



iJRASET

International Journal For Research in
Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 4 Issue: VI Month of publication: June 2016

DOI:

www.ijraset.com

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A Review on Comparison of Ancient and Modern Construction Materials in Civil Engineering

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Abstract: *There is a vast difference between the construction materials used by Civil Engineers in ancient times and recent times. Earlier the use of waste materials in the construction projects are not preferred but nowadays the use of waste and recycled materials are preferred over a large extent. Now a days the objective of every construction project is to obtain maximum and good productivity with the minimum utilization of resources. Also, earlier strength development in short periods becomes the first motive of the Civil Engineers. In recent times, the use of modern construction materials helps the Engineers to obtain the desired properties in short duration of time. In ancient times, the use of common construction materials does not provide satisfactory and desired properties in short period of time. Also, in olden times, the use of waste and recycled materials did not become common by the Engineers. There are many advantages of using modern construction materials than ancient construction materials.*

I. INTRODUCTION

Over the years, the use of common construction materials is widely practiced by the Engineers. The use of waste and recycled materials did not become common among Engineers. Also, the use of common construction materials does not provide satisfactory and desired properties in short period of time. The use of modern construction materials not only provides satisfactory and desired properties in short period of time but also makes the construction project economical. The use of various mineral admixtures in concrete improves the workability of concrete, reduces the permeability, and improves the resistance to attack from salts and sulphates present in soil and sea water. In recent years, the use of Light weight concrete, Polymer concrete, Fiber reinforced concrete, Self compacting concrete, super plasticized concrete, Fly ash concrete, Ready mix concrete become common among Engineers. The use of light weight and recycled aggregates also helps in improving the quality of concrete.

II. ANCIENT BUILDING MATERIALS

In the early as well as in medieval period, the use of advanced building materials did not become common among the Engineers. They used clay, metals, grasses, wood, timber, stone, and lime stones etc as the chief building materials. They use mud as the binding materials.

A. Straw

Straw is a very light weight material. It is used as construction materials in middle ages. Straw building construction system is adopted for providing natural appearance to the building. Though it provides sufficient insulation but it is not durable. It is unable to resist natural and seismic forces. The buildings made up of straw possess poor fire resistant properties. Due to this, it is not considered as a suitable material for construction process.

B. Wattle & Daub

In ancient times, a composite material commonly known as wattle and daub is used for making walls. In this, wattle (woven lattice of wooden strips) is coated (daubed) with a sticky material generally prepared by mixing wet soil, clay, sand, animal dung and straw. It is used in ancient times due to its economy. It does not require special skills; also it does not require the use of expensive materials. Despite of having several advantages, it has some drawbacks also. Wattle and daub walls require regular patching up. In order to keep the walls made of wattle and daub in good condition, it should be protected from damp and rain. This building material is not suitable for the areas having wet climate. So, it is also not widely used as a building material.

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C. Stones

In ancient times, stone is used as a building material. It possesses good resistance against abrasion. It is quite strong and durable building material. Buildings made up of stones do not require painting. Also, the process of cleaning the house made up of stone is very easy. Despite of having several merits, it has some demerits also. The buildings constructed with stones are not economical. Also, the stones are not available in all the places easily. Special skills are required for the construction of stone buildings. Stone structures cannot be repaired easily. Since, stones are available in irregular pattern; it requires special tools and techniques for its carving into a desired shape and size. Therefore, stone is not generally used as a building material.

III. MODERN BUILDING MATERIALS

Now a days, early strength achievement is the main objective of the Engineers. Also, the use of advanced materials is generally practiced by the Engineers. The uses of mineral admixtures, natural fibers in concrete not only enhance the strength but it also enhances the durability of the structures. Also, the use of various metals, alloys, composites become common now a days.

A. Composites

Composites are materials which are prepared by combining two or more constituent materials. The materials remain separate and different while forming a single compound. Usually, in composites one material forms a continuous matrix whereas the other material provides the reinforcement. The importance of composites is as follows:-

- 1) Composites possess better fatigue properties.
- 2) It also possesses greater toughness.
- 3) Through composites, it is possible to obtain the combinations of properties which cannot be obtained with metals, ceramics or polymers alone

B. High Strength Concrete

High strength concrete is a type of concrete having compressive strength more than 40 MPa at 28 days. It is prepared by reducing the water cement ratio to 0.35. In this, silica fumes are added which helps in preventing the formation of calcium hydroxides crystals in concrete. Due to the addition of silica fumes and lower water cement ratio the concrete mix becomes less workable. In order to minimize this difficulty, super plasticizers are added to the mixture. To resist high compressive loads, High strength concrete is used in high rise buildings, in bridges, foundations.

C. Fibre Reinforced Concrete

Fiber reinforced concrete is a type of concrete which contains fibrous material which enhances the structural integrity. The reinforcement for this type of concrete is internal and it does not require additional reinforcement. Its necessities are:

- 1) It increases the tensile strength of the concrete.
 - 2) It increases the durability of the concrete.
 - 3) It reduces the air voids and water voids.
- a) *Advantages of Fibre Reinforced Concrete*
- i) It enhances the strength of the concrete.
 - ii) Ductility, impact resistance, tensile and bending strength are improved.
 - iii) Fibers help in reducing the cracks

D. Self-Compacting Concrete

Self-compacting concrete is a type of special concrete which does not require vibration for placing and compaction. It has ability to flow under its own weight.

The hardened concrete is dense, homogeneous and possesses the same engineering properties and durability similar to traditional vibrated concrete. The advantages of self compacting concrete is as follows:-

- 1) Self compacting concrete provides faster construction
- 2) It helps in reducing the requirement of manpower at the site.
- 3) It enhances the durability of the concrete.
- 4) It helps in reducing the noise level.

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- 5) It provides better surface finish.
- 6) It is easier in placing.
- 7) It is suitable where the compaction of concrete is difficult.

IV. CONCLUSION

The use of modern construction materials provides more strength and durability than ancient construction materials. Also, the use of modern construction materials helps in achieving early strength; also it helps in the early removal of formwork. The structures constructed with modern materials can be repaired easily. The use of modern construction materials provides excellent resistance against corrosion and chemical attack. The ancient materials are prepared from natural available materials but it does not provide satisfactory and desired results than modern construction materials. The ancient construction materials do not provide speedy construction whereas the use of modern construction materials helps in providing the speedy construction.

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