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Building Constructi on



Form Work

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INTRODUCTION

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- ❑ Form work is a mould or box into which wet concrete can be poured and compacted so that it will flow and finally set to the inner profile of the box or mould.
- ❑ Proper selection of formwork has greater influence:
 - ✓ On reducing materials and labor cost,
 - ✓ Improving the quality of the produced concrete and
 - ✓ Saving time leading to smooth running of the projects.

Purpose – to contain freshly placed and compacted concrete until it has gained enough strength to be self-supporting

To produce a concrete member of the required

REQUIREMENTS OF A GOOD FORMWORK

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BASIC OBJECTIVES

i. Quality

- ❑ Desired size, shape and finish of the concrete is achieved.

ii. Safety

- ❑ Capable of supporting all dead and live loads without collapsing or danger to workmen and to the concrete structure.

iii. Economy

- ❑ Efficient, saving time and money for contractor and owner

REQUIREMENTS OF A GOOD FORMWORK

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1. Should **be strong enough to support** the load of wet concrete which is generally considered to be approximately 2400 kg/m^3
2. It must **not be able to deflect under load** which would include the loading of wet concrete, self weight and any superimposed loads
3. It must be **accurately set out**. Concrete being a fluid when placed, it will take up the shape of the formwork which must therefore be of the **correct shape, size and in the right position**.
4. It must have **grout-tight joints**. Grout leakage can be prevented by using sheet materials and sealing the joints with flexible foamed polyurethane strip or by using a special self adhesive tape

MATERIALS FOR FORMWORK

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Main requirements:-

- ✓ Hardness
- ✓ Permeability
- ✓ Surface texture

Formwork facing material:-

- Timber
- Plywood
- Steel
- Precast concrete or fibreglass ,used separately or in combination
- Hardboard

❑ To obtain smooth patterned or textured for surfaces we have to lined inside of form with various materials such as oil-tempered hardboard, moulded rubber, moulded PVC and glass fibre reinforced polyester called **formwork lining**.

MATERIALS FOR FORMWORK

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Timber formwork

Advantage

- More economic
- Easy to handle and formed into required shape
- Maximum re-use
- Easy to fix insert

Disadvantage

- Not enough strength
- Excessive shrinkage due to temperature changes.
- Leakage through joints and apertures.
- Easily damage during fixing and dismantling of formwork.

MATERIALS FOR FORMWORK

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Plywood formwork

Advantage

- Large panel
- No casting or cupping of surface – smooth surface
- Can be nailed to edges without splitting
- High resistance to impact loads
- Available in several thicknesses

Disadvantage

- Grain pattern on concrete face
- Less durable
- More expensive compared to timber

MATERIALS FOR FORMWORK

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Metal

Advantage

- More strong
- Can be erected, disassembled, moved, and re-erected rapidly
- Leakage can be avoided
- No shrinkage
- Easy to fix the joint with bolt and nut
- Economic

Disadvantage

- Limited to the shape of the structure.
- Standard steel unit are too heavy and difficult to

FACTORS AFFECTING SELECTION OF FORMWORK

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- ❑ Formwork for building nearly account for 25% of RCC work.
- ❑ Proper selection of formwork has greater influence:
 - On reducing materials and labor cost,
 - Improving the quality of the produced concrete and
 - Saving time leading to smooth running of the projects.
- ❑ Factors to be considered at the time of selection :
 - ✓ Strength
 - ✓ Economic use
 - ✓ Ease of handling, erection and dismantling
 - ✓ Ability to form the desired shape
 - ✓ Concrete quality and finish required

CONSTRUCTION OF FORMWORK

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i. Propping and centring

- ❑ The props used for centring may be of steel or timber plates.
- ❑ In case of wooden posts are used as props, they should rest squarely on wooden sole plates.

ii. Shuttering

- ❑ The shuttering can be made up of timber planks, or it may be in the form of panel unit made by either by fixing plywood to timber frames or by welding steel plates to angle framing.
- ❑ The shuttering joints should be tight against

CONSTRUCTION OF FORMWORK

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iii. **Provision of camber and cleaning**

- ❑ It is desirable to give an upward camber in the horizontal member of the concrete structure, especially in members having long span, to counteract the effect of deflection.
- ❑ The provision of desired camber should be in the formwork itself during its erection.

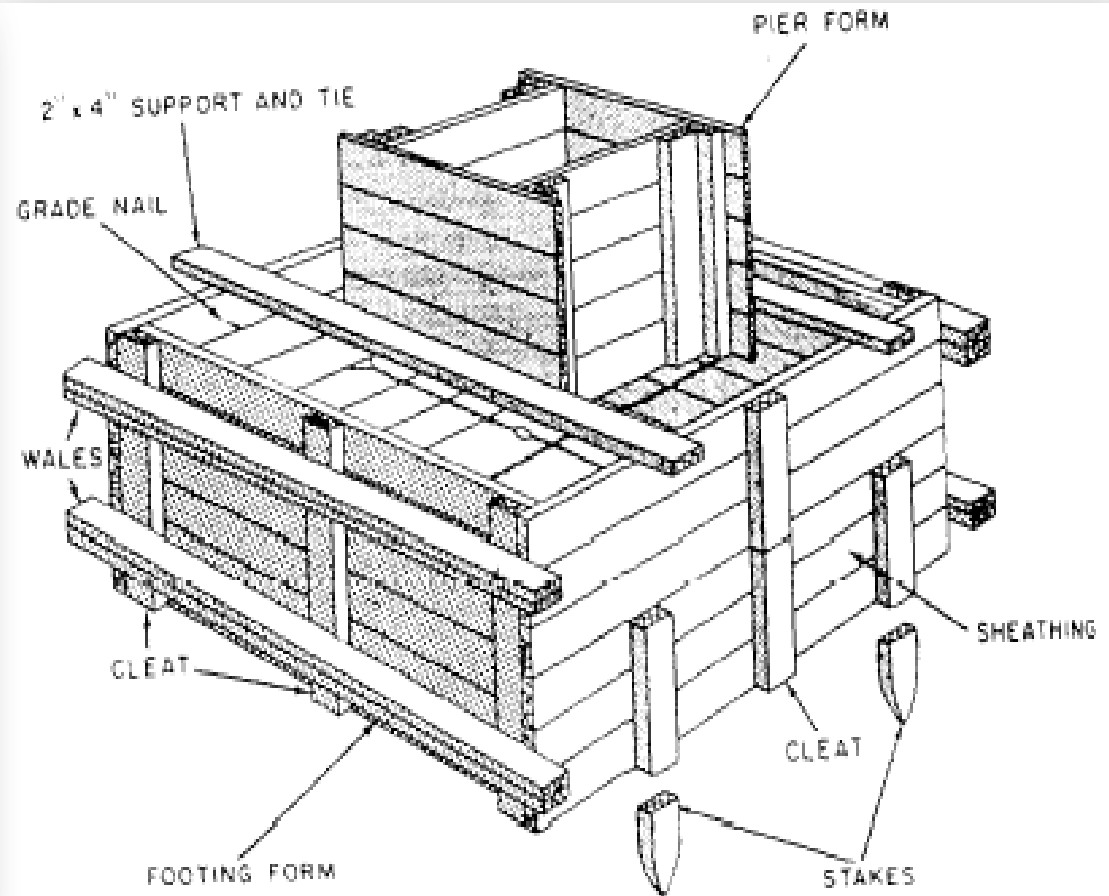
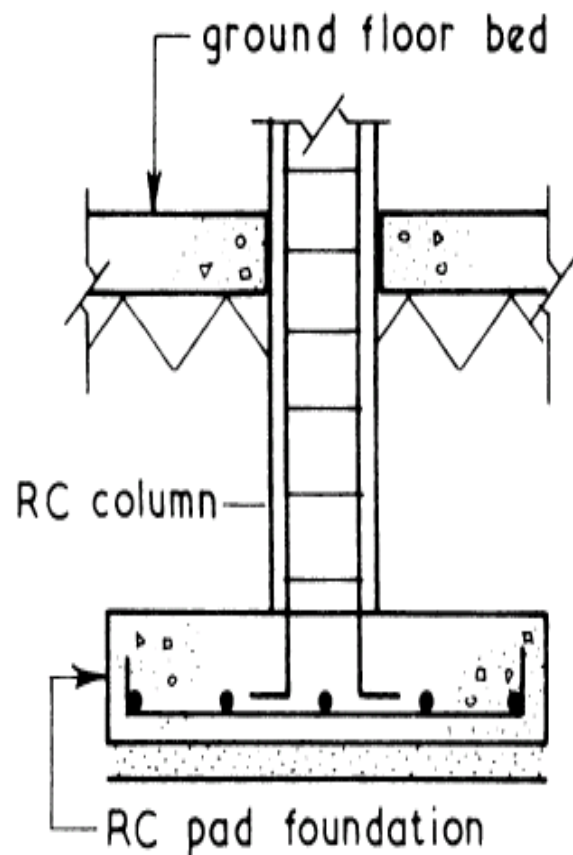
iv. **Surface treatment**

- ❑ Before laying concrete the formwork should be cleaned of all rubbish particles.
- ❑ All surface of timber shuttering that are to come in contact with concrete should be well wetted with water.
- ❑ All surface of shuttering should be given a good

CONSTRUCTION OF FORMWORK

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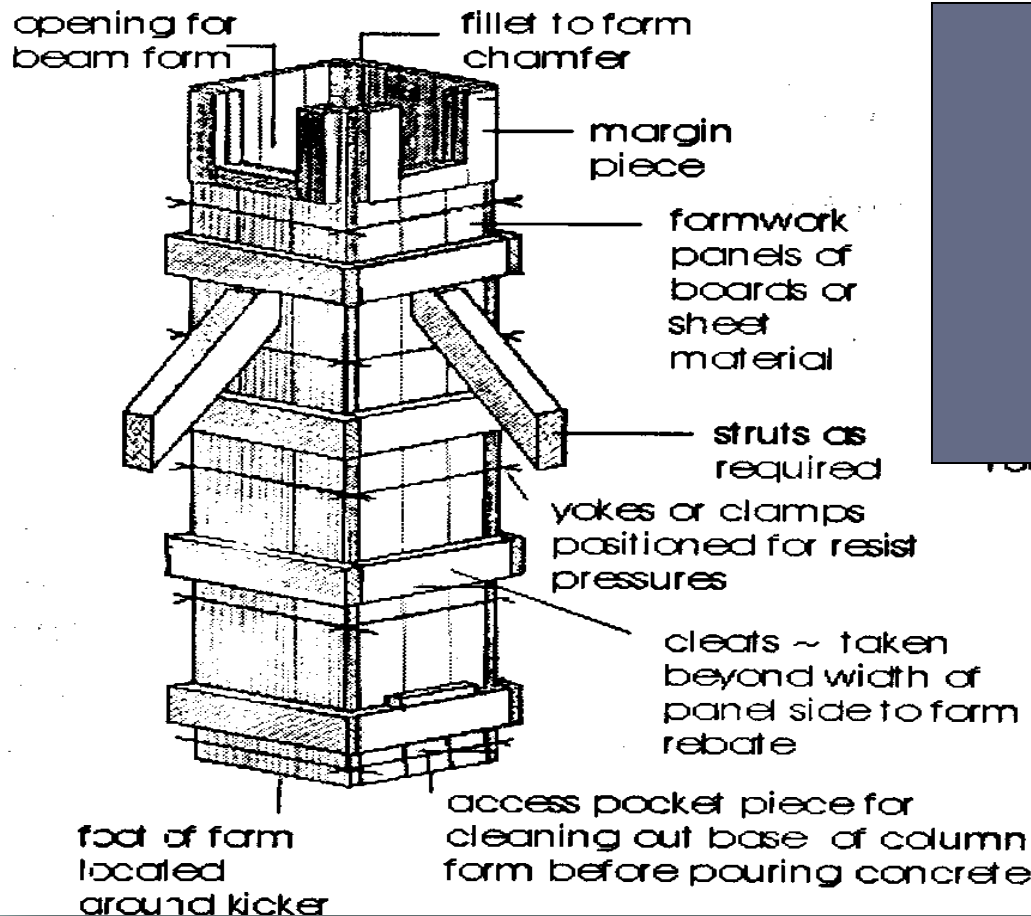
Formwork for foundation



CONSTRUCTION OF FORMWORK

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Formwork for column



CONSTRUCTION OF FORMWORK

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Formwork for beam and

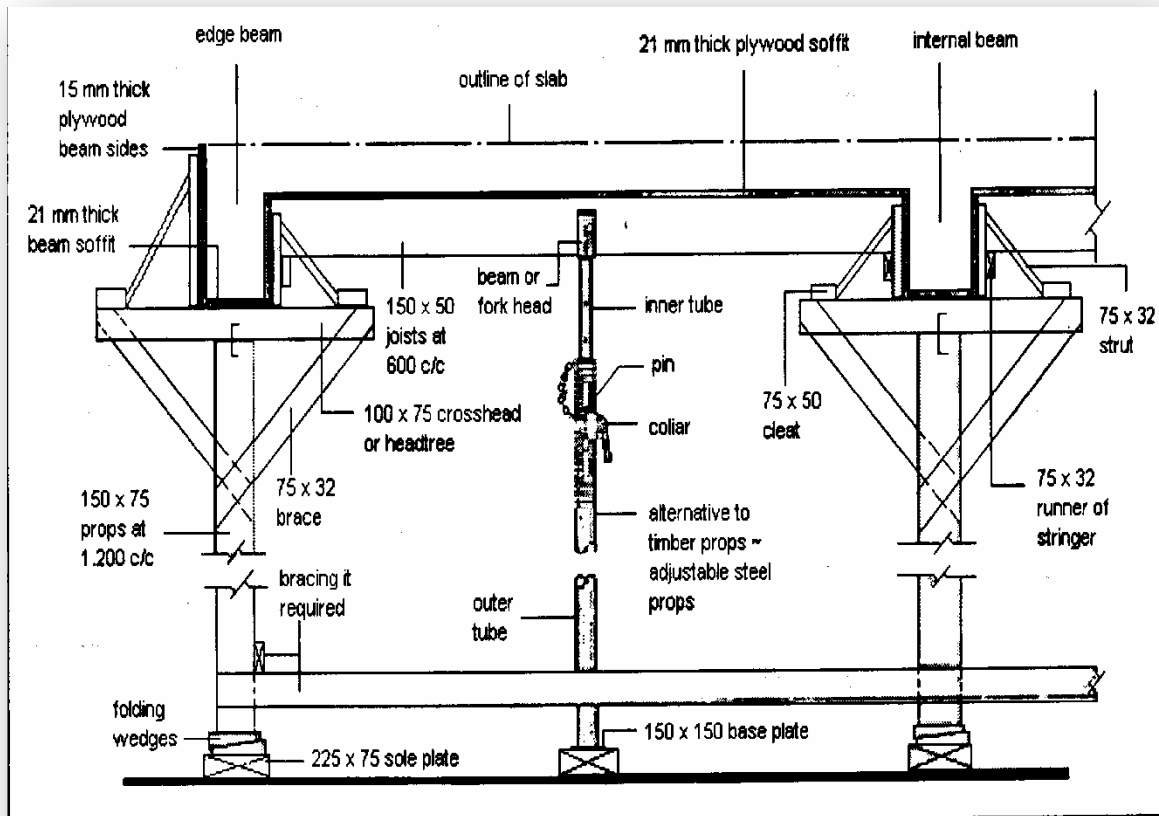


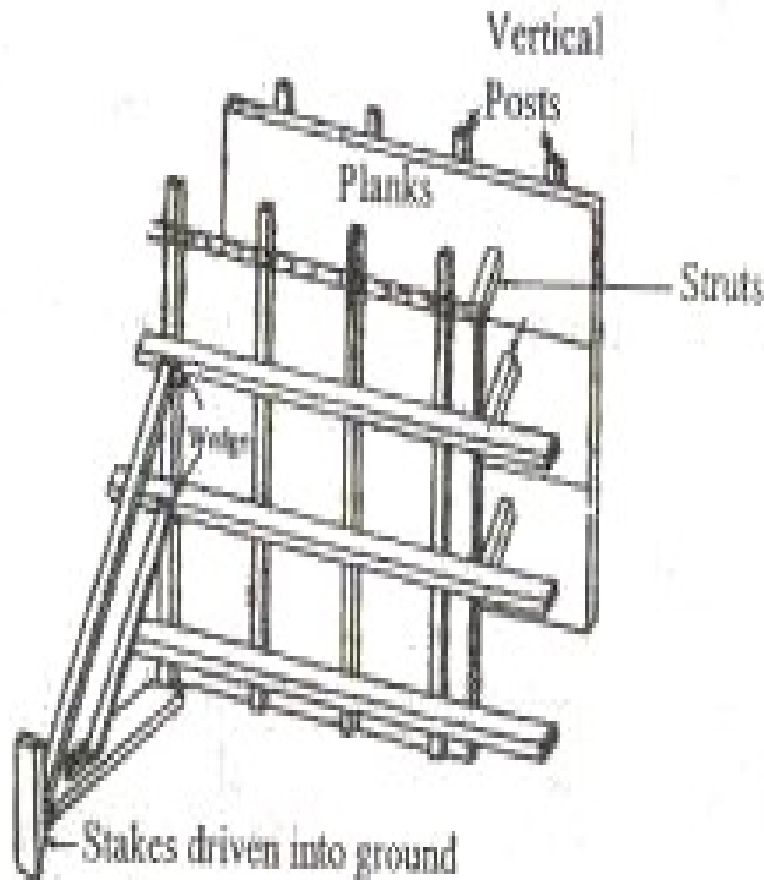
Figure 2.4: Typical beam and slab formwork



CONSTRUCTION OF FORMWORK

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Formwork for wall



Formwork for stair



FORMWORK STRIKING

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- ❑ Before formwork can be removed the concrete must have sufficient:
 - Strength to support itself
 - Surface hardness to resist damage
 - Curing.

FACTORS AFFECTING FORMWORK STRIKING

- Concrete used
- Weather and exposure of the site
- Any subsequent treatment to be given to the concrete
- The method of curing
- Standards of finish required
- Structural configuration e.g. simply supported or cantilever

FORMWORK STRIKING

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Duration for formwork removing

location	Surface or air temperature of concrete	
	16°C	17°C
Vertical f/work	12 hrs	18 hrs
Slab soffit (props left under)	4 days	6 days
Removal of props	10 days	15 days
Beam soffit (props left under)	10 days	15 days
Removal of props	14 days	21 days

FORMWORK STRIKING

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METHOD OF REMOVING FORMWORK

- Formwork should be planned and constructed in such a manner that it is possible to remove the different components in the following order of sequence:
 - i. Shuttering forming vertical faces of walls, of beams and columns sides, which bear no load but are used only to retain the concrete, should be removed first.
 - ii. Shuttering forming soffit of slabs should be removed next, and
 - iii. Shuttering forming soffit of beams, girders or other heavily loaded shuttering should be removed in the end.

RELEASING AGENT

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- ❑ Facilitate the striking or removal of the formwork.
- ❑ Prevent the concrete adhering to the form face.
- ❑ Most oils will fulfill the function of a release agent, but different oils can produce **blow holes** or **variations in the color** of concrete, affect **efflorescence**, or **retard the hardening** of the surface.



FAILURE OF FORMWORK

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- ❑ Failure may be collapse of entire formwork or part of it.
- ❑ Some of the reasons for the failure of formwork are given below:
 - a. Improper or inadequate shoring
 - b. Inadequate bracing of members
 - c. Lack of control of placement of concrete
 - d. Improper connection
 - e. Premature stripping of formwork
 - f. Improper design
 - g. Failure to follow codes and standards
 - h. Negligence of workers or supervisors

FAILURE OF FORMWORK

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- In order to **prevent** failure of formwork the following precautions should be taken:
 - i. The formwork should be designed properly
 - ii. Erection and stripping should be done only under engineering supervision
 - iii. The sequence of removal should be pre-designed and correctly executed.

