

Save Environment with Green Construction

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Building green by proper design of concrete mixes in construction activities.

NEW CEMENT

Portland cement, is made by a calcareous material, such as limestone or chalk, and from alumina and silica is found as clay or shale. The process of manufacturing of cement consists essentially of grinding the raw materials, mixing them intimately in certain proportions and burning in a large rotary

kiln at a temperature of up to about 14500C. When the material sinters and partially fuses into balls known as clinker, the clinker is cooled and ground to a fine powder, with some gypsum added, and the resulting product is the commercial portland cement so widely used through out the world. The manufacturing of this

cement releases in the atmosphere 0.8 tonnes of CO₂ in the production of one tonne of cement. When water is mixed with cement and aggregates in the production of concrete for use in the construction, each tonne of cement can absorb up to 0.4 tonnes of CO₂, but that still leaves an overall carbon footprint per tonne of 0.4 tonnes. In the year 2009 about 2000 million tonnes of CO₂ was emitted in the atmosphere in the production of cement.

The above problems have been overcome from researches by Nikolas Valaspoulos Chief Scientist and his colleagues at Imperial College, London, and they have set up a company of Novacem's cement which is making cement from magnesium silicate that absorb more CO₂ as it hardens. Valaspoulos responded that magnesium silicates are abundant world wide with 10,000 billion tonnes available. He is confident that material will be strong enough for use in buildings but acknowledge that getting licence to use it will take several years of testing.

Novacem's cement, which has a patent pending on it, uses magnesium silicate which emit no CO₂ when heated. Its production process also runs at much lower temperature around 6500C. This leads to total CO₂ emission of upto 0.5 tonnes of CO₂ per tonne of cement produced. But the Novacem cement formula absorbs more CO₂ as it hardens about 0.6 tonnes of CO₂ from the air. This is competitive

with the American Company of Caera cement. Concrete with olivine as a supplement material can absorb large quantities of CO₂ to produce green concrete.

Researches are in progress through which the constructed concrete structures will not be called the Concrete Jangal. Like green forest they will absorb CO₂ from the air. However, this must be kept in mind there is no replacement of trees. To keep the balance of nature trees must be planted to fill the gap of cut trees. Unfortunately this is not being done. For example at Dehradun (Uttarakhand) city 10,000 trees were cut in one year. To replace them only 200 trees were planted. This is the situation of whole India.

The new cement will be marketed after testing its performance of strength, durability and other properties. This will take quite a long time. In the mean time we can save our environment by the use of Water Reducers in the production of concrete. 100% concrete produces in Japan and Canada contains Water Reducers/Air-entraining admixtures, where as in India about 2% of its concrete contains Water Reducers. If it is increases to 25%, the results will be as given below:

CONCRETE WITH WATER REDUCERS

In India, 0.93 kg of CO₂ is emitted in the production of one kg of cement. In the financial year 2009-10, India produces 200 million tonnes of cement. In the production of this cement 186 million tonnes of CO₂ was emitted in the atmosphere during financial year of 2009-10.

The availability of water in India per person per year in 1950 was 5177 cu.m. In the year 2009, it is reduced to 1700 cu.m.

If 50 million tonnes cement in making concrete uses water reducers 7500000 tonnes of cement can be saved. 3750000 kl of potable water will be saved and the saving of Rs. 3300 crores per year to construction industry. This amount is worked out after adjusting the cost of water reducers. Less cement used means less cement required to be produced by the cement factories - resulting 6975000 tonnes of CO₂ will be prevented to be emitted to the atmosphere. These are worked out with an average saving of 15% cement and 15% water.

CO₂ emission is a world problem, but for India in addition to CO₂ it has problems of Air, Water, Soil, Food and Noise pollutions. Less density populated countries may cope with these problems but for India it is of the top concern. The population figures of 2009 is, India 350 person per sq.km, China 132 person per sq.km and USA only 34 person per sq.km. The figures of 2006 CO₂ emissions are USA 658.60 tonnes per sq.km, China 611.76 tonnes per sq.km and India 459.35 tonnes per sq.km. Every one should contribute his or her efforts to save the environment from pollution. Those involved in the construction activities can contribute their share by proper design of concrete Mixes with Water Reducers.

REFERENCE:

Kishore Kaushal – Manual of Concrete Mix Design, based on IS: 456-2000, Standard Publishers Distributors 1705-B, Nai Sarak, Delhi-110 006. ■

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