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Study and Development of Bamboo concrete Composite Structure for Tribal Area- A Review

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Abstract:- Concrete is the most consumed material, with three tons each year utilized for each individual on the planet. Two times as much cement is utilized in development as any remaining structure materials consolidated. Concrete has superb trademark in compressive strength, yet low in rigidity. Steel generally utilized in supporting material on account of high elasticity. The utilization of steel as supporting material is restricted on the grounds that it is exorbitant and furthermore makes a difference on air contamination during its assembling interaction. As a choice to conquer this issue, bamboo material has been utilized as a substitution of support in concrete. Bamboo is a reasonable material since it is a characteristic material, modest and furthermore accessible material. In this research, the exhibition of bamboos as an elective material in supported concrete has been assessed. Elasticity trial of bamboos has been performed to recognize the yields stress of bamboos. The utilization of beneficial cementations materials, for example, fly ash has seen a consistent development among the new investigations as a conservative and viable answer for halfway concrete substitution. A difficult issue while supplanting concrete is that the valuable materials influence substantial properties contrastingly as indicated by different factors, for example, the grade of concrete, the level of substitution, restoring periods and climate condition.

Key Words: *Bamboo, Fly ash, Reinforcement, Economical, Durable.*

I. Introduction:

Concrete is a broadly involved development material for its different benefits, for example, minimal expense, accessibility, imperviousness to fire and so on. Be that as it may, it can't be utilized alone wherever in view of its low elasticity. The plain concrete has an exceptionally low rigidity, restricted flexibility, and little protection from breaking. In this way, for the most part, steel is utilized to support the substantial in light of the fact that steel has a high rigidity to supplement the low elasticity of cement. In development, the utilization of steel is exorbitant and caused such a lot of energy-consuming in its assembling cycle. In this way, a reasonable material should be utilized to substitute steel in development. The material should give accessibility a minimal expense, harmless to the ecosystem and furthermore less energy-consuming. Resolving this multitude of issues, bamboo is one of the reasonable substitutions of building up bar in concrete for minimal expense developments. Bamboo is effectively open as it is accessible in pretty much every tropical and subtropical locale.

Fly ash is a fine gray powder consisting mostly of spherical, glassy particles that are produced as a byproduct in coal-fired power stations. Fly ash has pozzolanic properties, meaning that it reacts with lime to form cementations compounds. It is commonly known as a supplementary cementations material. The commencement of the utilization of "fly ash" term started in 1930 however it was exclusively in 1937 that fly ash was accounted for via Carlson et al. to be used in concrete in North America. Fly ash is known for his capacity to decrease water necessity in substantial combinations yet on the other hand its pozzolanic response is more slow which might postpone the setting season of cement.

II. Review on bamboo use as reinforcement:

1. Ayesha Siddika and et. al (2017):-

Authors investigated the physical and mechanical properties of bamboo fortifications. Bamboo supported cement footer examples were tried with various support proportions and noticed the heap limit, avoidance and disappointment designs. It was seen that, flexural strength of bamboo supported segment is adequate higher than plain concrete and practically identical to steel built up cement footers. Bamboo supported substantial segments with various support proportion likewise tried and noticed a definitive compressive strength and disappointment design. It found, all sections fizzled in a comparable example because of smashing of cement. As indicated by cost examination, bamboo built up shafts and sections with moderate support proportion showed the best strength-cost proportion among plain concrete cement and steel supported cement.

Authors conclude that the yield strength of bamboo fortifications is about 105 N/mm2 about 33% of that of steel, with low modulus of flexibility. The heap conveying limit and flexural strength of the BRC radiates are seen as much better as for plain concrete cement footer. It was viewed as 32% more strength than PCC bar when utilizing just two bamboo fortifications of 12 mm distance across. Pressure conveying limit relies incredibly upon properties of cement and holding between fortifications and cement.

BRC segment can stand up to more pressure than PCC. PCC sections can't avoid redirection subsequent to breaking, in any case, BRC segments endures a huge diversion later breaking begins.

2. Rahim N. L. and et. al (2020):-

Author's execution of bamboos as an elective material in built up concrete has been assessed. Rigidity trial of bamboos has been performed to recognize the yields pressure of bamboos. From the test, result has shown that bamboo has a comparative trademark with steel and bamboo can be utilized as an elective material for supporting cement. In any case, the quality of bamboos showed high water ingestion and low holding strength between bamboo's surface and cement. In this exploration, a waterproofing specialist has been utilized to limit water retention and increment the holding strength. Flexural strength trial of the bamboo separately supported pillar with the size of 150 mm x 150 mm x 750 mm has been embraced to decide the exhibition of bamboo as support. From the test, it has come about that bamboo give great potential as an elective material in substantial support for minimal expense lodging industry.

Authors conclude From the flexural trial of bamboo built up bar, it has been considered that involving bamboo to be support in cement can builds the load conveying limit of the bar. From the ductile test, it shows that bamboos have comparable conduct like steel which comprise the flexible trademark. As bamboo is eco-accommodating material, restricting the utilization of steel can decrease the carbon dioxide emanations. In the green structure idea, the utilization of bamboo supported cement might be recommendable. Further review should zero in on the most proficient method to further develop the holding strength among bamboos and cement. Water assimilation of bamboo is very high and waterproofing specialist is prescribed to limit the water assimilation during concrete projecting to further develop the holding strength among cement and bamboo.

3. Prof. Ajit M. Kadam and et. al (2020):-

Authors investigated Bamboo fortified concrete is a composite material containing concrete, sand, aggregate, water and bamboo. The present moment, bamboo sticks are flowed all through the strong. The social capability of this composite material is amazingly better than that of invigorated concrete and various other advancement materials of identical cost. Along these lines advantage, the usage of BRC has extended during the latest 10 years and its current field of utilization fuses safe. Use of bamboo as a building up material in strong turn of events and its expansive use in the replacement with steel as help in strong weight bearing people. . Concentrate on outcomes will be used for the finding of a strategy for the replacement of bamboo as supporting material in the ideal aggregate and the right degree and the best circumstance rather than steel just as with steel.

Authors conclude that the Bamboo, on utilizing as support in concrete avoids more because of low thickness; yet 100 % substitution doesn't achieve enough flexural strength. Thus it can't be utilized in significant part in structure yet taking less burden, for example, rooftop it very well may be utilized. Sections of stopping region, public latrines, guardian lodges and overhangs. It likewise helps in cost adequacy and diminishes ecological impacts that are cost by steel creation.

4. Masakazu Terai and et. al (2012):-

Authors read up for understanding the mechanical conduct of bamboo built up substantial part and explaining the distinctions of underlying properties from steel supported cement. This explores the mechanical properties of bamboo built up substantial design. It looks at these exploratory aftereffects of bamboo built up concrete individuals with the trial ones of built up substantial individuals, and the mechanical property of the bamboo built up substantial individuals is contemplated. From these trial works, the chance of successful utilizing of 'Bamboo'.

Authors conclude that the Bamboo, tensile strength filled with cement paste cured w/c=80% and 100% significantly increase with aging time. The behavior of pull-out test with bamboo is almost the same as the plain steel bar; however, the bond strength with bamboo was higher than the one with plain steel bar. It can be expected that the bond strength covering with full treatment shows the high value 1.2-1.35MPa. Bamboo reinforced concrete slab: When fresh concrete is poured, its water will moisten the bamboo; then, the concrete will harden and lose water so that the bamboo will again dry out. This drying process will completely break any bond between the bamboo and the concrete. It can be considered that underground humidity is high at any times therefore supply of water to the concrete can be accomplished.

5. Alvin Harison and et. al (2017):-

Authors investigated with the assistance of exploratory examinations the mechanical properties of bamboo supported cement has been introduced as far as compressive strength, split rigidity and flexural strength. In India biggest number of populace is living in country regions or they are locals. These individuals are working at little scopes to satisfy their business and a large portion of them are residing in little houses. In such conditions minimal expense lodging could be the most ideal choice and use of bamboo as development material can assume a vital part to accomplish the objective. A few scientists are running after the prudent and eco-friendly or green development. To give consideration in such manner an exploratory review was performed involving bamboo as the substitution of steel.

Authors conclude that the palatable expectation also conceivable outcomes of involving bamboo support as a substitution of steel support in concrete designs might be achievable as far as minimal expense green development. Other variable like strength of the bamboo supported cement is likewise expanding with the age. In the field of green development utilization of bamboo as steel substitution where the accessibility of steel material is low and furthermore the expense is high can be the better arrangement.

6. Omkar Gaikwad and et. al (2014):-

The use of small diameter whole culm (bars) and/or split bamboo has often been proposed as an alternative to relatively expensive reinforcing steel in reinforced concrete. The motivation for such replacement is typically cost bamboo is readily available in many tropical and sub-tropical locations, whereas steel reinforcement is relatively more expensive and more recently, the drive to find more sustainable alternatives in the construction industry. This review addresses such 'bamboo-reinforced concrete' and assesses its structural and environmental performance as an alternative to steel reinforced concrete. A prototype three bay portal frame, that would not be uncommon in regions of the world where bamboo-reinforced concrete may be considered, is used to illustrate bamboo reinforced concrete design and as a basis for a life cycle assessment of the same.

The variability of longitudinal mechanical properties of bamboo are similar to those of wood, having co-efficient of variance between 10 and 30%. Due to the absence of radial fibres, however, bamboo is particularly weak in the direction perpendicular to the fibres, making it especially susceptible to longitudinal shear and trans-verse tension and compression failures. Steel, on the other hand, is a man-made, isotropic and ductile material having a density of 7800kg/m3and a tensile yield strength of conventional reinforcing barsbetween400and550 MPa. Additionally, steel is easily shaped to optimize its mechanical efficiency, requiring relatively little material to resist loads in a predictable manner. Such optimization is not easily accomplished with bamboo without substantial processing, altering its properties and nature.

7. Hector Archila and et. al (2017):-

Bamboo is frequently referred as a highly renewable and high-strength alternative material to timber and, occasionally as a 'strong-as-steel' reinforcement for concrete. The high rate of biomass production and renewability of sustainably managed bamboo plantations are undeniably key benefits of bamboo. Nonetheless, favorable comparison with steel, in terms of strength, is not valid. In a dry state, bamboo characteristic strengths are, at best, comparable to that of high-grade hardwood between 30 MPa and 50 MPa. Bamboo is a typically hollow, anisotropic, natural material with high variability of physical and mechanical properties across the section and along the culm. The density of bamboo varies through the cross section with typical values ranging from 500 to 800 kg/m3.

8. Alireza Javadian and et. al (2012):-

Reinforced concrete is described as the "most fruitful and generous of all building materials" by Pier Luigi Nervi, an engineer and contractor and one of the greatest 20th-century structural designers in reinforced concrete. Over the past century, reinforced concrete has significantly transformed the built environment. The concrete matrix creates a protection layer around the reinforcement steel member by providing an alkaline environment with a pH level of 12 to 13, where a thin oxide layer forms on the steel reinforcement prevents iron atoms from dissolving.

The water absorption of the bamboo composite reinforcement samples reached a maximum of 0.5% of the weight of the dry sample. The low rate of water absorption indicates the high resistance of the bamboo composite samples to water and moisture ingress, even at extreme conditions. A quasi-equilibrium state was achieved in both 23 ◦C and 60 ◦C temperatures after 170 h of immersion in water. Earlier studies on the application of natural bamboo from 1914 have indicated that raw bamboo has the potential for replacing steel in reinforced concrete beams, however problems that are associated with durability have impeded the widespread use of bamboo in the construction industry. This research demonstrates the potential of the newly developed bamboo composite material for use as a new type of element for non-deflection-critical applications of reinforced structural-concrete members. Durability is greatly enhanced since fibres are embedded in epoxy.

III. Review on Low- Cost Housing:

1. Preetpal Singh and et. al (2016):-

Low cost housing construction technologies aim to cut down construction cost by using alternatives to conventional methods and Input. "It is effective budgeting and technique which help in reducing cost of construction through use locally available material along with improve skills and technology without sacrificing the strength, performance and life of structure. ''Low cost housing merely satisfies the most bottom and fundamental human needs for shelter and neglects other needs that people aspire home including psychological, social, and aesthetic needs and ultimately, need for self-actualization. Construction cost in India is increasing at around 50 per cent over the average inflation levels.

2. Isabel Mino-Rodríguez and et. al (2016):-

The aim of this research is to assess the indoor thermal performance of rural dwellings in the Ecuadorian highlands through both experimental and numerical analysis. A three-step methodology was applied to conduct the research: (a) field data collection, (b) building thermal model development and calibration, and (c) comparison analysis and assessment of traditional improvement strategies. Qualitative and quantitative data were collected from two representative rural dwellings under typical usage conditions. The first is a traditional construction, medium-exposed thermal mass dwelling. The second is a local common, uninsulated, lightweight construction. The thermal model was calibrated by comparing hourly temperature values of the observed and the predicted indoor air temperature.

A high correlation level was achieved between the observed and predicted data; 0.89 in Case A and 0.94 in Case B. The results show that the roof, floor, and the airtightness are the critical building parameters affecting the indoor thermal environment. Likewise, the indoor air temperature is increased up to 4 ◦C through the implementation of traditional strategies. However, despite the rise in indoor air temperature, acceptable thermal comfort ranges were only reached for 25% of the total hours. The model is comprised of a single thermal zone which represents the original configuration of the open space. The parameters of the fabrics were selected from several resources.

3. Felichism Kabo and et. al (2004):-

Housing research is undertaken from different perspectives, resulting in a breadth of positions as to what should be studied. Most researchers of housing are grounded in one of the meta-fields of the social sciences, philosophy, and architecture. Research in this field has tried to provide academics and designers with explanatory theories of the built environment, rather than the normative theories typical in design discourse. EBS researchers have tried advancing either theoretical knowledge, or methodology more responsive to user needs. Most research is based on "one epistemological assumption: that science provides the only reliable way of acquiring knowledge".

There is an acute paucity of research on materials in all the social science approaches that I have mentioned thus far. Further, much of the content in this small body of work tends to be theoretical or speculative, rather than empirical and driven by an interest in the role materials play in shaping the dwelling process. Generally, there is a dearth of studies devoted to substantive and non-technical materials research. Research on materials and the role they play in the construction of the 'house' and 'home' has been

non-existent in 'housing studies' or the sociological discourse. In contrast, there is more research in the EBS framework on materials, though it hardly forms a sizable corpus. An example of a researcher working within the EBS perspective is Kaitilla, who proposed that "when choosing building materials, most people strive to full fill tangible, intangible, and environmental variables."

4. Mohammad Sharif Zami and et. al (2010):-

A critical review of the existing literatures, it appears that there is a lack of structured research, to date, carried out to identify and understand the potential inhibitors of contemporary stabilized earth construction in urban low cost housing. In addition, the inhibitors identified by different practitioners and researchers mentioned in the literature are generally written from their perception, and thus there is a lack of empirical data and validation through a research methodological process.

This article has investigated and analyzed the state-of-art review of literature of inhibitors influencing the adoption of contemporary earth construction in general and validated through Delphi technique. It was found that there is a lack of structured research, to date carried out to identify the inhibitors. Therefore, it was imperative to empirically substantiate the findings of the literature review and validate them through an appropriate research technique. In the Delphi technique experts agreed that the drawbacks and adoption inhibitors of contemporary stabilized earth construction are in fact the same. Diversified inhibitors and drawbacks were stated by the experts in both rounds of the Delphi technique from which 14 inhibitors and drawbacks were summarized and identified. It is important to note that 5 more inhibitors and drawbacks were identified in the Delphi technique in addition to 10 inhibitors identified in the literature review.

5. K. Jaiganesh and et. al (2013):-

Low Cost Housing is a different concept which deals with effective costing and following of techniques which help in reducing the cost construction through the use of faraway available materials beside with and technology improved skills without losing the power, performance and life of the structure. There is huge misconception that low cost housing is suitable for only subnormal works and they are built by using cheap building materials of low quality. The profit gained from use of such methods can decrease the cost of construction and make the low cost housing accessible to all. Affordable housing is a general term used to define housing that is affordable to lower or middle income households. Low-cost housing projects are characterized by an increasing demand mainly due to urbanization. The selection of building materials should meet the needs of local circumstances to improve value of life for the most desired ones by building innovative structures and/or by refining existing structures. Sustainability regarding urban housing intends to progress new approaches to succeed human settlements and integrate energy and environmental issues. To achieve a sustainable housing project is required a balance of environmental, economic and social issues with technical issues. Findings show that up to 60 % of the total cost of a low-income housing project is allocated to engineering project and construction materials. Moreover, walls organize up to 50% of a total cost of resources and up to 45% of total building time. Material source, manufacture techniques and labor requirements all have major impacts on the selection of wall building material. The main objective of this paper is to give detailed review on low cost building design, planning, selecting proper building material and construction.

6. Urban Research Centre University of Western Sydney (2008):-

There is substantial evidence of a growing housing affordability problem in Sydney as well as across Australia. The incidence of the problem has spread from very low-income through low-income into moderate-income households. There is now a consistent call for housing schemes to retain 'key workers' and 'the working poor' in established areas to ensure access to employment, education, public transport and other facilities and amenities. Lancome has a strategic position within this landscape and there exists a range of current and potential mechanisms Lancome might utilize to create and maintain a pool of affordable houses.

The housing affordability crisis has been developing for some years and has been increasingly documented in recent media reports. One of the biggest problems lower-income Australian households face today is finding affordable, secure and appropriate housing. While this has been an issue for some time, concerns that the problem has been worsening and affecting moderate as well as low-income, households have made this a priority issue at all levels of government. However, work on a broad contemporary definition of what is meant by affordable housing in Australia has been advanced under the policy development process for the Framework for National Action on Affordable Housing. Australian housing, planning and local government ministers have agreed upon the following definition to assist state and local government planning agencies in the task of promoting and monitoring the supply of affordable housing: Affordable housing is housing that is appropriate for the needs of a range of low to moderate income households and priced so that low and moderate incomes are able to meet their other essential basic living costs.

7. Mr. I. Michael Raj and et. al (2016):-

In aim to chop down construction value by victimization alternatives to standard strategies and Input. "It is effective budgeting and technique that facilitate in reducing value of construction through use regionally obtainable material in conjunction with improve skills and technology while not sacrificing the strength, performance and life of structure. "Low value housing simply satisfies the foremost bottom and basic human desires for shelter and neglects different desires that individuals aim home as well as psychological, social and aesthetic desires and ultimately, need for self-actualization.

8. Vivian W. Y. Tam (2017):-

Adequate shelter for all people is one of the pressing challenges faced by the developing countries. India is currently facing a shortage of about 17.6 million houses. The dream of owning a house particularly for low-income and middle-income families is becoming a difficult reality. Hence, it has become a necessity to adopt cost effective, innovative and environment-friendly housing technologies for the construction of houses and buildings for enabling the common people to construct houses at affordable cost. This paper compares construction cost for the traditional and low cost housing technologies. Case studies in India are used for the investigation. Construction methods of foundation, walling, roofing and lintel are compared. Strength and durability of the structure, stability, safety and mental satisfaction are factors that assume top priority during cost reduction. It is found that about 26.11% and 22.68% of the construction cost can be saved by using low cost housing technologies in comparison with the traditional construction methods in the case studies for walling and roofing respectively. This proves that using low cost housing technologies is a cost effective construction approach for the industry.

9. Rinku Taur and et. al (2014):-

This paper aims to point out the various aspects of prefabricated building methodologies for low cost housing by highlighting the different prefabrication techniques, and the economic advantages achieved by its adoption. In a building the foundation, walls, doors and windows, floors and roofs are the most important components, which can be analyzed individually based on the needs thus, improving the speed of construction and reducing the construction cost. The major current methods of construction systems considered here are namely, structural block walls, mortar less block walls, prefabricated roofing components like precast RC planks, precast hollow concrete panels, precast concrete/Ferro cement panels are considered.

In India, the technology to be adopted for housing components should be such that the production and erection technology be adjusted to suite the level of skills and handling facilities available under metropolitan, urban and rural conditions. There should be a logical approach for providing appropriate technology based on the availability of options, considering its technical and economic analysis.

10. Peter A. Erkelens (2007):-

The provision of low-cost housing is a continuous struggle for governments, as well as, for the individuals. Everyone is seeking the 'best' low-cost housing solution. In the past many attempts were undertaken to address this issue. One can find numerous examples of realized low-cost housing projects worldwide. However, the ideas and projects that were not taken forward and materialized are a multitude of that. It is of interest to analyze the existing low-cost housing and to draw lessons from them for the future. Is it possible to formulate a general set of requirements that a successful low-cost house should satisfy.

All over the world there is a shortage of decent low income housing. It is useful to distinguish low-cost housing and low-income housing. The first is housing built at low-cost, while the second is housing not necessarily built at low-cost. In the latter case a concept has been developed, in which the users are able to pay for that housing. This affordability can be created by subsidizing the cost of housing or of the users. This can result in the ownership of the house, after a number of years, depending on the finance concept / agreement. Apart from financial measures, the actual cost of housing can also be reduced by the use of low-cost materials, simple construction methods, repetition, smart designs compact construction, not forgetting the option of self-help building, and other methods of financing. This paper historically reviewed the research developments of TU/e, both in walls and roofing of low-cost housing in developing countries.

11. Ansari Abuzar (2017):-

Continuous struggle for government, as well as for the individuals. Everyone is seeking the 'best' low cost housing solution. In the past very attempts were undertaken to address this issue one can find numerous examples of realized low cost housing projects worldwide. This report is mainly concentrate on chapter construction material a few low cost material and planning are discussed in this report. The report are also includes an important chapter as specification the material for real construction of house are specified for example use of light weight solid blocks and as per planning view design of room size is depend upon size of brick and size of flooring material.

Low cost housing targets can be achieved by replacing the conventional methods of planning and construction materials which are mention in this paper and other locally available materials. Also engineers can use their own efficiency and innovative ideas to reduce cost of construction. A middle class family can construct their own house in low cost and pleasant manner.

12. Ham Singh (2011):-

Housing is a great problem in today's world. The most basic building material for construction of houses is the conventional burnt clay brick. A significant quantity of fuel is utilized in making these bricks. Also, continuous removal of upper surface of soil mass, in producing conventional bricks, creates environmental problems. A feasibility study has been done on the comparison of fly ash brick and conventional clay brick. Fly ash is an industrial waste which is just a burden for the industry we can take it free of cost from the industries and can utilize it for the manufacturing of fly ash brick. Fly ash brick have sufficient strength and comparatively low cost than conventional clay bricks. Conventional clay bricks can be replaced with fly ash bricks, which can reduce the overall cost of a house.

There is a general exodus of rural population to the cities with the rapid industrialization in developing countries. The infrastructure to support these cities, such as buildings for housing and industry, mass transit for moving people and goods, and facilities for handling water and sewage will require large amounts of construction materials. The rapid increase in the capacity of thermal power generation in India has resulted in the production of a huge quantity of fly ash, which is approximately 50 million tons per year. The prevailing disposal methods are not free from environmental pollution and ecological imbalance. Large stretches of scarce land, which can be used for shelter, agriculture or some other productive purposes, are being wasted for disposal of fly ash.

Fly ash, lime and gypsum are available in mutual proximity in many regions. An economical alternative to conventional burnt clay bricks will be available, if these materials can be used to make bricks and hollow blocks of adequate strength. Lime and gypsum are usually available either from mineral sources or may be procured from industrial wastes. Materials used for the manufacturing of fly ash bricks and their constitution. Fly ash is an industrial waste from the power stations; there rise a big problem of utilization of fly ash. Fly ash can be used for different purposes as it shows the cementing properties when mixed with water. The fly ash bricks can be manufactured easily and show sufficient strength. Cost of the fly ash brick is very low as compared to conventional clay brick. Conventional clay bricks can be replaced with the Fly ash brick.

13. Akhildeep Kurup (2018):-

Housing is the major sector of urban infrastructure. Government of India has launched the scheme "Housing for All by 2022" for urban areas. To achieve this goal Government is providing subsidy to the urban poor up to Rs. 1 lakh per house which causes huge burden over the country's economy. Despite urban houses are not affordable to the poor due to escalating land & construction cost. This scenario can be improved if the land or construction cost can be reduced to some extent without compromising with the quality of structure. Low cost housing offers the use of various low cost material & technique which reduces the overall cost of construction. In this paper an attempt is made to review the various researches on low cost housing material & techniques which can be used for both rural and urban areas according to their suitability in different conditions.

House or shelter is one of the basic necessities for a human being. Evolution of houses from huts and mud brick houses to G+1, cement plastered, multi-story housing colonies has witnessed a great change in lifestyle and housing needs of individual. The housing scenario in India has changed a lot during past few decades since independence. Nearly 31% of India's current population lives in urban areas and with increasing urbanization, urban areas expected to house 40% of India's population by 2030. Housing availability and various difficulties arising due to it is more critical in urban areas as compare to rural areas. This can be understood from the data given by NSSO (National sample survey organization) from the 69 round conducted on July 12 to December 12 which revealed that 61.1% of the urban population resided in their own houses and the other 35.4% in rented homes whereas in rural areas 93.3% of the population had own houses and near 5.1% where residing on a rental basis.

14. Nikhil R Mohire (2016):-

To minimize the cost of house and it give affordability to the people now days .the basic principle behind this is to reduce cost of project by reducing duration of project and using different techniques which helps to reduce cost of project without losing quality. There are three factors which affect the cost of housing i.e. time, material used and techniques. The selection of building materials should meet the needs of local conditions field study was carried out in pune city, comparison is carried out with the help of persons such as engineers in mhada, jnnurm, housing who are involved in construction of low cost housing. For achieving the low cost, perfect technique is required in this paper the use of perfect techniques and comparison between different techniques is discussed for cost control and reduction. Being one of the largest countries in the world and possessing one of the largest populations in the world India still has lots of areas where it is lagging behind in comparison with the topmost economies in the world. As we know India has population about 1.4 billion and increasing at an unbelievable rates. Since the availability of the land is limited and demands for their accommodation and various other needs is increasing. India is developing country having about 30% of people of high income group and other are middle class and low income group, low cost houses constructed without sacrificing performance and life of structure.

IV. Concluding Remarks:

1. Bamboo Fiber showed good potential and increased strength.
2. Bamboo, on using as reinforcement in concrete deflects more due to low density; but 100 % replacement does not attain enough flexural strength.
3. The yield strength of bamboo reinforcements is about one-third of that of steel, with low modulus of elasticity.
4. The flexural test of bamboo reinforced beam, it has been seen that using bamboo as reinforcement in concrete can increases the load carrying capacity of the beam.
5. The tensile test it shows that bamboo have similar behavior like steel which consist the elastic characteristic.
6. The behavior of pull-out test with bamboo is almost the same as the plain steel bar; however, the bond strength with bamboo was higher than the one with plain steel bar. It can be expected that the bond strength covering with full treatment shows the high value.
7. Large percentage of low calcium fly ash provides concrete with high permeability against the passage of chloride ions, better durability and low dilatation.
8. The workability of a mixture where fly ash replaced sand or aggregates reduces if it exceeds 8% replacement and becomes unworkable if it reaches 40%.
9. Fly ash used as cement replacement in high concrete grades decreases the compressive and early strength of these grades. Fly ash can be an economical solution that gives better 28 days strength by mixing a small portion of high grades concrete with a high fly ash percentage rather than a big quantity of low grade concrete with low ash percentage.

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