

# ENHANCING THE CHARACTERISTICS OF REINFORCED CONCRETE ALTERATION WITH COCONUT SHELL

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**Abstract - Dynamic:** A typical normal for feasible structures is that they fundamentally lessen outflows, material utilize and water utilize and with commitment of monetary exuberance, ecological, wellbeing, and social fairness in it. This has required research into elective materials of development. The utilization of coconut by items has been quite a while wellspring of salary for a few people. Reusing of the arranged material is one technique for treating the farming waste. The utilization of coconut shell could be a profitable substitute in the arrangement of composite material that can be utilized as a lodging development, for example, concrete. In view to give new learning to the temporary workers and engineers on the best way to enhance the development business strategies and administrations by utilizing coconut shells and to maintain great item execution and meet reusing objectives, there is have to outline a specialized particular of solid utilizing coconut shell as totals that will meet the Indian standard prerequisites. In this examination, coconut shell is utilized as coarse total in concrete. The properties of coconut shell and coconut shell total cement is analyzed and the utilization of coconut shell total in development is tried. The undertaking goes for dissecting building properties of tests. The trademark properties of cement are resolved, for example, compressive quality and flexural quality utilizing the blend made by supplanting coarse total with pulverized coconut shell total with fractional substitution utilizing M20 review concrete. The undertaking additionally means to get ready and demonstrate that Coconut shell total is a potential development material for readiness of light weight concrete for development of building segments. Watchwords: Sustainable Building, Coconut Shell, Agricultural waste, Engineering properties, Light Weight Concrete.

**Key Words:** REINFORCED CONCRETE, COCONUT SHELL, CONCRETE PROPERTY ALTERATION, MATERIALS, TEST RESULTS

## 1. INTRODUCTION

### PRESENTATION

Presently a-days numerous designers and researchers are in procedure to discover different regular and additionally modernized routes for the generation of development materials particularly concrete. They are additionally sharp in keeping up its quality and quality and hence different materials are utilized as a substitution of a specific material

really taking shape of cement. One such material is coconut shell which can be utilized as a part of solid making by in part supplanting coarse total which is an imperative segment in concrete. Coconuts being normally accessible in nature and since its shells are non-biodegradable in; they can be utilized promptly in solid which satisfies every one of the characteristics of the first type of cement. Regular sources are draining by quick there ought to be some approach to stop it some place. One approach to beat this issue is to supplant the coarse totals utilized as a part of the generation of cement by coconut shell which are promptly accessible in nature. Utilization of this non-biodegradable material in cement would not just influence the development to cost less since coconut shells would require less costing when contrasted with the coarse totals yet in addition re-utilize the waste material and help in ecological viewpoint.

A potential exists for the utilization of coconut shells as substitution of ordinary total in both customary strengthened concrete and plain bond solid development. The utilization of coconut shells as fractional trade for customary totals ought to be energized as a natural insurance and development cost decrease measure. The expansion in populace additionally builds the modern side-effects, local squanders and so on. It has been seen in India that coconut shell (CS) as a farming waste, requires high dumping yards and in addition an ecological dirtying operator. COCONUT Coconuts are delivered in 92 nations worldwide on about in excess of 10 million hectares. Indonesia, Philippines and India represent just about 75% of world coconut creation with India being the world's second biggest coconut maker. A coconut manor is practically equivalent to vitality trim ranches; anyway coconut estates are a wellspring of wide assortment of items, notwithstanding vitality. The present world creation of coconuts can possibly deliver power, warm, fiberboards, natural manure, creature nourishes, fuel added substances for cleaner emanations, wellbeing drinks, and so forth. The coconut organic product yields 40 % coconut husks containing 30 % fiber, with tidy making up the rest. The substance organization of coconut husks comprises of cellulose, lignin, pyroligneous corrosive, gas, charcoal, tar, tannin, and potassium. Coconut tidy has high lignin and cellulose content. The materials contained in the packaging of coco tidies and coconut filaments are impervious to microbes and growths. Coconut husk and shells are an

alluring biomass fuel and are additionally a decent wellspring of charcoal. The real preferred standpoint of utilizing coconut biomass as a fuel is that coconut is a perpetual harvest and accessible round the year so there is consistent entire year supply. Initiated carbon made from coconut shell is considered to a great degree powerful for the evacuation of pollutions in wastewater treatment forms.

### Advantages of coconut shell recycling

The accompanying focuses recommend the summed up benefits:

- Production of light weight strengthened cement individual.
- Reuse and conservation of non-sustainable power sources.
- Preservation of the earth and lessening in arrive filling.
- Energy preservation and lessening in consumption of common assets.
- Cost sparing over conventional total employments.

### FOUNDATION OF STUDY

Gambhir (2005) the reasonableness of a specific lightweight concrete is controlled by the predefined compressive quality furthermore, the thickness of cement. the Coconut palm as one of nature's most noteworthy blessings to man. Coconut palm "shows the entire scope of human reliance on palm item". Its employments are army. Its most noteworthy variety of employments found on tropical Islands in the Pacific, where it furnishes the occupants with relatively every essential; human life would be unbearable, and at times inconceivable, without it. It gives nourishment, drinks, oil, drug, fiber timber, cover, mats, fuel and household utensils. The oil is utilized for cooking, blessing the body, enlightenment, grease and making cleanser. It isn't amazing that it has been known as the "tree of life" and mankind's most prominent supplier in the tropics. Coconut tree or palm (coco nufera) is an individual from the family Arecaceae (palm family) It is the main species in the variety coco, and is a substantial palm, developing to 30m tall, with pinnate leaves 4-6m long, pinnae 60-90cm long, old leaves split away neatly leaving the trunk smooth.

Gambir (2005) expressed that because of lessening in the heaviness of the solid delivered by utilizing light weight total this will upgrade better warm protection and in this manner moves forward the imperviousness to fire of the structure. Rossignolo and Agnesini (2001) Reported from their examination that lightweight solid creation produces low unit weight solid components which are favored as warm disconnection materials. By this solace temperature esteems can be furnished with bring down vitality utilization. They reasoned that due to the upsides of lightweight concrete in

giving warmth disconnection, the creation has expanded from mid 1980's until show day and an vital industry has created from it. Adegoke et. al (2008) revealed that various accomplishments have been made in looking into in to the use of nearby material which has pulled in consideration due to it's practical advantage of waste reusability and supportable improvement. Diminishment in development costs and the capacity to deliver lightweight are included points of interest. One of the weaknesses of ordinary cement is simply the high weight of cement. This substantial self weight will make it to some degree an uneconomical basic material. Endeavors have been made in the past to decrease the self weight of cement to increment the effectiveness of concrete as an auxiliary material. The thickness of typical solid extents from 2200kg/m<sup>3</sup> to 2600kg/m<sup>3</sup>, while that of lightweight exists in 300 to 2000kg/m<sup>3</sup>. There are numerous focal points of having low thickness, this incorporates:

- i. Diminishment in dead load
- ii. Increment the advance of building
- iii. Brings down haulage and dealing with costs
- iv. Low warm conductivity,

a property which moves forward with diminishing thickness Teo et. al (2006) expressed that by diminishing the heaviness of the structure, calamitous tremor powers and latency powers that impact the structures can likewise be at last lessened, as these powers are corresponding to the heaviness of the structure Gambhir (2005) the appropriateness of a specific lightweight concrete is dictated by the predetermined compressive quality also, the thickness of cement. the Coconut palm as one of nature's most prominent endowments to man. Coconut palm "shows the entire scope of human reliance on palm item". Its utilizes are army. Its most prominent variety of employments found on tropical Islands in the Pacific, where it gives the occupants with relatively every essential; human life would be horrendous, and now and again unthinkable, without it. It gives sustenance, drinks, oil,

pharmaceutical, fiber timber, cover, mats, fuel what's more, residential utensils. The oil is utilized for cooking, blessing the body, enlightenment, oil and making cleanser. It isn't astounding that it has been known as the "tree of life" and mankind's most noteworthy supplier in the tropics. Coconut tree or palm (coco nufera) is an individual from the family Arecaceae (palm family) It is the main species in the class coco, and is an expansive palm, developing to 30m tall, with pinnate leaves 4-6m long, pinnae 60-90cm long, old leaves split away neatly leaving the storage compartment smooth. Gambir (2005) expressed that because of diminishment in the heaviness of the solid delivered by utilizing light weight total this will upgrade better warm protection and along these lines progresses the imperviousness to fire of the structure. Rossignolo and Agnesini (2001) Reported from their examination that lightweight solid generation produces

low unit weight solid components which are favored as warm separation materials. By this solace temperature esteems can be given lower vitality utilization. They inferred that due to the upsides of lightweight concrete in giving warmth segregation, the generation has expanded from mid 1980"s until show day and an imperative industry has created from it. Adegoke et. al (2008) announced that various accomplishments have been made in looking into in to the utilization of nearby material which has pulled in consideration due to it"s practical advantage of waste reusability and supportable improvement. Decrease in development costs and the capacity to create lightweight are included preferences. One of the disservices of customary cement is simply the high weight of cement. This overwhelming self weight will make it to some degree an uneconomical auxiliary material. Endeavors have been made in the past to lessen the self weight of cement to increment the effectiveness of concrete as a basic material. The thickness of typical solid extents from 2200kg/m<sup>3</sup> to 2600kg/m<sup>3</sup>, while that of lightweight exists in 300 to 2000kg/m<sup>3</sup>. There are numerous favorable circumstances of having low thickness, this incorporates:

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a property which progresses with diminishing thickness Teo et. al (2006) expressed that by decreasing the heaviness of the structure, disastrous tremor powers and idleness powers that impact the structures can likewise be at last decreased, as these powers are relative to the heaviness of the structure. Nor Azazi et al. (1999) lightweight solid utilizing oil palm shell, the substitution of total by oil palm shell lessened compressive quality of cement, the quality of 20 N/mm<sup>2</sup> still can be achievable and meet the arrangement of BS 8110:1985. From the Reinforced Concrete bar and section tests, it is discovered that arrangement of BS 8110:1985 can be securely connected to this lightweight cement. J.P. RIES (2011) considered that Lightweight total (LWA) assumes imperative part in the present move towards supportable solid, Lightweight totals adds to reasonable improvement by bringing down transportation necessities, upgrading basic effectiveness that outcomes in a lessening in the measure of general building material being utilized, preserving vitality, Reducing work requests and expanding the survive life of basic cement.

AMARNATH YERRMALLA (2012) et al contemplated the quality of coconut shells(CS) substitution and extraordinary and think about the vehicle properties of cement with CS as coarse total substitution. They presumed that:

a. Increment in CS rate diminished densities of the concrete.

b. With CS rate expanded the 7 days quality pick up too expanded with comparing 28 days curing quality.

VISHWAS P. KULKARNI (2013) contemplated that Aggregates give volume easily, including 66 percent to 78 percent of the solid. Customary coarse total in particular rock and fine total is sand in solid will be utilized as control. While regular material is coconut shell as coarse total will be explore to supplant the total in concrete.

### III. TRIAL PROGRAM AND METHODOLOGY.

#### MATERIALS

The properties of material utilized for making solid blend are decided in lab according to applicable codes of training. Diverse materials utilized as a part of present examination were concrete, coarse totals, fine totals, notwithstanding steel bars. The point of concentrate of different properties of material is utilized to check the execution identified with traditional techniques. The depiction of different materials which were utilized as a part of this investigation is given beneath:

Readiness OF MATERIALS FOR MIX Materials utilized for this thesis blend bond, coarse totals, fine totals, water, Coconut shell total what's more, Steel for fortification. The solid blend utilizes a solitary gathering of bond supply to limit variety of results. Totals are chosen through degree test which are free from debasements were checked and certain benchmarks were gone along over the span of this investigation.

#### COCONUT SHELL AGGREGATES

The coconut shell total was gotten from the neighborhood vendors of coconut in the market region and sanctuaries region, situated inside Bhopal (M.P). It was sun dried for two months before being pounded in the quarry. The smashed Coconut shell material was later transported to the research center where they were completely cleaned and washed, at that point permitted to dry under surrounding temperature. The coconut shells were accessible in different shapes, for example, bended, flaky, stretched, generally illustrative and other unpredictable shapes. The sizes appeared underneath were acquired previously pulverizing. Keeping in mind the end goal to find out the properties of coconut shell total the accompanying tests was completed which incorporates the particular gravity, molecule estimate conveyance and porosity/water retention limit. Every one of these tests were performed in understanding to Indian Standards. The outcomes are displayed in tables.

#### PROPERTIES OF COCONUT SHELL

Coconut shell has high quality and modulus properties. It has included favorable position of high lignin content. High lignin content makes the composites more climate safe. It has low cellulose content because of which it ingest less dampness as contrast with other horticulture squander. Coconuts being normally accessible in nature and since its shells are non-



biodegradable; they can be utilized promptly in solid which may satisfy every one of the characteristics of the original form of concrete

**IV. DETAILS OF REINFORCEMENT FOR PREPARATION OF BEAM**

For this experimental set up, No of beams were casted and tested which is of 1.2m long 0.1m wide and 0.2 m deep. One is conventional concrete beam; the other was coconut shell concrete beam. The beam was designed as under reinforced section to carry on a minimum ultimate load of 70 KN. The beam consists of two 12Ø bars at bottom & two 8Ø hanger bars at the top. 8Ø @135 stirrups are provided as stirrups to hold the reinforcements and to act as shear reinforcements. The beams were casted with the dimension of 230mm wide and 150mm deep with the cover of 15mm. The diameter of the bar used is 12mm as tensile bars and 10mm as compressive bars. 6mm stirrups are used to hold the bars in its position. There were four types of beams were casted.

PREPARATION OF CONCRETE MIX (M20) The mix proportions obtained for the various mixes cast are tabulated in Table 3.7 Table

2:Proportions of Concrete Mixtures for Compressive strength Cubes Preparation

**Table -1:** Sample Table format

MIX	MIX DESIGNATION (M20)	WATER (W),%	CEMENT (C) Kg	FINE AGGREGATES (FA),Kg	COARSE AGGREGATES, (CA)Kg	COCONUT SHELL AGGREGATES, Kg
M1	1:1.5:3	0.45	1.47	2.20	4.41	00
M2	1:1.5:3	0.45	1.47	2.20	3.96	0.44
M3	1:1.5:3	0.45	1.47	2.20	3.52	0.89
M4	1:1.5:3	0.45	1.47	2.20	3.08	1.33

**TEST ON FRESH CONCRETE WORKABILITY TEST OF CONCRETE**

Fig 3: Workability test of concrete by slump cone method



**TESTS ON HARDENED CONCRETE**

COMPRESSIVE STRENGTH Compressive strength is calculate using the following formula: Compressive strength (kg/cm2) = Wf / Ap Where Wf = Maximum applied load, (kg) Ap = Plan area of cube mould, (mm2).The results and graphs for compressive strength tests are tabulated in the next chapter.

Figure: Placing of concrete cube specimen in Compression testing machine.



**BEAM FLEXURAL STRENGTH (BENDING) DESCRIPTION OF SPECIMENS**

The Reinforced solid shafts are threw of M20 review concrete (1:1.5:3) in this test work, were the measurements of shafts was 100 mm wide x 200 mm profound x 1200 mm long are threw with 2-12Ø bars at base and 2- 8Ø holder bars, 8Ø @135 stirrups are given. The shafts are threw with the variable level of coconut shell total asubstitution of coarse total to decide its twisting quality.

S. NO	Coconut shell aggregate s, %	W/C	Fck N/m m <sup>2</sup>	Fy N/m m <sup>2</sup>	Ast mm <sup>2</sup>	Size of the beam	Design load kn
B.1	0	0.45	26.6	415	226.2	1200X200X100	70.4
B.2	10	0.45	26.6	415	226.2	1200X200X100	70.4
B.3	20	0.45	26.6	415	226.2	1200X200X100	70.4
B.4	30	0.45	26.6	415	226.2	1200X200X100	70.4

Before conducting the experiments some assumptions are made as following: The planes of the cross section of the beam considered will be remains plane before bending and after bending. The bonding between the concrete and steel will be prefect and homogenous.The stress-strain behavior of concrete and steel are mostly similar. The tensile strength of concrete is ignored. All the tensileonly bythe reinforcement. The stress-strain relationship for the compressive zone in concrete is assumed to be parabolic that results inobtaining the strength.

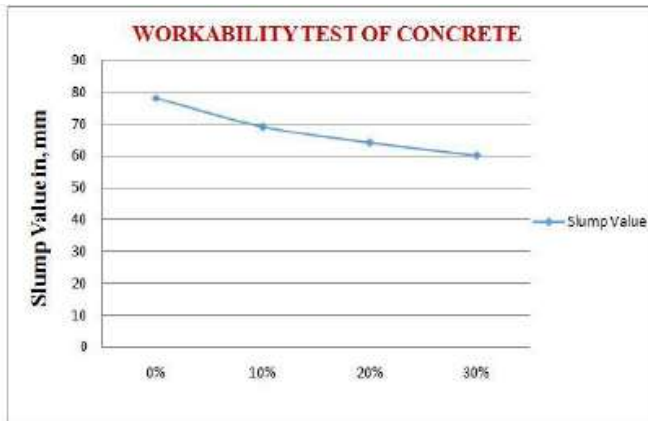
**TEST RESULTS: WORKABILITY (SLUMP CONE TEST)**

Slump cone test was conducted on all samples. Concrete mix with 30% coconut shell aggregate gave the lowest slump with 60 mm while control mix showed a slump measurement of 78 mm. Graph shows the reduction in slump measurement when coconut shell aggregate was added.

Table 5: Workability Test results of cement replaced with

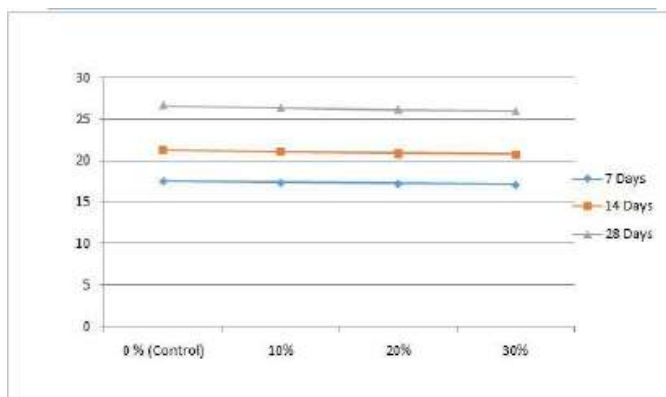
S.No	CSA, %	Weight of CSA in Mix (Kg)	Slump Value, mm
M1	0	00	78
M2	10	0.44	69
M3	20	0.89	64
M4	30	1.33	60

Graph 1: Workability testing of concrete Mix with CSA.

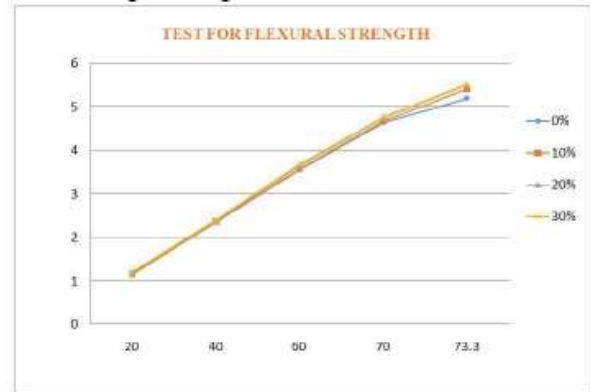


**COMPRESSIVE STRENGTH**

Table 5: Details of Compressive Strength test with various %



Flexural Strength testing of concrete Beam with variable CSA%



This examination was embraced to research the compressive quality and flexure quality of solid 3D shape and R/F Beam with substitute of common coarse total with coconut shell total in solid blend. Coarse total was reasonably supplanted by coconut shell total in solid blend at distinctive rate i.e. 0%, 10%, 20%, and 30%. On the birthplace of this trial work done in the research facility, following conclusion can be drawn.

**PERCEPTION ON FRESH CONCRETE**

Visual perceptions amid blending and compaction of the cements proposed that the solid were homogeneous; there was no isolation and dying, the blends were compactable. By supplanting the ordinary total with coconut shell total, the solid produced using it falls under the classification of light weight concrete. Expansion of coconut shell total in supplanting with common total into the solid essentially diminishes the workability because of its lightweight. Coconut shell concrete has normal workability due to the smooth surface on one side of the shell. So we could utilize coconut shell concrete in cements where high workability is attractive. The CSA blend concrete has less droops, the droop esteems of the cements were between 70-80mm. The droop diminished with increment in CSA rate.

**PERCEPTIONS ON HARDENED CONCRETE**

Development of Sustainable Light-weight concrete is accomplished by supplanting of CSA with characteristic coarse totals. Increment in rate substitutions by coconut shells decreased the quality and thickness of cement. The dry thickness of blend was under 2000 kg/m<sup>3</sup>. Minute Compressive Quality and Flexural quality decrease is watched fluidly contingent upon the rate utilization of Aggregates and Coconut shells. It needs in quality when contrasted with customary concrete however it can be disregarded and embraced for the light weight structures. Since minute non-uniform varieties are seen in the quality of Coconut Shell Concrete, it can be successfully utilized for Low Strength Concrete Mixes. Coconut shells can be utilized as halfway substitution of smashed stone or on the other hand other ordinary totals in fortified cement development. Up to 20 to 30% of total supplanted by coconut shell is great as indicated by quality and cost shrewd.

Endeavoring to supplant total by coconut shell halfway to make solid structure more financial alongside great quality criteria. General cost decrease of the development is watched. From the exploratory outcomes and discourses of above inquires about on coconut shell, the coconut shell has potential as lightweight total in concrete. Additionally, utilizing the coconut shell as total in cement can diminish the material cost in development in light of the minimal effort and its accessibility is wealth. Coconut Shell Concrete can be utilized as a part of provincial territories and spots where coconut is plentiful and may likewise be utilized where the traditional totals are expensive.

### SUGGESTION

The investigation found that expansion of coconut shell as incomplete total substitution decreases the solid workability inferable from its shape and rougher surface. To build the speed of development, improve green development condition we can utilize lightweight cement. The likelihood exists for the incomplete supplanting of coarse total with coconut shell to deliver lightweight cement. Coconut shell shows more opposition against squashing, effect and scraped area, contrasted with squashed rock total. Coconut shell can be gathered under lightweight total. There is no compelling reason to treat the coconut shell before use as a total aside from water retention. Coconut shell is perfect with the concrete.

The 28-day air-dry densities of coconut shell total concrete are under 2000 kg/m<sup>3</sup>. In any case, it is intriguing to take note of that substitution of normal coarse total by coconut shell brought about the moment reduction of compressive quality and flexural quality contrasted with customary solid blend. It can be comprehended by the outcomes that mix of a lot of coconut shell will produces harsher blend which make troubles create thick concrete. Our investigation had numerous impediments, of which the time was a noteworthy concern. The sturdiness properties of coconut shell concrete are to be refreshed before for all intents and purposes applying our venture. Toughness tests on CSA which may take around a year to finish can be led as a future work. The quality properties of CSA rely upon the total properties of coconut shells and its individual quality trademark.

### REFERENCES

- [1] IS CODES: "I.S:10262-198". Prescribed rules for solid blend outline, Bureau of Indian Norms, reaffirmed, New Delhi 1999.
- [2] "IS: 383 - 1970". Determination for coarse and fine totals from normal hotspots for concrete.
- [3] "I.S:456:2000". Code of training plain and fortified cement.
- [4] "IS: 8112-1989". Determinations for 43-Grade Portland bond, Bureau of Indian Standards, and New Delhi, India.

[5] "I.S: 516-1959". Technique for test for quality of solid, Bureau of Indian Standards, New Delhi, 1959.

[6] "I.S: 2386 (Part I, IV, VI)- 1988". Indian standard Technique for test for total for solid, Bureau of Indian Standards, Reaffirmed, New Delhi, 2000.

[7] "IS: 1199-1959". Indian Standards Methods of Inspecting and Analysis of Concrete, Bureau of Indian Standards, New Delhi, India.

[8] REPORTS/JOURNALS/PAPERS: Dewanshu Ahlawat , L.G.Kalurkar (2013), "Quality Properties of Coconut Shell Concrete", International Diary of Civil Engineering and Technology, vol 4, issue 6 Dec 2013.

[9] Kulkarni V.P, Kumar .S, (2013), "Near ponder on coconut shell total with traditional concrete", Vol.2, Issue 12, pp 67-70

[10] Daniel Y.O, (2013), "Test Assessment on Coconut Shell as total in concrete", Global Journal of Engineering Science Creation, Vol.2, Issue 5, pp 07-11

[11] Amarnath Yeramala, Ramchandrudu.C, (2012), "Properties of cement with coconut shell as total substitution", International Journal of Building Inventions, Vol.1, Issue 6, pp 21-31

[12] R. Nagalakshmi, "Test Study on Strength Qualities on M 25 Concrete with Partial Supplanting of Cement with Fly Ash and Coarse Total with Coconut Shell", International Diary of Science and Engineering Research, 2013, Vol. 4, Issue 1.

[13] K. Gunasekaran, "Usage of Coconut Shell as Coarse Aggregate in the Development of Light

Solid", Thesis-SRM University, 2011.

[14] Majid Ali and NawawiChouw, "Coir Fiber and Rope Reinforced Concrete Beam Under Dynamic Stacking", Thesis-University of Auckland, New Zealand, 2009.

[15] Olanipekun,E.A.,Olusola,K.O. also, Ata O, "A relative investigation of solid properties utilizing coconut shell and palm bit shell as coarse totals". Building and Environment 41: pp: 297-301, 2006.