TYPES OF MATERIALS USED IN CONSTRUCTION

9.1. Vocabulary

Ex. 1. *Match the words to their Russian equivalents.*

1. miscellaneous	a. проволочная (арматурная) сетка
2. compression	b. добавка; примесь
3. bitumen	c. состав
4. coarse aggregate 	d. разный, прочий
5. admixture	e. крупный заполнитель
6. tension	f. сжатие
7. mortar	g. мелкий заполнитель
8. fine aggregate	h. растяжение
9. composition	i. битум
10. pavement	j. тротуар
11. wire mesh	k. строительный раствор

Ex. 2. *Complete the sentences with the following words:*

mesh, admixture, tension, fine, bitumen, compression, coarse, wire, composition, mortar, miscellaneous, pavement

Adding _____(1) to the cement mix improves its properties.

_____(2) is commonly used in road construction as a binding agent.

_____(3) aggregate consists of large stones and rocks.

_____(4) forces can cause a structure to collapse if not accounted for properly.

_____(5) materials, such as nails and screws, were included in the kit.

Mixing _____(6) is an important step in building walls.

_____(7) forces can cause a rope to snap under too much weight.

The _____(8) of this material includes water, sand, and gravel.

The concrete slab is reinforced with _____(9) _____(10) for added strength.

The _____(11) outside my house needs repair.

The sand used for this construction is _____(12) aggregate.

9.2. Reading

Ex. 1. *Read the text.*

Types Of Building Materials Used In Construction

1. Concrete:

Concrete is the most important and widely used building material. It is made of cement, fine and coarse aggregates, and water of suitable proportions. Chemical admixtures are also optionally used to accelerate or slow down the setting process of concrete.

The properties of concrete depend upon the quantity and mix ratio of concrete ingredients. The use of concrete has become predominant in construction where strength and durability are prime factors.

Nowadays, most residential, commercial, and industrial buildings are constructed of concrete. Different types of concrete are used in construction such as plain cement concrete, reinforced cement concrete, prestressed concrete, etc.

Uses:

Concrete is suitably used in the construction of buildings, bridges, dams, towers, roads, etc.

2. Cement:

Cement is a binding agent for construction materials. Cement is produced by burning at high temperatures in a definite mixture of calcareous, siliceous, and aluminous raw materials and crushing the resulting clinkers to a fine powder.

Cement is the most costly ingredient in concrete and is available in a variety of forms. When cement is mixed with water, a chemical reaction starts, and the powder transforms into a paste that binds all the materials with it.

The properties of cement depend on the chemical composition, manufacturing process, and degree of fineness. There are almost 16 types of cement used in construction, depending upon the type of structure. The most common types of cement used are Ordinary Portland cement (OPC) and Portland Pozzolana Cement (PPC).

Uses:

Cement is used in concrete for the construction of buildings, bridges, plastering work, dams, railway, roads, etc.

3. Fine aggregate:

Fine aggregates are the filler materials in concrete obtained from natural rocks and crushed gravels. The size of the fine aggregates is limited to 4.75 mm and below.

The fine aggregates are usually inert materials that do not react with the other components of concrete. However, the silica content in the fine aggregates should be monitored to prevent the alkali-aggregate reaction which may form unwanted cracks in the structure.

The most commonly used fine aggregate was river sand, which is now being replaced by Manufactured sand, known as M sand. The M sand is obtained by crushing the granite stone.

4. Coarse Aggregate:

Coarse aggregates are another type of filler material of a size greater than 4.75 mm. The coarse aggregates are available in various sizes from 4.5 mm to 150 mm, where 20 mm is the most commonly used size. The coarse aggregates are widely used in the production of concrete and in the construction of flexible pavements (Bitumen and asphalt pavements).

The most commonly used coarse aggregates are crushed stones from quarries and gravels. However, as the world moves towards

sustainability, the old concrete obtained from demolished buildings is also being used as aggregates.

5. Admixture:

Admixture is an optional component of concrete that is added to modify certain properties of the concrete to improve its performance. The volume of admixtures added to the concrete mix depends upon the need and varies from site to site. The admixtures are of two types namely – Mineral admixtures and chemical admixtures.

Mineral admixtures are solid admixtures that can replace the cement in a concrete mix. The most common mineral admixtures are fly ash, Ground granulated Blast furnace slag (GGBS), silica fume, rice husk ash, and metakaolin.

Chemical admixtures are liquid admixtures that are added to the concrete mix to modify the property of the concrete.

6. Mortar:

Mortar is one of the oldest construction materials made using binders and fine aggregates. The most common type of binder used in mortar is cement. However, lime can also be used as a binder. The mortar used in the brick masonry should always be weaker than the bricks. This is to ensure that the failure occurs in the mortar which can be easily repaired rather than the bricks.

Uses:

They are used in masonry works, plastering, repair, and patching work.

7. Steel:

There are three types of steel used in construction.

i) Rebar steel.

ii) Structural steel.

iii) Chicken wire mesh.

a. Rebar Steel:

Rebar steel, commonly known as steel reinforcement, is a vital component of modern construction. Concrete is strong in compression but weak in tension. Steel is used in order to resist the tension that acts on the member due to bending or lateral loads.

Of all metals, steel is the most suitable reinforcement material because of the near same thermal coefficient of expansion. The thermal coefficient of concrete is 14.5 /°C, and that of steel is 12 /°C. Due to this property of the steel, it is more compatible with concrete than other metals.

The most commonly used rebars are deformed steel bars, Thermo Mechanically Treated bars (TMT bars), and High Yield Strength Deformed bars (HYSD) bars. These bars are circular in cross-section and have ribs protruding on the surface, improving the bonding between the concrete and steel.

b. Structural Steel:

Structural steel is an alloy of iron made using carbon and manganese. It is the building block of steel structures like trusses, steel buildings, bridges, etc. The structural steel is pre-fabricated at factories and can be easily erected at the site making the construction process faster.

Using steel for construction also reduces the dead weight of the structure. Unlike rebars, structural steel is not circular in shape. It is available in I, H, C, T, L, S, W, pipe and box sections.

c. Chicken Wire Mesh:

Chicken wire mesh is used in the construction of Ferro concrete. Ferroconcrete, also called Ferrocement is a type of reinforced concrete structure made up of cement, fine aggregates, hexagonal or square chicken wire mesh, and water.

First, a tightly packed wire mesh is installed over which a rich cement mortar mix of ratios 1:2 or 1:3 is applied to both sides of the wire mesh. The diameter of the holes in the wire mesh is restricted to 1 mm.

It is mostly used in repair works, slabs, manhole covers, etc.

8. Bricks:

Bricks are rectangular blocks usually made from clay or mud and hardened by heating or chemical process. Bricks are set with mortar which acts as an adhesive to hold them in place and withstand the loads acting on them.

Nowadays, bricks are also available in different varieties made from concrete, fly ash, lime, calcium silicate, ceramics, etc. Out of them, concrete bricks are gaining popularity in modern construction.

Uses:

Bricks are used in masonry walls, paths, driveways, fireplaces, etc.

9. Stone:

Stone is also one of the oldest types of building materials used since ancient times. Stone masonry is made using natural stones and mortar. The most common types of stones are sandstone, granite, marble, limestone, and laterite. Stone masonry is mostly followed in areas that have locally available stones.

Stone masonry gives a superior appearance to the building and is mostly not plastered to manifest the beauty of the stones. The major drawback is that naturally occurring stones are of different sizes and shapes which may be difficult to use in masonry construction.

Uses:

Stone is used for building foundations, floors, retaining walls, arches, walls and columns.

10. Timber:

Timber is one of the oldest type of building materials whose use is now limited to making doors, windows, closets, cabinets, shelves, concert halls, wooden sleepers and interior decoration. The most commonly used timber from oak, ash, poplar, pine, fir, cypress, walnut, redwood or even plywood. Timber improves the beauty of the building.

Uses:

Timber structure, floors, walls, roofing frames, door, windows, furniture, interior decoration, etc.

11. Bamboo:

Bamboo is amongst the oldest and traditional construction materials used since ancient times. Bamboo is recognized as wood but technically it is a species of grass. With the improvement of technology, the use of bamboo in modern construction has been reduced.

Uses:

Bamboo structures, bamboo houses.

Bamboo roofing,

Bamboo wall.

Bamboo in foundation (There are limitations).

Bamboo as an alternative to steel reinforcement.

12. Glass:

Glass is widely used in modern buildings not only because of its architectural appeal but also because of its ability to allow sunlight, recyclable value, and insulation properties. Glasses are available in various forms. The most commonly used glasses are plain – transparent and tinted glasses.

Uses:

Glasses are used in making doors, windows, floors, non-load bearing walls, skylights, and translucent bricks. and improving the appearance of the façade of the building.

13. Tiles:

Tiles are factory manufactured plates of minimum thickness that can be used to cover the surface of walls, floors, ceilings, parking, walkways, etc., They are made using ceramics, porcelain, and even recycled plastic.

The most alluring properties of the tiles are that they come in various colors, and various surface finishes – matte, glossy, normal, glazed and they can be customized to any shape. Tiles can be arranged to form interesting patterns that are otherwise not possible in conventional flooring materials.

Some of the conventional flooring materials are timber, marbles, granites, and mosaics. They are not only costly but also don’t provide a wide set of options. Tiles can be used on the floor and also on the walls which is difficult to implement in conventional materials.

Uses:

Tiles can be used in the following areas:

Flooring: They provide an elegant finish to the interiors of the building.

ii) Bathroom: They provide sufficient damp proofing to the bathroom when used as wall tiles and floor tiles

Kitchen, Parking, Walkways, Terrace.

Read – How To Calculate Number Of Tiles Required In A Room

14. Foam:

Foam is an artificial type of building material made of synthetic chemicals made of polyurethane and used as a packing material to improve the thermal insulation properties of a building. They can also be sprayed to inhibit the filtration of air and water into a surface. They are mostly used in exterior walls, attics, basements, and crawl spaces.

15. Bitumen:

Bitumen is a non-crystalline viscous material obtained from petroleum. It is used in the construction of flexible pavements in both roads and airfield pavements.

Uses:

This type of building material is used in Roofing, Road construction.

16. Fibres:

Fibres are some unconventional types of building materials used in construction. Various types of fibres like steel fibres, Polypropylene fibres, glass fibres, asbestos fibres, carbon fibres and organic fibres are widely used to reduce permeability, bleeding and the formation of minor cracks. Fibres can be added to the concrete to improve flexural rigidity, durability and thermal resistance.

Uses:

These types of building materials are used in Dams, spillways, basins, Pavements in airports and highways, Bridge decks, Thin shelled structures, Foundation, In refractories, Industrial floors, and Machine foundations.

Miscellaneous Types:

There are some other types of building materials used in construction are as follows:

Earth: Earth or mud can be used to build small unimportant and temporary structures.

Ice: Ice is the building block of igloos.

Straws – Thatch: Thatched roofs are still common in tropical regions of the world.

Fabric: Fabric is used in the construction of temporary tents.

Paver block: Paver blocks are used in gardens, parking, and in the construction of sidewalks. The most recent trend in the paver blocks is manufacturing them using waste plastic materials.

Ex. 2. *Choose the correct answer.*

1. What is the most important and widely used building material?

a) Cement

b) Fine aggregate

c) Coarse aggregate

d) Concrete

2. What are the properties of concrete dependent on?

a) The quantity and mix ratio of concrete ingredients

b) The size of the fine aggregates

c) The type of binder used in mortar

d) The chemical composition of cement

3. What is the most commonly used fine aggregate?

a) Crushed stones from quarries

b) Gravels

c) River sand

d) M sand

4. What is the most commonly used size of coarse aggregate?

a) 4.5 mm

b) 20 mm

c) 150 mm

d) 4.75 mm

5. What is an admixture?

a) A type of coarse aggregate

b) A type of fine aggregate

c) An optional component of concrete that modifies certain properties of the concrete

d) A type of steel reinforcement

6. What is the most common type of binder used in mortar?

a) Cement

b) Lime

c) Silica fume

d) Rice husk ash

7. What is the purpose of using steel reinforcement in concrete?

a) To resist the compression that acts on the member due to bending or lateral loads

b) To resist the tension that acts on the member due to bending or lateral loads

c) To improve the bonding between the concrete and steel

d) To reduce the dead weight of the structure

8. What are the most commonly used rebars?

a) Chicken wire mesh

b) Deformed steel bars, Thermo Mechanically Treated bars (TMT bars), and High Yield Strength Deformed bars (HYSD) bars

c) Structural steel

d) I, H, C, T, L, S, W, pipe and box sections

9. What is Ferroconcrete?

a) A type of reinforced concrete structure made up of cement, fine aggregates, hexagonal or square chicken wire mesh, and water

b) A type of cement

c) A type of steel reinforcement

d) A type of coarse aggregate

10. Where is chicken wire mesh mostly used?

a) In the construction of buildings

b) In the production of concrete

c) In repair works, slabs, manhole covers, etc.

d) In the construction of flexible pavements (Bitumen and asphalt pavements)

Ex. 3. *Answer the questions.*

1. What are bricks made of, and how are they set in place?

2. What are some other materials besides clay that can be used to make bricks?

3. What is stone masonry, and what types of stones are commonly used in it?

4. Why might natural stones be difficult to use in masonry construction?

5. What are some common uses for timber in modern construction?

6. How is bamboo traditionally used in construction, and what are some potential limitations to its use?

7. What are some reasons why glass is a popular material in modern buildings?

8. What are some different types of tiles, and where can they be used in a building?

9. What is foam, and how is it used in construction?

10. What is bitumen, and where is it commonly used in construction?

11. What are fibres, and how can they improve the properties of concrete?

12. What are some other unconventional building materials that have been used in construction?