BE- 204 (Basic Civil Engineering and Engineering Mechanics)
Unit-I
Topic- Lime

It is an important binding material used in building construction. Lime has been used as the material of construction from ancient time. When it is mixed with sand it provides lime mortar and when mixed with sand and coarse aggregate, it forms lime concrete.

Types of Limes and their Properties

The limes are classified as fat lime, hydraulic lime and poor lime:

(i) Fat lime: It is composed of 95 percentage of calcium oxide. When water is added, it slakes vigorously and its volume increases to1 – 1/2 times. It is white in colour. Its properties are:
(a) Hardens slowly
(b) Has high degree of plasticity
(c) Sets slowly in the presence of air
(d) White in colour
(e) Slakes vigorously.

(ii) Hydraulic lime: It contains clay and ferrous oxide. Depending upon the percentage of clay present, the hydraulic lime is divided into the following three types:
(a)Feebly hydraulic lime (5 to 10% clay content)
(b)Moderately hydraulic lime (11 to 20% clay content)
(c)Eminently hydraulic lime (21 to 30% clay content)
The properties of hydraulic limes are:

- Sets under water.
- Colour is not perfectly white.
- Forms a thin paste with water and do not dissolve in water.
- Its binding property improves if its fine powder is mixed with sand and kept in the form of heap for a week, before using.

(iii) Poor lime: It contains more than 30% clay. Its colour is muddy. It has poor binding property. The mortar made with such lime is used for inferior works. IS 712-1973 classifies lime as class A, B, C, D and E.

Tests on Lime:-
The following practical tests are made on limestone or lime to determine their suitability:
(i)Physical tests
(ii)Heat test
(iii)Chemical test
(iv)Ball test.

(i) Physical Test: Pure limestone is white in colour. Hydraulic limestones are bluish grey, brown or are having dark colours. The hydraulic lime gives out earthy smell. They are having clayey taste. The presence of lump gives indication of quick lime and unburnt lime stones.

(ii) Heat Test: A piece of dry stone weighing $W1$ is heated in an open fire for few hours. If weight of sample after cooling is $W2$, the loss of weight is $W2 - W1$. The loss of weight indicates the amount of carbon dioxide. From this the amount of calcium carbonate in limestone can be worked out.

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(iii) Chemical Test: A teaspoon full of lime is placed in a test tube and dilute hydrochloric acid is poured in it. The content is stirred and the test tube is kept in the stand for 24 hours. Vigorous effervescence and less residue indicates pure limestone. If effervescence is less and residue is more it indicates impure limestone. If thick gel is formed and after test tube is held upside down it is possible to identify class of lime as indicated below:
Class A lime, if gel do not flow.
Class B lime, if gel tends to flow down.
Class C lime, if there is no gel formation.
(*iv*) Ball Test: This test is conducted to identify whether the lime belongs to class C or to class B. By adding sufficient water about 40 mm size lime balls are made and they are left undisturbed for six hours. Then the balls are placed in a basin of water. If within minutes slow expansion and slow disintegration starts it indicates class C lime. If there is little or no expansion, but only cracks appear it belongs to class B lime.

Uses of Lime

The following are the uses of lime in civil works:
(*i*) For white washing.
(*ii*) For making mortar for masonry works and plastering.
(*iii*) To produce lime sand bricks.
(*iv*) For soil stabilization.
(*v*) As a refractory material for lining open hearth furnaces.
(*vi*) For making cement.

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