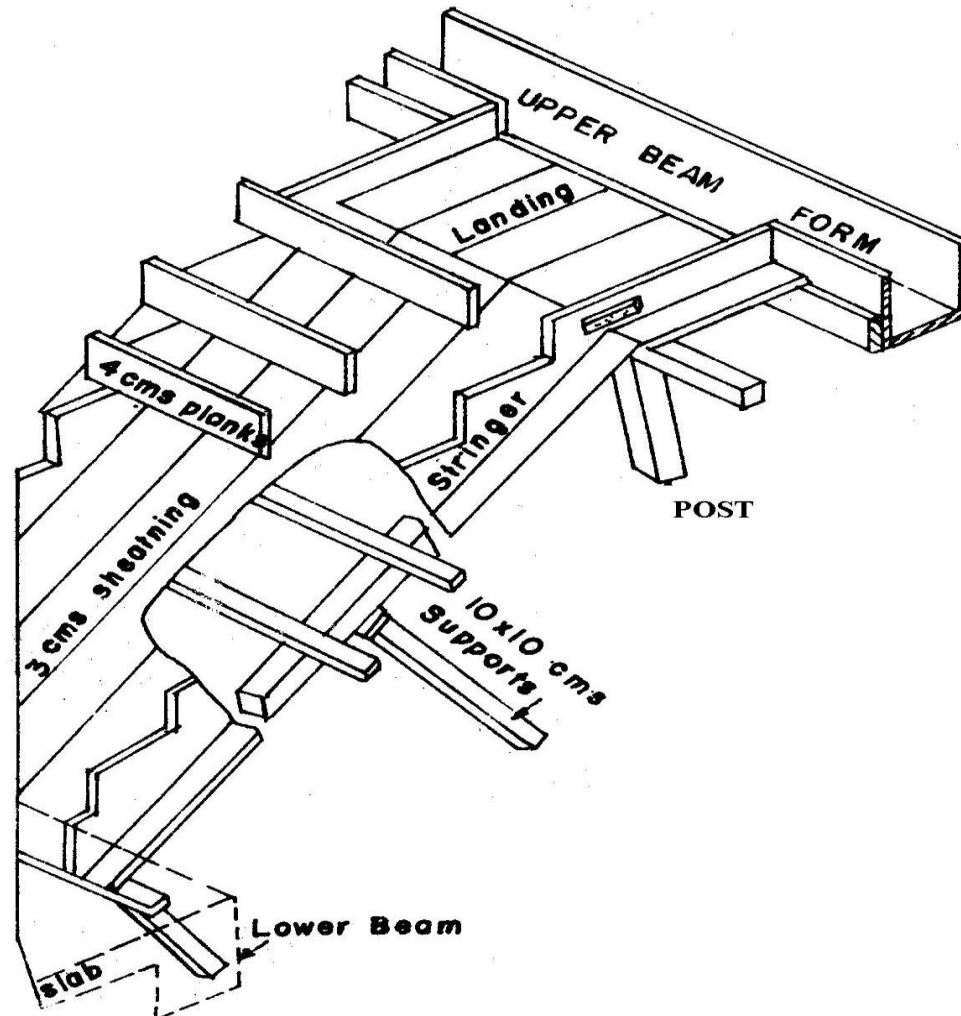
## 7. Form Work

- Formwork of the Slab



## 7. Form Work

- Formwork of Stairs:

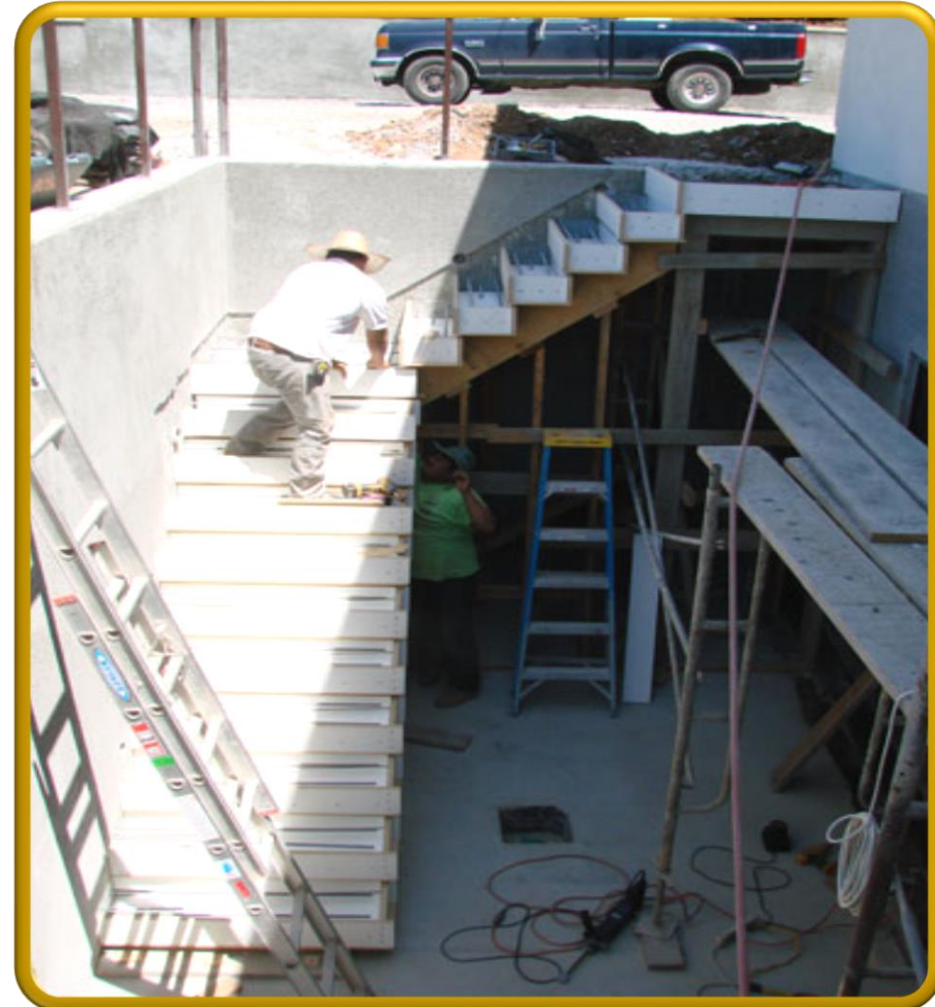
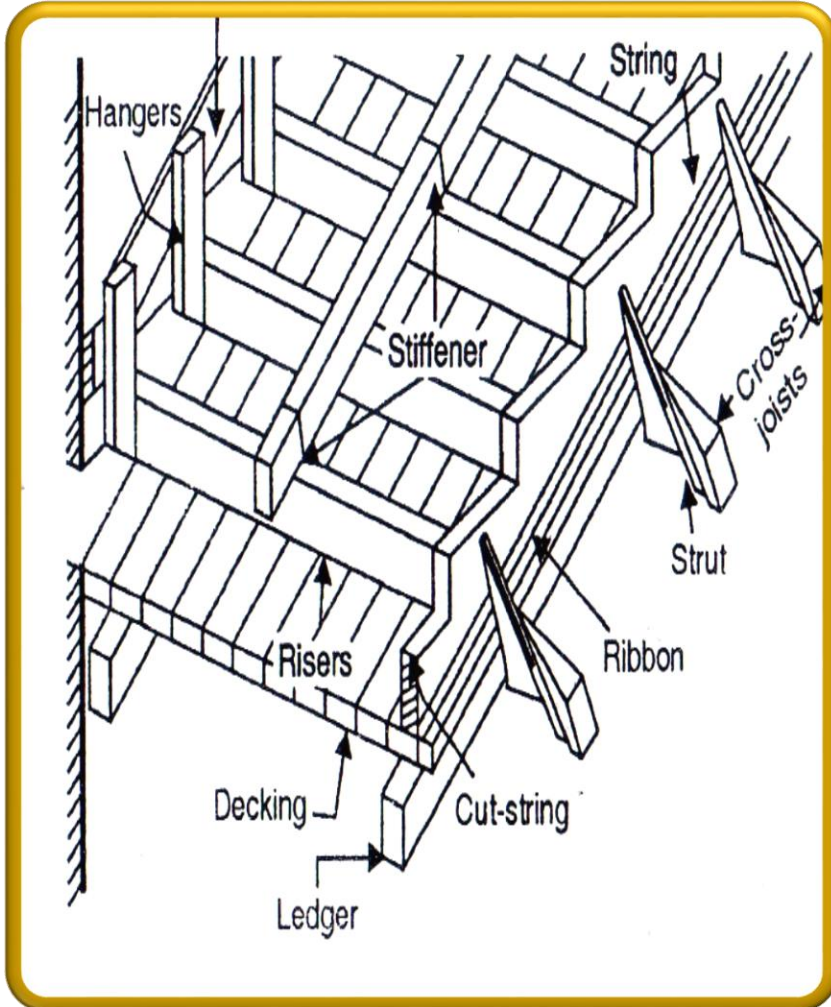


- It consists of
  - Vertical & inclined posts
  - Inclined members
  - Wooden Planks or sheathing
  - Stringer
  - Riser Planks



## 7. Form Work

- Formwork of Stairs:



## 7. Form Work

- Formwork of SPIRAL STAIRS :

