The background features a light blue sky with several falling leaves in shades of orange and yellow. On the left, a red brick barn with a yellow bell in its cupola sits on a green hill. A yellow school bus is driving on a winding road that curves across the landscape. The foreground is filled with stylized trees in various autumn colors (orange, yellow, brown) and several large pumpkins in shades of orange and yellow.

Technical English
Unit 16
professional english
Non-ferrous metals

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The slide features a light blue background with several stylized autumn leaves in shades of green, yellow, and orange scattered around the edges. At the bottom, there are rolling green hills. Two white rectangular boxes with thin brown borders are positioned in the upper and middle sections of the slide. The top box contains the word 'Contents' in red. The middle box contains two items: 'A. Concrete mix design' and 'B. Reinforced concrete', both in red.

Contents

A. Concrete mix design

B. Reinforced concrete

A. Concrete mix design



Cement



Sand – fine aggregate



Gravel – coarse aggregate

Cement is a key material in construction. It consists of a very fine powder. When water is added to cement, a chemical reaction occurs, and the cement begins to set - it starts to become solid. The most widely used **cement-based** material is concrete, which is made from cement, **fine aggregate** (sand), coarse aggregate (gravel) and water. After concrete has set, it needs time to reach its structural strength - the strength needed to perform effectively. Generally, engineers consider that this strength is reached after 28 days - a point called **28-day strength**.

A. Concrete mix design

Concrete **mix designs**, which are specified by engineers, state the proportions of cement, fine aggregate and coarse aggregate to be used for specific structures. For example, a **1:2:4** (**one-two-four**) mix consists of one **part** cement, two parts fine aggregate and four parts coarse aggregate. For mixing precise quantities- known as **batching**- proportions are measured by weight. Mix designs also specify the **water-cement ratio** - the amount of water added relative to the amount of cement used. Excess water reduces the strength of concrete, so the quantity of water is kept to a minimum. But as drier concrete is more difficult to work with, an **additive** (added chemical substance) called a **plasticizer** is often used. This helps the concrete to flow more easily. Other additives can also be used- for example, a **retarder** may be added to delay setting, which gives workers more time to **pour** (place) the concrete.

B. Reinforced concrete

Reinforced concrete (RC) structures contain steel bars. Steel reinforcement is needed mainly because concrete is weak in tension - that is, bad at resisting stretching forces. As steel is strong in tension, reinforcing bars overcome this weakness. In order to form the different parts of structures, formwork - sometimes also called shuttering - is used. This consists of moulds of the required size and shape, made from steel or timber, which are used to contain the concrete until it has set.



In-situ reinforced concrete being poured

B. Reinforced concrete

When wet concrete is cast (placed) in its final position, it is called **in-situ concrete**. Instead of being **cast in-situ**, reinforced concrete elements can also be **precast- cast** at a factory - then delivered to the construction site ready for assembly. Sometimes, **precast concrete** is also **prestressed**. With **prestressing**, tension is applied to the reinforcing bars, by machine, usually before the concrete is poured. The bars are then held in tension while wet concrete is poured around them. After the concrete has fully set, the bars become 'trapped' in tension. This increases the concrete's ability to resist bending forces.

16.1 Find words and expressions in A opposite to match the descriptions (1-10).

1 gravel used in concrete

2 sand used in concrete

3 powder that enables concrete to set

4 mixing concrete accurately

5 specification of concrete ingredients

6 effective structural capability of concrete

7 affects the wetness and strength of concrete

8 different types of chemical put in concrete

9 allows concrete to stay wet for longer

10 makes drier concrete easier to work with

1 coarse aggregate

2 fine aggregate

3 cement

4 batching

5 mix design

6 28-day strength

7 water-cement ratio

8 additives

9 retarder

10 plasticizer

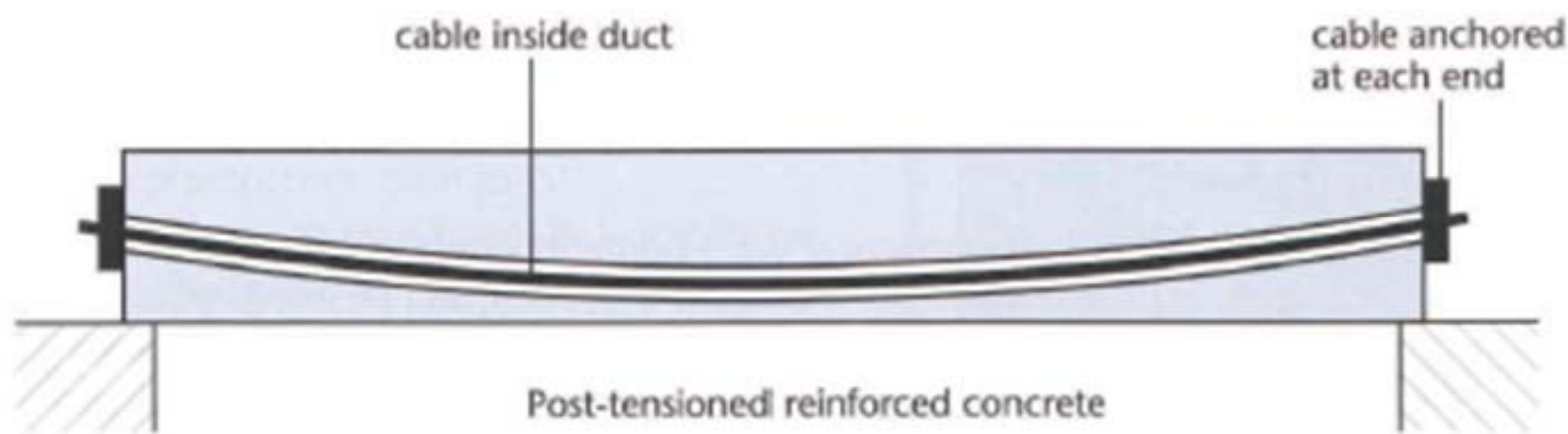
16.2 Complete the textbook extract about a type of prestressed concrete using the words in the box. Look at B opposite to help you.

cast	formwork	pourmg	prestressing	structural
concrete	in-situ	precast	reinforcement	

Prestressing techniques

In the production of reinforced concrete components, the process of (1) usually involves holding the (2) in tension while (3) the concrete. This form of prestressing is called pre-tensioning, as tension is applied *before* the concrete is poured. The technique is often used in the manufacture of floor components, which are small enough to fit on the back of a truck, and can therefore be (4) at a factory.

A less common prestressing technique is post-tensioning (applying tension *after* the concrete has set). This is more suitable for large elements, especially long beams, which cannot be transported, and therefore need to be poured (5) Before the concrete is poured, ducts (usually plastic tubes) are placed inside the (6) along the length of the beam. These ducts contain steel cables. After the concrete has been (7) and has gained sufficient (8) strength, the cables are put in tension, using jacks at either end of the beam. This is only possible because the cables are free to move within the ducts- it is not possible with pre-tensioned reinforcing bars, which are held fast by the hard (9) surrounding them. The ends of the cables are then permanently anchored at either end of the beam.



16.2

1 prestressing	4 precast	7 cast
2 reinforcement	5 in-situ	8 structural
3 pounng	6 formwork	9 concrete



I see you
got right

Any Questions