Sustainable Materials and Construction Techniques of Ancient India

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Abstract: Today need of sustainable development is growing hence it is very important to develop and execution of the indigenous model of sustainable development. For that we need to develop special techniques which are suitable for the specific region. While searching in our past we can get many of such techniques which are developed specifically for our region and needs locally available materials. And the main advantages of using such techniques are these methods are widely used and proven for thousands of years. And even today also evidences can be seen and shown proudly.

Introduction

This paper is about the ancient construction materials and their relevance in modern India. The major types of construction materials in ancient India were found to be clay, stones, mud bricks, lime, timber, etc. It can be claimed that even at that time engineers were aware of the properties and importance of the durability of construction material. However modern structures which are made by using modern building materials have experienced significant deterioration throughout their service life, generally less than hundred years. Our India has thousands of years of tradition for the construction of buildings, and other structures, which are serving their purpose even today.

Now the question is whether these techniques and methods are easily usable and adoptable in today’s era and upcoming futuristic demand. Hence we have studied the relevance of such techniques and materials with respect to availability of material and skilled labour also the speed and cost of the development, also the main factor which usually not considered that environmental impact. And we can definitely say that using these techniques has far more additional benefits & solution to our everyday rising problems.

As per the requirement we have to alter and develop new methods as per availability of raw material and need of particular project. While considering the construction industry, this has been one of the most important sectors in the development of nation.

Methodology

Traditionally, natural materials are being used as construction material as well as sanitation such as mud, timber, stone, lime, herbs and plant etc. In India more than 80% of the population is sheltered in structures built with biomass. Locally available materials are the most environmentally sustainable.

2.1 Lime as construction material

Lime is being used vastly as a binding material with some natural additives in to it as it has very good cementing ability. In various scriptures like Bhrugu Samhita the procedure of preparation of lime mortar is described in detail.

As per our practice, the one part of lime to the two part of river sand is used with 1/10 part of jaggery as natural polymer and chopped grass fibers. The mortar was successfully used for brick masonry, plastering, and tiling. Various tests were carried out on the lime confirming to IS1624-1986.

HYDROCHLORIC ACID TEST

Procedure - Place sufficient quantity of powder lime into a 50-ml graduated glass cylinder, which on gentle tapping for about two minutes or so, settles down to about 5-ml mark with a neat surface on the top. Into this cylinder, fill up to 25-ml mark hydrochloric acid (1 : 1), preferably along a glass rod placed in the cylinder so that the acid does not get smeared all over the side of the cylinder. The contents, after stirring with a glass rod, should not leave much inert material at the bottom of the cylinder. To ensure that the inert material left at the bottom of the cylinder after stirring with a glass rod, does not contain any calcium carbonate, add excess of hydrochloric acid drop by drop with constant stirring till there is no effervescence. The cylinder with its contents shall then be kept standing for about 24 hours for observation of gel formation.

Test observations & result- A good thick gel was formed and below it some inert material was deposited. Hence by observations it can be said that the lime is of class B.

BALL TEST

Procedure - Make balls of about 50 mm diameter of quick lime mixed with just sufficient water to give a stiff paste, and leave them undisturbed for a period of
six hours. Immerse in a basin of water.

Test observations & result- Very little expansion and numerous cracks seen on the surface show that the lime may be of class B.

2.2 Sewage treatment technique

Traditionally India all toilet and kitchen waste water was circulated through excavated shallow open channel surrounding it various plants and herbs species were grown which absorbs impurities from sewage and make water pure.

The same concept is used in recently developed Soil biotechnology plant (SBT) & Root zone treatment. The collected & screened wastewater is sprayed, by means of a pump, onto a plant bed which is part of an engineered ecosystem that constitutes two bio-reactors, one for a coarse purification and the other for further refining through recycling. This ecosystem consisting of soil, bacterial culture and earthworms, mineral additives and select plants, treats the water is a combination of physico-chemical and biological processes. Purification takes place by adsorption, filtration and biological reaction. The entire waste is processed and converted into bio-fertilizer which is rich in organic content, and is being used organic fertilizer.

Conclusion

By studying this subject, we can definitely say that the technologies from ancient India which are being ignored due to modern & westernized trends of so called development should be given required attention. As this techniques and materials are proven as sustainable and eco-friendly, which are not consisting of toxic and poisonous materials.

Though these ancient techniques are not applicable in some areas we have to alter them as per the requirement and available materials and suitable condition.

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