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CRITERIA – 3

INNOVATION ECOSYSTEM

3.2.1 Institution has created an ecosystem for innovations and has initiatives for creation and transfer of knowledge (patents filed, published, incubation center facilities in the HEI to be considered)

INNOVATIVE PROJECT

CIVIL

S.No	Name of the Document	Year
1	Water absorbing pavement using pervious concrete	2023-2024
2	Partial sand replacing glass powder bricks	
3	Modelling of water pump for irrigation using wind power	
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A PROJECT REPORT ON “WATER ABSORBING PAVEMENT USING PERVIOUS CONCRETE”

ABSTRACT:

Water Absorbing pavement is a new technique in Pavement construction. Through this technique we can find a solution for the low ground water level, effective management of storm water runoff, Agricultural problems, etc. pervious concrete can be introduced in low traffic volume areas, walk 7ways, sub base for concrete pavements. Pervious concrete as a paving material have the ability to allow water to flow through itself to recharge ground water level and minimize surface storm water runoff. This property of pervious concrete reviews its applications and engineering properties, including environmental benefits, strength and durability.

INTRODUCTION:

Pervious pavement is a rain water drainage system that allows storm water and runoff to move through the pavements surface to storage layer below, with the eventually absorbing into the underlying soil. Permeable pavement is beneficial to the environment because it can reduce rain water volume, treat the rain water quality, and replenish the ground water supply and lower air temperatures in summer season. Due to increased void ratio, water conveyed through the surface and allowed to infiltrate and evaporate, whereas conventional surfaces will not do so. A pervious pavement surface therefore becomes an active participant in hydrological cycle: rain fall and ice melt are

conveyed back through soil into ground water. And also, this pavement technology creates more efficient land use by eliminating the need for ponds, swales, and other rain water management devices.

In doing so, pervious concrete has the Ability to lower overall project costs on a first-cost basis. In pervious concrete, carefully controlled amounts of water and cement materials are used to create a paste that forms a thick coating around aggregate particles. A pervious concrete mixture contains little or no sand, creating a substantial void content. And that's why it is also known as No fines Concrete. Using sufficient paste to coat and bind the aggregate particles together creates a system of highly permeable, Inter-connected voids that drain quickly. For pervious concrete, water permeability is the main specification requirement instead of its strength and continuity of the open pervious is the main concern in the production of pervious concrete.

OBJECTIVES:

- 1) Effective surface Runoff Management – Pervious concrete pavement allows water to percolate through itself. This is effective in managing runoff from paved surfaces, thus providing local flood control.
- 2) Ground Water Recharge – It solves the problem of ground water by constantly recharging groundwater through its paved surface.
- 3) The making of pervious concrete pavement is less costly.
- 4) The groundwater provided by this method can be used in a multiple way.
- 5) It reduces the need for traditional storm water infrastructure, which may reduce the overall cost.

6) It can help to reduce temperatures on and around concrete which helps to reduce urban heat island effect.

7) Reducing the rate of runoff

8) Filtering pollutants out of runoff

Materials:

Cement:

Cement must develop the appropriate strength. It must represent the appropriate rheological behaviour. Generally same type of cements has quite different rheological and strength characteristics, particularly used in combine sediments in the cement play a specific role in different properties of cement. The action with admixtures and supplementary cementing materials.

Water:

Water to cementations materials ratios between 0.34 and 0.40 are used routinely with proper inclusion of chemical admixtures, and those as high as 0.45 and 0.52 have been used successfully. The relation between strength and water to cementations materials ratio is not clear for pervious concrete because unlike conventional concrete, the total paste content is less than the voids content between the aggregates.

Coarse Aggregate:

As coarse aggregate in concrete occupy 35 to 70% of the volume of the concrete. Smaller sized aggregates produce higher concrete strength. Usually an aggregate with specific gravity more than 2.55 and absorption less than 1.5% can be regarded as being of good quality. The coarse aggregate are produced by the disintegration of rock and by crushing rock. Coarse aggregate are usually those particles which are retained on an IS 4.75mm sieve.

Stones which are hard and durable such as granite, basalt, and quartzite provide good coarse aggregate. Aggregate was 20 mm, 12 mm and specific gravity of 2.56 & 2.6. granite is a coarse grained, igneous rock having an even texture and consisting largely of quartz and feldspar with often small amounts of mica and other materials. There are many varieties. Granite is very compact and it takes a fine polish, showing, the beauty of crystals Machine crushed granite broken stone angular in shape was used as coarse aggregate. The maximum size of Coarse aggregate which passes 20 mm and 12 mm IS sieve and retained 4.75 mm, naturally occurring crushed stone used in the work.

Uses of conplast SP430

- To produce pumpable concrete
- To produce high strength, high grade concrete by substantial reduction in water resulting in low permeability and high early strength.
- To produce high workability concrete requiring little or no vibration during placing.

CONCLUSION:

- It is clearly seen from the experimental result that pervious concrete has very low compressive strength, so it cannot be used for structural application but it can be significantly used for sidewalks, parking lots, sports surfaces, driveways, etc.
- Pervious concrete is considered as eco-friendly system.
- From the experimental results of investigation, the following conclusions can be made. Porous concrete allows water passes through it. It is not composed of fine aggregates. Aggregate having size more than 20mm cannot be used, because of larger voids cause settle down of cement slurry and aggregates having size less than 10mm can give better results.
- Regardless of the high advantage of these systems to reduce the flooding impact, this permeable pavement is known for its lower strength. Due to this fact, it is rare and impossible for this permeable pavement to be utilized at the main road and highway.
- The size of coarse aggregates, water to cement ratio and aggregate to cement ratio plays a crucial role in strength of porous concrete.
- The void ratio and unit weight are two important parameters of porous concrete in the context of mix design.
- Among the two methods of increasing compressive strength of pervious concrete, the addition of fines has gave more value when compared to replacement of cement materials.
- The addition of fines and replacement of Cement will reduce the permeability capacity of porous concrete.

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PARTIAL SAND REPLACING GLASS POWDER BRICKS

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ABSTRACT:

Glass is used in many forms in day-to-day life. It has limited life span and after use it is either stock piled or sent to landfills. Since glass is non-biodegradable, landfills do not provide an environment friendly solution. Hence, there is strong need to utilize waste glasses. And still time high amount of hospitals in the world, However the hospital medicine bottles wastes does not recycled process, it has limited life span and after use it is either stock piled or sent to landfills. Since glass is non-biodegradable, landfills do not provide an environment friendly solution.

Many Peoples are using tube lights & bulb this also glass material same time tube & bulb are not working so peoples throw it and these wastes are polluted in ground. So this project to introduce new building material .High amount of waste glass powders are used to fine aggregates in fly ash bricks

INTRODUCTION:

Fly ash bricks have an important place in modern building industry. They are cost effective and better alternative to burnt clay bricks by virtue of their good durability, fire resistance, partial resistance to sound, thermal insulation, small dead load and high speed of construction. A fly ash brick being usually smaller in size than the normal clay building bricks and less mortar is required, faster of construction is achieved. Along with this project can be introduced new brick its stronger better than alternative brick. And brick can be manufactured on waste glass powders.

RAW MATERIALS:

Raw material are using this types of waste glass powder bricks is given below

1. Fly ash cement.
2. Waste glass powders (Medicine bottles & Tube lights, Accident vehicle glass)
3. Sand.

MANUFACTURING PROCESS

The process of manufacture of cement bricks involves the following 4 stages;

- 1 .Proportioning
2. Mixing
3. Compacting
- 4 .Drying

PHYSICAL TEST ON MATERIAL:

1. Specific gravity test: Specific gravity is a widely used parameter in establishing the density-volume relationship of physical materials. Testing was conducted in general accordance with IS codifications. , Fly Ash is 2.25, Waste glass powder is 2.47, and River sand is 2.51.

2. Particle Size Analysis for sand& glass:

This method sieve to sand & glass powders in 4.75mm, 2.8mm 2.1mm, 600micron, 425micron, 300micron, 150micron, 75micron sieves are using on this method. Fineness modulus of River sand is 3.08 & waste glass powder is 2.92.

3. Water absorption test for bricks:

The specimen brick is first weighed dry .It is then immersed in water for 24 hours and weighted again .the difference in weight indicates the amount of water absorbed by the brick. And result for water absorption test values is 5.78 % of the weight of dry brick.

4. Compressive strength test:

Compression test decides the strength of the brick. This test was carried out by compression testing machine. This test was carried out on the three different age's 7th & 14th & 21th day from the date of casting. And achieved 21th day compressive strength is 14.02 N/mm².

PHYSICAL PROPERTIES:

1. SHAPE AND SIZE: Rectangular shaped bricks and then size of brick 23 cm x11cmx7 cm

2. COLOUR: Bricks have been silver grays colour.

3. WEIGHT: The weight of a brick is 2.54 kg.

4. COST: The cost of glass powder brick is 60% lesser than the conventional fly ash & clay brick. The cost of brick is Rs.1.23 (each brick).

CONCLUSION:

The following conclusions are drawn based on the experimental investigations and results obtained from those tests, which are follows:

- The water absorption value of brick is lesser than the conventional fly ash & clay brick.
- The weight of this brick is 30% to 50% lesser than the conventional fly ash & clay brick.
- Due to less weight of these bricks, the total dead load of the building will be reduced. Since, the waste glass materials are used; it will reduce the landfills and pollution.
- The cost of brick is 60% lesser than the conventional fly ash & clay brick.
- Using this waste glass powder brick in a building construction cost will be lower than the conventional fly ash & clay brick.
- The compressive strength of Mix-5 (50% glass +50% sand used) in 21 days is 14.02 N/mm^2
- The compressive strength of brick is 30% higher than the conventional fly ash brick.
- The compressive strength of brick is 50 % higher than the conventional clay brick.

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3. IS: 12894-2000, "Pulverized fuel ash-lime bricks-specification" Bureau of Indian Standards. New Delhi.
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Modeling of water pump for irrigation using wind power

INTRODUCTION:-

The new model wind power water pump was invented and introduced in the year 1854 by DANIAL GALADAE at United States of America. This new innovative model consumed wind was the primary energy source to draw water. It was widely used in areas in and around American continent. After a grand success in America this innovative model was introduced to the other parts of the world. This module and mechanism was manly implemented by farmers in the agricultural sectors, and in areas of water supply for domestic purposes.

According to the survey we Indians are using it meagerly.

For the Indian utility this apparatus is modified and modeled in lower expense and higher benefits. We can utilize this innovative model for better present and best future.

Objective

- The goal of this project is to build a windmill to drive water using reciprocating pump. It can pump water from a near by source to a tank.
- The purpose is to demonstrate and spread knowledge about this technique to farmers in the Pudukkottai region.

Methodology

1	Planning of wind mill	Area
		Intensity of wind
		Components
2	Planning of irrigation area	Area
		Type of Crops
3	Erection of bore well	
4	Design of foundation	
5	Installation of wind mill	Gear box
		Reciprocating Pump
6	Design of circular water tank	
7	Estimation	
8	Implementation of flow irrigation	

work plan

1. Planning of windmill
2. Planning of irrigation area
3. Erection of bore well
4. Design of foundation
5. Installation of windmill
6. estimation

Yet to be completed

1. Design of circular water tank
2. Implementation of flow irrigation

Project detail estimation

1. Bore well: Rs.15, 000/-
2. Water tank (or) table: Rs. 8000 -
3. Pump pistol: Rs. 20,000/-
4. Wind pole: Rs. 15,000/-
5. Wind leaf: Rs.11, 000/-
6. Gear box: Rs.15, 000/-
7. Transport & erecting: Rs.16, 000/-
8. Foundation: Rs.15,000/-

Total estimation: 1, 15,000/-

Application

It is used to irrigate agricultural land with low cost.

Effect of waste ceramic tiles as a partial replacement of aggregates in concrete

Abstract:

In recent constructions, the consumption of ceramic materials is increasing day by day in the form of tiles, sanitary fittings, electrical insulators etc. But a large quantity of ceramic materials changes into wastage during processing, transporting and fixing due to its brittle nature. Therefore, using these wastes in concrete production could be an effective measure in maintaining the environment and improving the properties of concrete. Hence, the crushed waste ceramic tiles were used in concrete as a replacement for natural coarse aggregates with 0%, 5%, 10%, 15% 20% and 25% of substitution. After analyzing results, the optimum value of waste ceramic tile to be used within the concrete mix with a water/cement ratio of 0.5 was determined as about 20%. The findings revealed that using waste ceramic tile lead to enhancing the properties of concrete.

Introduction:

Concrete is a widely used construction material for various types of structures due to its durability. Concrete is a combination of cement, Fine aggregate, Coarse aggregate and water. In these components only cement is manufactured and both fine and coarse aggregate has been obtained naturally. Aggregates are inert or chemically inactive materials which form the bulk of cement concrete. These aggregates are bound together by means of cement. The aggregates to be used for cement concrete work should be hard, durable and clean. The aggregates should

be completely free from lumps of clay, organic and vegetable matter, fine dust, etc. The presence of all such debris prevents adhesion of aggregates and hence reduces the strength of concrete.

The aggregates are classified into two categories: a) Fine aggregate and b) coarse aggregate. The aggregate size is lesser than 4.75 mm is considered as fine aggregate. Usually, the natural river sand is used as fine aggregate. The aggregate size bigger than 4.75 mm, is considered as coarse aggregate. It can be found from original bed rocks.

Aggregates are considered as one of the main constituents of Concrete. Huge amount of natural aggregates, sand and water are being consumed in concrete production. In India, there is great demand of aggregates mainly from civil engineering industry for road and concrete constructions. But now-a-days availability of natural aggregates is very difficult problem. Natural resources are depleting worldwide. So, there is strong need to use alternative materials in place of natural aggregates. With the ever increasing population of the world, there is the tremendous pressure on the Civil Engineer to develop a cost effective as well as eco-friendly structure to fulfil the need of the human beings. The alternative materials used in this project are Periwinkle shell powder and Waste Ceramic tiles.

The objectives of this study are:

- To study the variations in strength characteristics of concrete made with the alternative materials.
- To use alternative materials in place of natural aggregates in concrete.
- The alternative materials used in concrete are disposed in a safe manner from the environment point of view.

conclusions:

- The variations in strength characteristics of concrete made and coarse aggregate by waste ceramic tiles in the incremental proportions of 5%, 10%, 15%, 20% and 25% were studied.
- The optimum compressive strength of concrete is obtained at 20% replacement and the value is 35.55 N/mm^2 which is 10.09% more than that of conventional concrete.
- The optimum Split Tensile Strength of concrete is obtained at 20% replacement and the value is 4.1 N/mm^2 which is 28.9% more than that of conventional concrete.

References :

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Exploratory study of crushed periwinkle shell as partial replacement for fine aggregates in concrete

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Mix design for concrete with crushed ceramic tiles as coarse aggregate
Int. J. Civil Eng. Res.20214

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Reuse of sanitary ceramic wastes as coarse aggregate in eco-efficient concretes
Cem. Concr. Compos.2015

Light weight concrete with partial sand with wooden powder

ABSTRACT:

In this project main objective is to study the partial replacement of the fine aggregate with Teak Wooden Dust with the varying proportion in the concrete and to check the different properties of the concrete by comparing with the controlled concrete. The replacement of Fine aggregate (sand) with certain Teak wooden dust in concrete that makes the structure lighter in weight. For making M20 grade of concrete replacing sand with teak wood dust in proportions of 0%, 5%, 10%, 15%, 20%, 25% and 30%. The Workability, strength and durability test are studied in this project the most important properties of concrete is the compressive strength and Tensile strength. Also, increasing the teak wooden dust incorporation caused decreases in unit weights and strength values of mortars with a parallel increase in water absorption values at all ages.

INTRODUCTION:

The development in the construction industry all over the world is progressing. Many structures are being built, both residential and non-residential. As a result of the increase in the cost of construction materials, especially cement, crushed stone (coarse aggregate), fine sand (fine aggregate); there is the need to investigate the use of alternate building materials which are locally available. Since most building construction works consist of concrete work; therefore, reduction in cost of concrete production will reduce the cost of building construction.

In this topic main aim is to study the partial replacement of the wooden powder dust with the different percentage in the concrete and to check the properties of the concrete by comparing with the normal concrete. The replacement of fine aggregate (sand) with certain wooden powder in concrete that makes the structure more light in weight. The strength, workability and durability test are analyse in this dissertation. The most important properties of concrete is the strength in compressive force. Also, increasing the wooden dust in corporation caused decreases in unit weights and compressive strength values of mortars with a parallel increase in water absorption values at all ages. The wooden powder dust replaced by fine aggregates (sand) gives the properties and the benefits in the actual production of concrete.

OBJECTIVE:

- Effect of use of wooden dust on workability.
- Wooden powder in concrete that makes the structure more light in weight.
- Effect on compression strength of concrete by using wooden dust.
- To give a solution regarding disposal of wooden dust which creates environmental pollution mainly landfill.

MATERIAL:

Portland cement:

The cement used is Ordinary Portland Cement conforming to Indian Standards IS 12269 – 1987 of grade 43. The tests conducted on cement are standard consistency, initial setting time, final setting time, and specific gravity. On mixing the water, cement hardens and hence all the ingredients are bounded together. Portland cement is the most commonly used cement with the composition of alumina, silica, lime, iron, and gypsum.

Aggregates:

Crushed granite of 20 mm maximum size has been used as coarse aggregate. The sieve analysis of combined aggregates confirms to the specifications of IS 383: 1970 for graded aggregates. The concrete mixtures consist of both coarse and fine aggregates which helps in increasing the strength of concrete. Now a days, sand, gravel, crushed stone, recycled materials, including blast furnace slag, glass (mostly for decorative purposes), and ground-up concrete are used as aggregates.

Water:

Mixing water should not contain abominable organic substances or inorganic ingredients in excessive proportions. In this project clean potable water is used. The water in the concrete mix should be clean and free of impurities. The change in water content with respect of cement decides the properties of the cement like how easily the concrete flows, but also affects the final strength of the concrete. Excess water implies to easier flow of concrete, but decreases its strength.

Wooden dust / Saw dust:

TWD is also known as wood dust. It is the by-product of cutting, drilling wood with a saw or any other tool. It is composed of fine particles of wood. Certain animals, birds and insects which live in wood, such as the carpenter ant are also responsible for producing the saw dust. Wooden powder dust's are produced as a small alternate chips or small fragments of wood during sawing of logs of timber into different sizes.

REFERENCE:

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4. Blumfield, T. (2007). Improving silvicultural and economic outcomes for community timber plantations in the Solomon Islands by interplanting with *Flueggea flexuosa* and other Pacific agroforestry species. Full proposal to ACIAR, Project No. FST/2007/020.

CONCLUSION:

From the test results, graphs and the relative chemical composition of the specimen a number of conclusions can be drawn. The conclusions drawn are:

1. From the test result it is observed that the Workability of concrete with partial use of teak wood increases upto a limit than it decreases. The workability is in increasing order upto 20% of sand replaced with Teak wood.
2. The Compressive Strength of partially replaced sand by teak wood in concrete of grade M 20 for proportions of 0%, 5%, 10%, 15%, 20%, 25% an 30% are 32.33MPa, 33.48MPa, 33.78MPa, 34.41MPa, 34.87MPa, 34.75MPa and 33.55MPa respectively at 28th day of curing. The Compressive Strength increases upto 20% of use of teak wood further it starts decreasing.
3. The Split Tensile strength of partially replaced sand by teak wood inconcrete of grade M 20 for proportions of 0%, 5%, 10%, 15%, 20%, 25% and 30% are 2.43MPa, 2.72MPa, 2.94MPa, 3.14MPa, 3.39MPa, 3.08MPa and 2.76MPa

respectively at 28th day of curing. The Split tensile Strength increases upto 20% use of teak wood further it starts decreasing.

4. With the use of 20% of teak wood in concrete gives the maximum result in compression as 25.40MPa, 32.3MPa and 34.87MPa at 7th day, 14th day and 28th day of curing respectively.

5. With the use of 20% of teak wood gives the maximum result in Split Tensile Strength as 1.5MPa, 1.97MPa and 3.39MPa at 7th day, 14th day and 28th day of curing respectively.

6. Water absorption capacity increases with increasing percentage of wooden powder. Larger absorption of water causes the reduction in the strength.

7. Teak wood is obtained at very low no cost, the cost of concrete can potentially be reduced by replacing sand with TWD in concrete