UNIT II

CONSTRUCTION PRACTICE - SUPER STRUCTURE

Topic 5 - Formwork, Shuttering, Centering, Staging, and Scaffolding

1. Formwork

- **Definition**: Temporary or permanent molds used to hold fresh concrete until it gains sufficient strength.
- **Purpose**: To shape and support concrete until it hardens and gains enough strength to support itself.

Types of Formwork:

1. **Timber Formwork**:
    - Made from wood and plywood.
    - Advantages: Easy to construct, lightweight, and adaptable.
    - Disadvantages: Short lifespan, can absorb moisture.
2. **Steel Formwork**:
    - Made from steel panels.
    - Advantages: Durable, reusable, provides a smooth finish.
    - Disadvantages: Heavier and more expensive than timber.
3. **Aluminum Formwork**:
    - Lighter than steel, easier to handle, and reusable.
4. **Plastic Formwork**:
    - Lightweight, reusable, and resistant to water and chemicals.
    - Typically used for smaller structures.
5. **Engineered Formwork**:
    - Modular formwork systems designed for quick assembly and reuse.

Components of Formwork:

- **Panels**: Provide the surface for the concrete.
- **Bearers/Supports**: Provide horizontal support to the panels.
- **Braces**: Diagonal supports to stabilize the formwork.
- **Ties**: Hold the formwork in position and maintain its shape.

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2. Shuttering

- **Definition**: A term often used interchangeably with formwork, specifically referring to vertical molds used to hold fresh concrete for walls, columns, and beams.
- **Purpose**: Shuttering is primarily focused on supporting the vertical elements of a structure.

Materials Used in Shuttering:

- **Timber**: Commonly used in traditional construction.
- **Plywood**: Used for a smoother finish.
- **Steel**: Often used for its durability and precision.

Advantages of Shuttering:

- Provides a smooth surface finish.
- Can be reused depending on the material.
- Customizable to any shape or design.

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3. Centering

- **Definition**: Refers to the formwork used to support horizontal structural elements like slabs, beams, and arches.

- **Purpose**: To support fresh concrete for horizontal structures until it sets and can carry its own weight.

Components of Centering:

- **Props/Posts**: Vertical supports that hold the weight of the formwork and concrete.
- **Bearers**: Horizontal members that distribute the load across the posts.
- **Bracing**: Additional supports to ensure stability and strength.

Advantages of Centering:

- Ensures horizontal structures are well-supported during construction.
- Can be adjusted for varying heights.

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4. Staging

- **Definition**: Temporary framework that provides support for formwork, centering, and shuttering during the construction process, usually for tall structures.
- **Purpose**: To transfer the load of the formwork and fresh concrete to the ground, particularly in multi-story construction.

Components of Staging:

- **Vertical Supports (Standards)**: Provide vertical load transfer.
- **Horizontal Supports (Ledgers)**: Provide lateral stability and distribute loads horizontally.
- **Cross Bracing**: Ensures stability against swaying or lateral movement.

Types of Staging:

1. **Steel Staging**: Prefabricated steel frames that provide higher load-carrying capacity.

2. **Timber Staging**: Traditional form, typically used for smaller projects or in locations with lower construction costs.

Applications:

- Used for elevated work such as in the construction of bridges, high-rise buildings, and overpasses.

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5. Scaffolding

- **Definition**: Temporary structures erected outside a building to provide workers with access to work areas at heights.
- **Purpose**: To allow construction, repair, or maintenance work to be carried out safely at heights.

Types of Scaffolding:

1. **Single Scaffolding**:
    - Used for brick masonry work.
    - Consists of vertical standards, ledgers, and putlogs.
2. **Double Scaffolding**:
    - Used for stone masonry work, where it is difficult to support putlogs into the wall.
    - Two rows of standards are used.
3. **Cantilever Scaffolding**:
    - Supported by needles projecting from the structure, useful when the ground space is limited.
4. **Suspended Scaffolding**:
    - The working platform is suspended from roofs with chains or ropes. Ideal for painting, repair, or window cleaning.

5. **Trestle Scaffolding**:
    - Working platform supported on mobile tripods or ladders. Used for work inside rooms or lower height activities.
6. **Steel Scaffolding**:
    - Made from steel tubes, which are easy to assemble and disassemble. Suitable for high-rise construction.

Components of Scaffolding:

- **Standards**: Vertical supports carrying the entire weight.
- **Ledgers**: Horizontal supports connecting the standards.
- **Transoms**: Horizontal cross members placed at right angles to the ledgers.
- **Braces**: Provide diagonal support to increase the stability of the scaffold.
- **Platforms**: Provide the working surface for laborers.

Safety Measures:

- Ensure scaffolding is securely anchored to the building.
- Guard rails, toe boards, and safety nets must be provided.
- Regular inspections for stability and safety.

Summary of Differences

Term	Definition	Used For
Formwork	Molds that hold fresh concrete until it sets.	Walls, beams, slabs, columns
Shuttering	Vertical formwork used for walls and columns.	Vertical elements like walls and columns
Centering	Horizontal formwork used for slabs and beams.	Horizontal elements like slabs and arches
Staging	Temporary framework for supporting formwork and centering.	Multi-story construction and high-level work
Scaffolding	Temporary structure for workers to access heights safely.	Construction, repair, and maintenance work