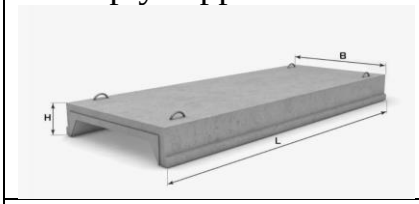
TYPES OF SLABS USED IN CONSTRUCTION

10.1. Vocabulary

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

1. prestressed	a. консольная плита
2. continuous slab	b. сборный; изготовленный заводским способом
3. hardy	c. софит; нижняя поверхность (свода, потолка)
4. deflection	d. сеточная система
5. soffit	e. неразрезная плита
6. simply supported slab 	f. плита, свободно опёртая по двум сторонам
7. stiffness	g. заранее
8. prefabricated	h. выносливый
9. cantilever slab	i. плита с опорами
10. grid-like system	j. прогиб
11. slab	k. жесткость элемента конструкции из бетонной смеси
12. beforehand	l. предварительно напряженный

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

prestressed, hardy, prefabricated, slab, grid-like, soffit, deflection, stiffness, beforehand

He prepared for the exam _____(1).

The _____(2) in the beam caused it to sag.

The _____(3) system made it easy to install.

The _____(4) construction was able to withstand harsh weather conditions.

The _____(5) walls were assembled quickly on site.

The bridge was built using _____(6) concrete.

The simply supported slab was used for the ground floor.

The _____(7) of concrete was poured in sections.

The _____(8) of the roof was painted white.

The _____(9) of the steel beam provided strong support.

10.2. Reading

Ex. 1. *Read the text.*

Types Of Slabs

1. Conventional Slab

The slab which is supported by beams and columns, is called conventional slab. In conventional slab the thickness of the slab is small but depth of the beam is large. The load is transmitted from slab to beam and then from beam to column.

These types of slabs are provided with reinforcement where the horizontal bar is called main reinforcement and vertical bar is called distribution bar. Conventional slabs are two types.

One way slab

Two way slab.

a. One Way Slab

One way slab is a conventional horizontal slab rectangular in shape and supported by beams on two of its four sides. The slabs are supported on beams opposite to each other. Therefore, the deflected shape is cylindrical.

In one way slabs the longer span is more than twice of the shorter span. The ratio of longer span to the shorter span is greater than two. As a result, the shorter span is subjected to bending.

The main reinforcements are provided in the shorter directions to resist the bending and the secondary reinforcements are provided in the longer direction.

Application: Veranda slab.

b. Two Way Slab

Two-way slabs are also conventional slabs mostly rectangular in shape and supported on all four sides of a beam. In two-way slabs, the longer span is less than twice the shorter span. The ratio of longer span to shorter span is lesser than two. The deflected shape of the slab is like a dish or saucer shape.

In this case, both the shorter and longer directions are subjected to bending. Therefore, the main reinforcements would be provided in both directions based on the magnitude of bending. The two-way slabs are economical to a size of 6m x 6m. Also, the quantity of steel used in two-way slab is more than the one-way slab.

Application

Most apartments, multi-storeyed buildings.

3. Flat Plate

Unlike conventional slabs, in flat plates, the loads are not transferred from the slabs to the beams. In flat plates, the loads are transferred directly to the columns. The flat plate system may be one-way or two-way depending on the design plan.

Applications

Underground parking, multi-storey buildings

4. Flat Slab

Flat slabs are the modified version of flat plates with a column head and/or a drop panel cast monolithically with the slab. There are no beams present in the flat slabs but the drop panels and column heads will transfer the loads smoothly to the columns.

The drop panels are square or rectangular in shape and increase the shear capacity of the slab. The drop panels add deflection to the slab and thus minimize the deflections.

The column heads are provided below the drop panels and they are mostly sloping to meet the column dimensions. A flat slab may have either column head or drop panel or both.

The flat slabs are mostly popular in unconventional structures without column symmetry. The column heads and drop panels act as a special beam confined to that particular space. However, the formworks become complicated due to the need for column heads and drop panels.

Applications

These types of slabs are used in underground parking and unsymmetrical buildings.

5. Waffle Slabs Or Grid Slabs

Waffle slabs are lightweight slabs with hollow grid-like systems on their soffit. The hollow grid system reduces the self-weight of the slab without compromising its structural stability.

The grids are spaced at equal intervals and they transfer the load from above to the beams. The space between the ribs is sometimes treated as a beam and reinforced to increase the flexural rigidity of the slab.

Due to their lightweight, they can span long distances with ease. The waffle slabs may have a grid system or a girder system where the bands of beam run throughout the slabs. The grids can be or any shape – square, rectangular, triangular etc.

Application

These types of slabs are used in public buildings, museums, airports, etc.

6. Ribbed Slab

Ribbed slabs are very similar to waffle slabs but often mistaken for being the same. A ribbed slab has wide grids or bands of beams in the soffit of the beam whereas a waffle slab has deeper corresponding parts.

The ribbed slabs like waffle slabs are flexible, light in section, economical and can be constructed for longer spans. They have the same advantages and disadvantages as the waffle or grid slab.

Applications

Public buildings, museums, galleries.

7. Hollow Deck Slab

Hollow deck slabs are special types of prefabricated concrete slabs that use the fundamentals of the stress developed in a section for the design. The concrete takes care of the compression while the steel takes care of the tension. There is no specific use for the concrete in the tension zone other than to provide a solid section.

Taking this principle into account, the hollow deck slab does not provide concrete in the tension zone. It is provided with minimum concrete to hold the steel reinforcements in place. The hollow deck slab can be prestressed or non-prestressed.

Applications

Bridges, wall panels, multi-storey prefabricated buildings.

8. Bubble Deck Slab

Bubble deck slabs are hollow slabs where the concrete in the tension zone is replaced by recycled high-density polyethylene or HDPE plastic balls. Bubble deck slabs use the same principle as the hollow core slab. The concrete in the tension zone of a section has no structural importance.

The removal of that concrete will not affect the performance of the structure in resisting the loads acting on it. Bubble deck slabs can reduce the amount of concrete in a slab from 40% to 60%. This reduces the dead weight of the structure and also saves on costs.

Application

Bubble deck slabs are mostly used in public buildings, high rise buildings.

9. Hardy Slab

Hardy slabs are special types of slabs consisting of hardy bricks placed in a uniform fashion inside them. The hardy bricks are hollow blocks made

of concrete. The depth of the hardy bricks is usually at least 200 mm. Therefore, the depth of the slab is increased.

The formworks are placed over which the hardy bricks are placed in rows with space between them. This space between the hardy blocks is treated as small beams. Reinforcements are placed within these ribs and concrete is poured and the slab is cast monolithically. It is mostly used in regions of high temperature.

Applications

Hospitals, office buildings, residential buildings, and public buildings.

10. Dome Slab

Dome slabs are hemispherical in shape and are used mostly to enhance the view of a structure. In ancient times, most structures were built in such a way that only compressive forces act on the structure.

Before the invention of steel, there were no tensile materials known to man to resist tension. Therefore, the load was transferred through axial compression as in domes. In the modern era, the discovery of steel has led to thin sections of domes.

Applications

These concrete slabs are preferably used in monumental buildings, museums, meditation halls, galleries, and religious structures.

Ex. 2. *Choose the correct answer.*

1. What is a conventional slab?

a) A slab with no beams or columns

b) A slab supported by beams and columns

c) A slab supported only by columns

d) A slab with a curved shape

2. What are the two types of conventional slabs?

a) One way slab and two way slab

b) Flat plate and flat slab

c) Waffle slab and grid slab

d) Conventional slab and unconventional slab

3. What is the difference between a one way slab and a two way slab?

a) The shape of the slab

b) The type of reinforcement used

c) The ratio of longer span to shorter span

d) The amount of steel used

4. What is the application of a one way slab?

a) Multi-storeyed buildings

b) Underground parking

c) Veranda slab

d) Public buildings

5. What is the deflected shape of a one way slab?

a) Cylindrical

b) Dish or saucer shape

c) Curved

d) Rectangular

6. What is the difference between a flat plate and a conventional slab?

a) The shape of the slab

b) The way loads are transferred to the columns

c) The type of reinforcement used

d) The amount of steel used

7. What is the application of a flat plate?

a) Multi-storeyed buildings

b) Underground parking

c) Veranda slab

d) Public buildings

8. What is a flat slab?

a) A modified version of a flat plate with a column head and/or a drop panel

b) A slab with a hollow grid-like system on its soffit

c) A slab supported by beams and columns

d) A slab with no beams or columns

9. What is the application of a flat slab?

a) Multi-storeyed buildings

b) Underground parking

c) Unsymmetrical buildings

d) All of the above

10. What are waffle slabs?

a) Heavyweight slabs with no reinforcement

b) Lightweight slabs with hollow grid-like systems on their soffit

c) Slabs with a curved shape

d) Slabs supported by beams and columns

Ex. 3. *Answer the questions.*

1. What is a ribbed slab and how does it differ from a waffle slab?

2. What are the advantages and disadvantages of ribbed slabs?

3. What types of buildings are ribbed slabs commonly used in?

4. How do hollow deck slabs use steel and concrete to resist stress?

5. What is the difference between prestressed and non-prestressed hollow deck slabs?

6. What are some common applications for hollow deck slabs?

7. How do bubble deck slabs reduce the amount of concrete needed in a structure?

8. What types of buildings are bubble deck slabs commonly used in?

9. What are hardy slabs made of, and how are they constructed?

10. Why were dome slabs commonly used in ancient times, and what materials have allowed for thinner sections in modern times?