



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 11, Issue 5, May 2022

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.118

9940 572 462

6381 907 438

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Study and Comparative Analysis of the Older Construction Technology to the Advanced Construction Technology

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ABSTRACT: Traditional Indian structures exist beyond all ages and can be utilized by the people of every generation since the truth of all time could also be expressed as the truth of present time. Based on this premise, older construction concepts will definitely provide inputs to supplement advanced construction methods and this will pave a flexible runway by extracting the essence from ancient texts and interpret it to suit advanced construction this is not mere repetition but one of the creative interpretations as older construction practices have come a long way without proper documentation and records. Imposing structure in India constructed before BC reflects the degree of civilization and cultural spectrum. If texts are repeated without reinterpreting them to suit modern practices and innovations, civilization becomes a phenomenon of arrested development. The Advanced Construction Technology System (ACTS) is a computerized database for the classification, documentation, storage and retrieval of information about emerging construction technologies. ACTS consists of a custom MS Windows application, classification and keyword files, and a database of emerging technologies, It currently includes technologies that relate to civil, architectural, electrical, instrumentation, mechanical, and piping systems. Technologies have been classified according to the CSI Master format, indexed using a predetermined set of keywords, and described according to a standard format that determines the type, amount and organization of information about cache technology.

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.

From the Stone Age to the modern age, we have come to know that the human being is reflective, curious and inventor Means explorer. In modern civil engineering science has done never to be forgotten progresses and made dreams come true which was beyond of our imaginations. At present science has uncovered secrets. Even everything is before us but it seems that there is body but not the spirit. There is an adage "Old is Gold". Today after uncovering secrets, using modern machines we could not rise civil engineering to the point where our ancestor had left. Despite of reaching to the highest point in the field of architecture still we found ourselves speechless watching the ancient structures. So many question rises even about the gratefulness or in the context of firmness or strength or in the context of lively instantiation. As the law is incomplete without evidence in the same way our memory is incomplete without history. History means our past.

II. OLDER CONSTRUCTION TECHNOLOGY

Before the advent of manufactured building materials, nearly all buildings were constructed from materials at hand: animal skins, wooden poles, bark, tall grass, stone, mud, logs, even the sod underfoot. In Manitoba, all of these materials were employed by Aboriginal groups and settlers before 1880. The actual techniques used to raise these materials into sturdy walls and water-shedding roofs shared a certain underlying consistency. When they were used for a permanent wall, these materials were typically raised as a solid mass. The familiar log wall gives you a good idea of the concept; components were basically laid one atop another. Aboriginal groups employed a different approach. Because of their nomadic lifestyle it was more appropriate to stretch animal skins or bark over a light frame of wooden poles to form a steep tipi shape or a round conical form. The form of the tipi was ideal for shedding water and snow. This kind of sheathed framework was also used by European settlers in the construction of their roofs. Whether thatched with heavy marsh grass or covered with hand-hewn shingles, the underlying support for a roof was a frame of interlocking poles or cut timbers. And to effectively shed water and snow, the shape was likewise a fairly steep pitch.

III. ADVANCED CONSTRUCTION TECHNOLOGY

The rising cost of construction is a subject of grave concern to U.S. industry. Excessive construction costs have eroded the construction industry's competitive position and have led to a decline in capital investment and the growth of manufacturing. A large number of projects have been abandoned and many are delayed because of shortness of funds. As a result, owners are more aggressively looking for more cost-effective design and construction, while contractors are looking into increasing productivity and efficiency to remain competitive. The expedient introduction of new technology has been widely recognized as one of the most promising solutions to these problems because of the potential to enhance quality of the constructed product, to increase efficiency, and to decrease costs.

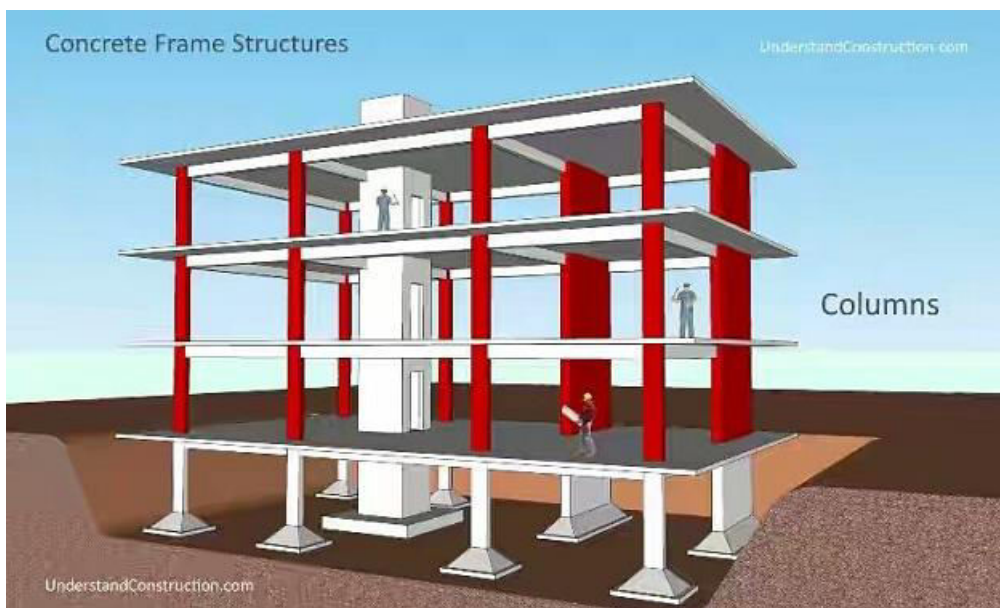


Fig 1: Concrete Frame Structure

1. Under Water Construction

During the construction of bridges, dams or any other structure where foundation part of the structure is mostly like to lie underwater, we have to opt for underwater construction. Construction in water poses many difficulties especially in the places where there the depth is considerable. During underground construction our main objectives is to create a dry and water free environment for working in such a manner that the structure stability of the structure is not compromised.

2. Caissons

Caissons are the structure used in underwater construction work, consisting of an air tight chamber, open at the bottom and containing air under sufficient pressure to exclude the water.

3. Trenchless Technology

Trenchless technology methods include all methods of installing or renewing underground utility systems with minimum disruption of the surface or subsurface. Trenchless technology consists of various methods, materials and equipment for inspection, utilization and rehabilitation. Trenchless technology has become popular for underground utility construction road crossings. In recent years, there has been remarkable progress in development of new trenchless technology equipment and methods.

IV. REVIEW OF LITERATURES

Prof. Patil Hemant Chudaman Due to globalization in 21st Century nation require more infrastructure facility for economic development such as roads, ports, thermal and hydro electrical plant, dams, irrigation project, shopping malls, hospitals, education institutes, air ports etc. for supporting and increasing the GDP rates. It leads the pressure on construction industry and industry transforms their conventional methodology into modern construction methodology. The overall aim of this paper is to identify the effect of world trend on construction technique and discuss the evolution of building construction with respective of time scale.

Prof. Shan Somayaj This book deals with properties, applications and analysis of important materials of construction/civil engineering. It offers full coverage of how materials are made or obtained, their physical properties, their mechanical properties, how they are used in construction, how they are tested in the lab, and their strength characteristics--information that is essential for material selection and elementary design. Contains illustrative examples and tables and figures from professional organizations. Considers all common materials of civil engineering/construction--and looks at each in depth: e.g., physical properties, mechanical properties, code provisions, methods of testing, quality control, construction procedures, and material selection. Discusses laboratory testing procedures for selected tests--provides step-by-step descriptions of laboratory test procedures to determine properties of materials. All test procedures are based on relevant ASTM specification. For Civil Engineers, Construction Engineers, Architects, and Agricultural Engineers.

Prof. P. Norris While much money and effort has been spent by manufacturers and users of pipe jacking equipment to develop suitable techniques, this work appears to be the first to study the method at full scale, in a scientific research programmer. It has involved monitoring a series of five pipe jacks during construction. In each case a heavily instrumented pipe was incorporated into the pipe string to measure pipe joint stresses, pipe and joint compressions and contact stresses between pipe and ground. Total jacking loads and movements of the pipe string were also measured and all results correlated with a detailed site log, full tunnel alignment surveys, and observed ground conditions. The success of the site monitoring has been highly dependent upon the development of a suitable instrumentation and data acquisition system in conjunction with appropriate site procedures for working in the restricted and physically demanding pipe jack environment without undue disruption to normal site operations.

Prof. J.E. Gordon for anyone who has ever wondered why suspension bridges don't collapse under eight lanes of traffic, how dams hold back-or give way under-thousands of gallons of water, or what principles guide the design of a skyscraper or a kangaroo, this book will ease your anxiety and answer your questions. J. E. Gordon strips engineering of its confusing technical terms, communicating its founding principles in accessible, witty prose. Prof. S.A. Neild There has been much work published in recent years on the use of vibration characteristics to detect damage in bridges. Almost all of this work has been based on the assumption that the vibration is linear, i.e. the natural frequencies are not dependent on the amplitude of oscillation. The aim of the work presented here was to investigate the possibility of using changes in the non-linear vibration characteristics to detect damage in reinforced concrete bridges.

Prof. M.M. O'Mahony Although Britain is relatively rich in natural aggregate reserves, planning approvals to develop new quarries are running at about half the rate of aggregate extraction. The use of secondary materials, such as recycled aggregate, might not create a major course of aggregate but if secondary material were used in less demanding situations, the quantity of natural aggregate required by the construction industry would be reduced. This dissertation reports mainly on laboratory tests conducted on crushed concrete and demolition debris to examine the potential use of these materials in new construction. Standard aggregate tests were conducted on the materials to check their compliance with the Specification for Highway Works (1986), particularly for use as aggregate in road sub-base layers. A more detailed examination of the aggregates was conducted with regard to CBR, shear strength and frost susceptibility where the influences of moisture content, density and particle packing on these properties were

investigated. One part of the study involved examining the use of recycled aggregate as the coarse aggregate fraction in new concrete.

Prof. Hassan Fathy Architecture for the Poor describes Hassan Fathy's plan for building the village of New Gourn, near Luxor, Egypt, without the use of more modern and expensive materials such as steel and concrete. Using mud bricks, the native technique that Fathy learned in Nubia, and such traditional Egyptian architectural designs as enclosed courtyards and vaulted roofing, Fathy worked with the villagers to tailor his designs to their needs. He taught them how to work with the bricks, supervised the erection of the buildings, and encouraged the revival of such ancient crafts as claustra (lattice designs in the mudwork) to adorn the buildings.

Prof. Alan Graham Bloodworth The subject of this thesis is the verification of a three-dimensional numerical modeling approach for the prediction of settlement damage to masonry buildings due to tunneling in soft ground. The modeling approach was developed by previous researchers at Oxford, and was applied to three sites, representative of a range of practical configurations. The first involved the excavation of a shaft close to the corner of an eighteenth-century church in London. The second involved tunneling with very low cover beneath the foundations of a terrace of cottages at Rams gate, Kent.

V. COMPARISON OF OLDER AND ADVANCED CONSTRUCTION

Older 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.

1. 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.

2. 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.

3. 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.

VI. MODERN BUILDING MATERIALS

Now 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.

1. 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

2. 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.

3. Fiber 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 Fiber 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

4. 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.
- 5) It provides better surface finish.
- 6) It is easier in placing.
- 7) It is suitable where the compaction of concrete is difficult.

Advanced Machineries



Concrete Mixers



Grader

Down The Hole (DTH)



Loader



Gantry Girders



Tower Crane

VII. CONCLUSION

Nowadays, natural resources are depleting worldwide, while at the same time the generated wastes from the industries are increasing substantially. The aim of this paper is to describe the industrial and natural waste utilization in construction materials. According to their fineness and specific gravity the wastes are partially or fully replaced with the construction materials (cement, fine and coarse aggregates). The industrial wastes contain high pH and they are calculated under the different temperatures to improve its reactivity. Generally, the wastes contain the pozzolanic properties due to its fineness and plasticity, so it increases the strength of the materials. The pozzolanic characteristics may partially replace the materials and known benefits on the durability of the products. The physical, mechanical and chemical characteristics are analyzed by SEM, XRD and XRF analysis. Under this the wastes are partially or fully replaced to the construction material and using a different grade of concrete mix and tests were conducted for various proportions to analysis or finding the strength attainments (compressive, flexural, tension etc.,) tests are followed under the standard setup procedures and machines. Nowadays, the wastes are not having any industrial applications, so it can be innovatively using these wastes as a raw material in the civil engineering field. By using these wastes as the non-conventional and reuse or recycling of waste material in order to compensate the lack of the natural resources. So, wastes can be used to produce new products or can be used as admixtures in the civil engineering field. Environment is protected from waste deposits. These new emerging building materials should be replaced with the old ones to improve the properties of materials and helps in recycling of the materials to save energy, time, money and make our country as pollution free. So more innovative materials should be created and make construction of the building simpler with more strength.



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Impact Factor: 8.118



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