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Main elements of buildings

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Abstract: Special structures, objects, decorative elements, and bridges for buildings without elevators or special buildings. These elements constitute the main architectural and structural parts of the building. Each element performs its specific function and collectively ensures the stability and functional capabilities of the building.

Keywords: Brick, wood, gypsum board, thermal insulation, mineral wool (low volcanic rock wool), polystyrene (yogurt material), extruded polystyrene, polyurethane insulation, welding (welded fabric).

Introduction: Foundation: The foundation is the primary structure of a building or structure that ensures its stability and is installed on the ground. The foundation distributes the weight of the building to the ground and ensures its balance in the form of a sail.

Building structure: The main structures used to ensure the correct shape and stability of a building:

Structural components (columns, areas, ropes, fasteners, ceilings).

Elements that support right angles and heights (e.g., columns, walls, partitions).

Walls: Elements that separate the exterior and interior parts of the building, often made of materials such as brick or concrete. Walls define the architectural shape of the building.

Roof: The upper part of the building, which protects it from rain, snow, and other weather conditions. The material, design, and structure of the roof play an essential role in ensuring the long-term stability of the building.

Covering and insulation materials: Insulation materials used to provide heating, cooling, and energy efficiency (e.g., mineral wool, polystyrene, etc.).

Windows and doors: Elements that connect the

building's interior and exterior spaces, facilitating air exchange and ensuring security.

Communications: Essential infrastructure elements in a building, such as water supply, electricity, sewage, heating, and ventilation systems.

Other additional elements: Special structures, objects, decorative elements, and bridges for buildings without elevators or special buildings. These elements constitute the main architectural and structural parts of the building. Each element performs its specific function and collectively ensures the stability and functional capabilities of the building.

Foundation (fundament): The foundation is the main structure of the building that distributes its entire weight to the ground and ensures its stability. The foundation is usually much stronger and deeper than the upper parts of the building, as it withstands various ground conditions.

The main functions of the foundation are as follows:

Weight distribution: The foundation evenly distributes the load from the upper parts of the building, including its own weight, furniture, people, equipment, and other loads, to the ground. This helps transfer the forces exerted by the walls and columns of the building to the ground.

Ensuring stability: The foundation strengthens the building's connection with the ground, keeping it stable against strong winds, earthquakes, floods, or other external forces.

Adaptation to ground conditions: A specific type of foundation is chosen based on the unique ground conditions during construction. For example, special foundation types may be required for soft soil, concrete, or sand-mixed ground.

Foundation Types and Construction Structures

Slab Foundation: This type of foundation covers the entire area of the building and distributes its weight evenly. It is commonly used in areas with light or uneven soil.

Column Foundation: This foundation consists of columns that are installed at the lower part of each structural support. It is mainly suitable for heavy buildings, as it helps to reach stable soil layers.

Strip Foundation: In this method, the foundation consists of long, continuous strips of concrete or other materials placed between columns. It is widely used in large-scale constructions.

Rock or Basement Foundation: This type of foundation is built directly on rock or solid soil layers, ensuring permanent stability.

The design and construction of foundations vary depending on the building’s function, geological and hydrogeological conditions of the site, and the load-bearing characteristics of the upper structure. Ensuring long-term durability and safety in foundation construction is of utmost importance.

A construction structure is the set of fundamental elements designed to provide the shape, stability, and safety of a building. It includes all external and internal parts of the building, each serving a specific function to ensure overall structural integrity.

Columns: Columns are the primary vertical load-bearing elements of a building. They transfer the forces from the upper structure to the foundation. They can be made of concrete, steel, brick, or reinforced concrete.

Walls and Bricks: Walls separate the interior and exterior spaces of a building. Constructed from bricks, concrete, blocks, or other materials, they define the building’s appearance and structural stability. Walls also support vertical loads, including columns and ceilings.

Ceilings (Floors): Ceilings form the upper part of the building and distribute loads to the walls and columns. They are typically made from concrete, reinforced concrete, or wood and help protect the interior space from external weather conditions.

Wood or Steel Structures: Some buildings use steel or wood as structural components. Steel structures are common in high-rise and industrial buildings, while wood is more commonly used in small and medium-sized buildings.

Enclosed Systems: The building’s walls, windows, and doors create an enclosed space, providing insulation and air circulation control.

Balconies and Platforms: Balconies are external extensions of a building, often designed to enhance the view and create additional functional spaces. They are typically constructed from concrete or steel.

Glass and Window Systems: Glass and window systems contribute to the exterior appearance and allow natural light to enter the interior space, enhancing aesthetics and providing thermal and noise control.

Traditional and Modern Technologies: In addition to conventional materials, modern construction technologies such as modular structures, prefabricated elements, and high-tech systems enable faster and more efficient building processes.

Functions of Construction Structures:

Load Distribution: The construction structure ensures the proper distribution of all loads and transfers them to the ground, maintaining the building’s stability and safety.

Stability and Durability: It provides resistance to vertical

and horizontal forces, ensuring the building's structural integrity against stress and vibrations.

Economic Efficiency: Construction structures incorporate efficient materials and technologies to reduce overall costs, ensuring rapid construction and energy efficiency.

Environmental Considerations: Using eco-friendly materials and sustainable technologies in construction enhances long-term energy efficiency and minimizes environmental impact.

A well-designed construction structure consists of various elements that contribute to the building's safety, comfort, and long-term functionality.

Walls are one of the essential structural elements that separate and protect the internal and external parts of a building. They ensure the building's durability, safety, and insulation by distributing vertical loads, such as the building's weight and other forces, to the foundation or other supporting structures.

Separating Internal and External Spaces: Walls divide the building's interior and exterior areas, creating rooms, corridors, and other sections.

Protection: They shield the building from external factors such as weather conditions (rain, cold, heat) and also provide noise and pollution insulation.

Load Distribution: Walls distribute the vertical loads of the building (such as the building's own weight, columns, and ceilings) and transfer them to the foundation or other structures.

Insulation: Walls can be equipped with insulation materials to enhance thermal and sound protection, improving energy efficiency and comfort.

Exterior Walls: Designed to protect and insulate the building's outer structure, these walls define the building's appearance and serve as a barrier against environmental elements. They are typically made of high-strength materials such as concrete, brick, reinforced concrete, or stone.

Interior Walls: These walls divide the building's interior space into rooms. They are usually made from lighter materials such as brick, drywall, or blocks. Interior walls differ from exterior walls as they carry less structural load.

Load-Bearing Walls: These walls support the building's weight and transfer it to the foundation. They are often made of concrete, reinforced concrete, or brick and require high durability.

Partition Walls: Used to create separate sections within the interior space, partition walls are usually lightweight and movable. They are often made of drywall or panel materials.

High Walls: High walls provide vertical support for multi-story buildings and require strong materials such as concrete or reinforced concrete.

Glass Walls: These walls improve the building's aesthetic appeal and allow natural light to enter the interior space. Glass walls are commonly used in office buildings, shopping centers, and modern architectural designs.

Brick: A widely used building material known for its high durability and resistance to various climatic conditions. Brick walls provide excellent insulation and long-term stability.

Concrete and Reinforced Concrete: These materials offer high strength and stability, making them suitable for large and multi-story buildings. Reinforced concrete walls can support heavy loads and are commonly used in structural construction.

Wood: Used mainly in small-sized buildings, wooden walls are lightweight and easy to construct, but they provide lower strength and insulation compared to concrete or brick walls.

Drywall (Gypsum Board): Typically used for interior walls, drywall is quick to install, cost-effective, and easy to modify.

Concrete Blocks: These blocks are used to build strong walls, often in large structures, providing high reliability.

Types of Wall Insulation:

1. Thermal Insulation: Helps maintain stable indoor temperatures by preventing heat loss in winter and reducing cooling costs in summer. Common materials include:

Mineral Wool: Offers excellent thermal retention, fire resistance, and long-term durability.

Polystyrene: A lightweight, highly effective insulation material that is easy to install.

Extruded Polystyrene (XPS): Provides high thermal insulation and works well in high-moisture conditions.

Polyurethane Insulation: Highly effective in retaining heat and is used in wall cavities or as a membrane layer.

Cork: A natural, eco-friendly insulation material used in sustainable construction.

2. Sound Insulation: Helps reduce noise transmission, which is especially important in multi-story or office buildings.

3. Moisture Protection: Special insulation materials such as liquid coatings or waterproofing layers protect walls from water damage and humidity.

Walls play a critical role in ensuring a building's structural stability, energy efficiency, and interior comfort. The choice of materials and construction

technologies depends on the building's function and location.

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