

CIVIL ENGINEERING MATERIALS -A REVIEW

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ABSTRACT:

Civil Engineering based on the many characteristically, diversified public works based projects depends on the design, inspection, management and maintenance criteria's or properties. These projects starts from the house hold applications to high rise buildings and from rail road manufacturing to the dam construction or giant plant infrastructures. At the core of this branch nothing but the civil engineering, materials and the methods of these materials can satisfy the need of above mentioned characteristics. Selection of the right material for the specific use and also appropriate method for material selections are the key factors for the construction of any structure. This review paper is based on the various types of materials used in the civil engineering and the prons and cons of these materials.

KEYWORDS: Civil Engineering Materials, Basic Construction Materials, Futuristic Materials etc.

INTRODUCTION:

Building materials are the key elements in the civil engineering. These elements are the backbones and used to construct the homes, building infrastructures, roads, railway lines, dams, airports and many other things. From ancient times man used different materials for the purpose of the shelters. Only difference is the ancient building materials like leaves, braches etc. are replaced by the advanced building materials such as bricks, concretes and mortars etc. These civil engineering

materials brought a change in the world but came with a many environmental problems like pollution.

Table1: Chemical composition of cement, terrestrial fly ash and moon dust.

Component	Cement (% by mass)	Fly ash (% by mass)	Lunar dust (% by mass)
CaO	64.01	0.37-27.68	10
SiO ₂	20.13	27.88-59.40	50
Al ₂ O ₃	5.98	5.23-33.99	15
Fe ₂ O ₃	2.35	1.21-29.63	5-15
MgO	1.19	0.42-8.79	10
S ₂ O ₃	3.53	0.04-8.79	-
Na ₂ O	0.11	0.2-6.9	-
K ₂ O	0.77	0.64-6.68	-
TiO ₂	0.37	0.24-1.73	5
LOI	1.63	0.21-28.37	-

CIVIL ENGINEERING MATERIALS:

1. BASIC MATERIALS:

Some basic material which are use dint he civil engineering applications are listed below.

1. Cement and concrete material
2. Wood
3. Bituminous type of material
4. Clay as structural or concrete units
5. Structural or reinforced steels material
6. Plastics.
7. Aluminium

These materials are the basic structural type of materials used in the civil engineering. All these types of materials are used in the construction of dams, water reservoir, bridges, roads, foundations etc. Wood is the type of material which is derived from the trees which are cut in the pieces and used as a raw material for manufacturing the various construction components. Common Examples are the plywood, timber wood etc. These types of materials are used in the construction of the buildings and bridges etc.

A. AGGREGATE:

It is the one of the civil engineering material which made up of the composition of rocklike material of various shapes and sizes. It is derived from the stones or the rocks such as igneous rocks, granite, basalt etc. Aggregate is used in the manufacturing of the civil engineering material such as the Portland cement material or concrete, palster.etc. Aggregate defined on the basis of ASTM standards such as C125 and D8. Under this Standard aggregate is the material which is made up of the stones or rocks which are crushed, sand, slag of iron blast furnace etc. With the medium which is made up of cement, concrete or mortar.

B. CONCRETE:

Concrete and cement is one of the most common example of building material or constructive material in the civil engineering. One of the common examples of the cement material is the Portland cement which is also known as hydraulic cement. It is the key element in manufacturing of the cementitious products such as bricks and blocks and plaster etc. In combination of polypropylene fibers, high strength and reinforced bars, wires, another type of concrete is produced called as pressurised fiber. The intergradient materials of concrete are

1. Cement
2. Aggregates
3. Water
4. Admixtures

Mixing and melding of these materials into desired property led to the formation of the Concrete. When these intergradients are mixed, brought a chemical reaction called as hydration. With time, mixture becomes strong, hard one and durable in property which can be used for civil application.

C. BITUMINOUS MATERIALS:

Another type is the bitumen or the bituminous material which is commonly used in the construction of the pavement blocks, waterproofing compounds and many others. The basic bituminous materials are the asphalts and tars. Asphalts is the natural element found in earth crust or it can be by-products of the petroleum process. Tar is obtained from the condensing process of the caol, petroleum, oil, wood and other organic materials. Structural steels, aluminium are commonly used for the various shapes and sizes of various civil applications such as railway tracks, high rise buildings for better strength, bridges and roof trusses etc.

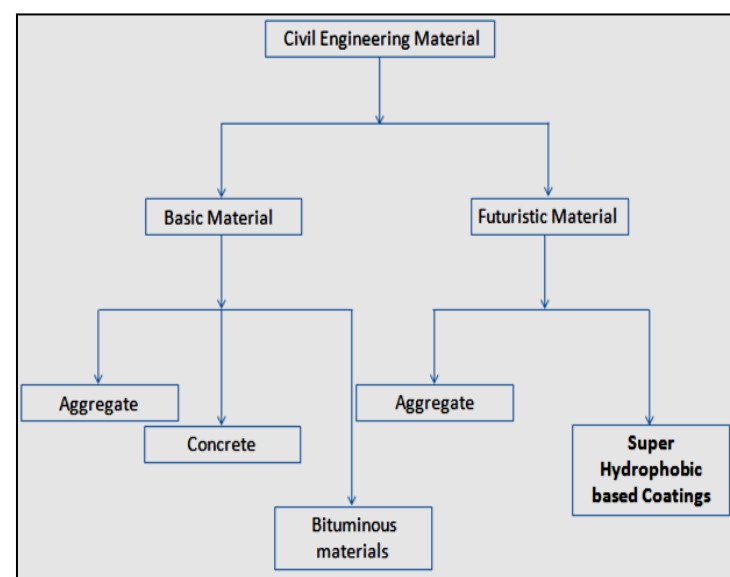


Fig. No.1. various materials in civil engineering

2. FUTURISTIC MATERIALS:

A. NANO TYPE OF MATERIAL:

A research has been carried out for the use of the Nano particles in the Concrete and cement. Carbon Nano-tubes (CNTs), Nano-silica, Nano-clays are the futuristic Nano- materials which can be used for the formation of the Concrete and Cements.

B. BIOLOGICAL MATERIALS:

Biological materials is the also one of the futuristic material which can be used for the remedial approach for the cracks in infrastructure. Synthetic polymers are normally used for the remediation of the cracks in the buildings and bridges. But, as it is not the environment friendly, some biological materials formed to overcome these issues. For this bacterial spore, calcium lactate and nutrients are used as biological materials. The capsules of these materials are used to prevent the cracks as these bacterial has ability to heal the cracks.

C. SUPER HYDROPHOBIC BASED COATINGS:

Most common observed problem in any construction and structure is the leaks and dampness. Many conventional methods are used to overcome these problems like water proofing of these structures. Hydrophobicity is the solution for this issue. As it has the property of repulsion of water on their surfaces. Manganese Oxide Polystyrene, Zinc Oxide Polystyrene, Precipitated Calcium Carbonate are the few materials used for formation of these hydrophobic materials.

CONCLUSION:

Basic civil engineering material plays a vital role in many constructive applications. But at the same time, innovation in the civil engineering materials also needed as to reduced pollution which is caused by these basic civil engineering materials when we

discussed regarding the environmental considerations and global warming. Nanotechnology, biotechnology based materials are considered as more sophisticated civil engineering materials. Optimum use of earth resources is the key factor while developing the civil engineering materials for both economic and pollution free environment.

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