

## TYPES OF CONSTRUCTION MATERIALS

Abdullayev I. A.

Senior Lecturer of the Department of Civil Engineering and  
Architecture, Andijan State Technical Institute

### Abstract

Construction materials are natural and artificial substances used in the construction and repair of buildings and structures. The purpose of a building and the conditions under which it is used determine the diverse requirements for construction materials and their wide variety. This article explores the different types of construction materials and approaches to improving their quality.

**Keywords:** Construction materials, material categories, production methods, composites, industrial waste.

### Introduction

Construction materials are classified according to their intended purpose into two main categories: general-purpose materials, which are used in the construction of various structures (cement, sand, lime, concrete, steel, timber, etc.), and specialized materials, designed for specific functions such as acoustic insulation, thermal insulation, and fire resistance.

Traditional classification based on the degree of preparation includes:

- **Building materials:** such as binding materials, aggregates, and wood.
- **Construction units:** prefabricated components assembled on-site, including reinforced concrete panels, sanitary cabins, and door and window blocks.

The technological and operational properties further divide construction materials into several major groups.

### Methods (Material Classification and Properties)

1. **Natural stone materials:** Mechanically processed rock types, including facing slabs, wall stones, crushed stone, gravel, and quarry stone.
2. **Wood materials and products:** Derived primarily from mechanical processing of timber, including round logs, sawn timber, blanks, parquet, plywood, and laminated constructions.

3. **Ceramic materials and products:** Produced by molding, drying, and firing clay-based raw materials. Their high strength and durability make them suitable for walls (bricks, ceramic blocks), roofing (tiles), sanitary ware (washbasins, toilets), and interior and exterior finishing (ceramic tiles).
4. **Glass:** Primarily used for transparent barriers. Standard sheet glass is supplemented by specialized types (reinforced, tempered, heat-insulating) and products such as glass blocks, profiled glass, and glass-coated panels. Technologically, glass materials include cast stone, glass-ceramics, and slag-ceramics.
5. **Inorganic binders:** Powdered materials such as cement, gypsum, and lime, which form a plastic paste when mixed with water and subsequently harden into a stone-like state.
6. **Concrete and mixtures:** Artificial stone materials obtained by mixing binders, water, aggregates, and additives, with wide-ranging physical, mechanical, and chemical properties. Types include cement concrete, silicate concrete, lightweight concrete, cellular concrete, and reinforced concrete. Concrete can be used directly on construction sites (monolithic concrete) or in factories for prefabricated products (reinforced concrete units). This category also includes asbestos-cement products and constructions reinforced with asbestos fibers.
7. **Organic binders:** Bitumens and resins used to produce waterproofing and sealing materials such as asphalt concrete, roofing felt, mastics, and elastic sealants.
8. **Polymer construction materials:** Materials derived from synthetic polymers with high mechanical and decorative properties, water and chemical resistance, and recyclability. Applications include flooring (linoleum, PVC tiles), structural and decorative elements (laminates, fiber-reinforced plastics), thermal and sound insulation (foamed plastics, honeycomb panels), and molded products.
9. **Thermal insulation materials:** Used to insulate building facades, structures, industrial equipment, and pipelines. These include mineral wool, cellular concrete, asbestos-free materials, foamed glass, expanded perlite and vermiculite, fiberboards, reeds, and other fibrous boards. Using insulation in enclosing structures reduces building weight, lowers material consumption,

and decreases energy costs while maintaining required thermal conditions. Some insulation materials also serve as acoustic insulation.

10. **Acoustic materials:** Designed to absorb and insulate sound, including mineral wool, fiberboards, and porous rubber.
11. **Paints and coatings:** Decorative and protective finishes applied to surfaces.
12. **Metals:** Rolled steel is widely used in construction, reinforcing concrete, building frames, bridge superstructures, pipelines, heating systems, and roofing materials.

### **Results (Material Quality and Performance)**

The quality of construction materials is evaluated based on their type and primary performance indicators, such as strength, density, fire resistance, and cold resistance, or combinations of these properties.

Improving construction efficiency is associated with:

1. Expanding the use of new, lightweight materials (lightweight concrete, polymers, metal alloys).
2. Increasing production of specialized materials (rapid-hardening cement, effective insulation and finishing materials).
3. Enhancing the quality of traditional materials.
4. Greater use of locally sourced construction materials.
5. Recycling industrial waste (metallurgical slags, power plant ash, wood-processing residues).

### **Discussion**

The diversity of construction materials reflects the complexity of modern building requirements. Material selection directly impacts the structural performance, energy efficiency, durability, and sustainability of buildings. Incorporating innovative, lightweight, and recyclable materials not only reduces construction costs but also supports environmental conservation. Advances in binder technologies, polymer composites, and insulation materials offer promising directions for future construction projects, emphasizing safety, comfort, and sustainability.



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