

A REVIEW ON UTILISING BAMBOO AS SUBSTITUTION FOR CONVENTIONAL BUILDING MATERIAL

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ABSTRACT

From the early occasions Bamboo is utilized as a development material. The Bamboo is utilized in both specialized just as non specialized manners. Our progenitors utilized Bamboo in the development of the houses. The Bamboo was utilized as the swaggers, posts, rooftops and so forth in the development of the houses. Presently a day's solid are utilized as the essential materials for the development works. The solid is feeble in the elasticity yet great in pressure Strength. So steel is utilized as support in the solid to accomplish the rigidity. Issues experienced with the normally utilized development material like steel are high in cost, erosion, and so forth As a result of the important credits of Bamboo, over the latest couple of years, looks at have been used Bamboo as basic material and stronghold in concrete. The fundamental snag for the utilization of Bamboo as a support is the absence of adequate data about its collaboration with solid, strength and solidness. This investigation presents the assessment of the possibility of the utilization of Bamboo as fortification in solid individuals. In this investigation the Bamboo was utilized as a fortifying material with no treatment and stirrups

Keywords: Bamboo Reinforcement, Crack, Flexure Test, Tensile Test.

I. INTRODUCTION

Bamboo is a traditional building material throughout the world's tropical and sub-tropical regions. Bamboo is a renewable and versatile resource, with high strength and low weight. That's why it is widely used in different forms of construction, particularly for housing in rural areas. It can also be used to make traps, cages, tools, weapons, bridges, rafts, towers, fences, water wheels, irrigation pipe, and thousands of other items. Due to its low tensile strength, it is generally reinforced with materials which are strong in tension (Generally steel bars). But the price of steel is very high and also it cannot find in all the places. To overcome this problem, Architecture, Civil Engineers, Industrialist research and Scientist were searched for the new alternative eco-friendly & lowest cost material to reinforce with concrete. At last they all found one alternative material, i.e. bamboo, which is very used for replacements of steel in concrete for eco-friendly & low cost constructions. Bamboos are evergreen perennial flowering plants in the subfamily Bambusoideae of the grass. Bamboo is an economical, orthotropic, natural, and easily available material. It is relatively strong in tension compare to compression. Numerous onlookers and scientists have been chipping away at the properties of bamboo to be utilized as strengthening bar in a fortified cement. From the beforehand analysts and spectators considers, it was discovered that bamboo strip bars can possibly be utilized as option for steel fortification.

II. LITERATURE REVIEW

Francis E Brink et.al(1966). It gives a bunch of guidelines on the best way to appropriately build an assortment of structures and primary components utilizing Bamboo. This study proposed not to utilize green, unseasoned Bamboo for general development, nor to utilize unwaterproofed Bamboo in cement. Concerning Bamboo fortified solid, it was discovered that the solid blend plans might be equivalent to that utilized with steel, with a droop as low as functionality will permit.

Suresh et.al(2008). It has covered the examination and the theoretical plan of a normal bamboo based shed structure under different burdens and their blends. Wind loads have been considered according to IS 875 PART 3 and the structure investigated in a straightforward manner by thinking about the conduct of a commonplace edge the cross over way. The proposed structure plans to give an option ecological agreeable development for a

steel mechanical shed, normally 10m in range and 5m in tallness. Not exclusively is the structure light contrasted with ordinary steel, it is simultaneously a few times less expensive and ecofriendly.

Agarwal A. et.al (2011). The studied axial compression and bending test was performed on Plain, Steel & Bamboo reinforced members. As clarified in there test program, For instance, a sum of 12 segments (150×150×1000 mm) were projected utilizing configuration blend (M20) according to IS code. These sections included 3 segments of steel fortification, 3 segments of plain solid, 3 segments of untreated bamboo support and 3 Columns of treated bamboo fortifications (with changing level of fortification; for example 3, 5, and 8%). The heap twisting bends showed critical nonlinearity, demonstrating 9that the bamboo has the ability to ingest energy. Disappointment of Columns predominately happened in shear under compressive stacking. 1Plain concrete and untreated bamboo segments demonstrated weak conduct in which, minuscule breaks happened at the outside of the segment 7 at about 80% of greatest pivotal power. There were no noticeable indications of ruined solid covering to caution of looming disappointment.

Anurag Nayak et.al (2013).To show the advantage of bamboo reinforcement in place of steel, building components are designed using steel and bamboo as a reinforcement. Further estimation of reinforcement is done. In this task we have picked progressed bamboo fortification strategy rather than customary steel support. Plan head and figuring accomplished for bamboo support are taken from US NAVAL CORPS rules and references. It is clear from results that this bamboo reinforcement technique is absolutely cheaper than steel reinforcement technique especially for single story structure.

Kaware. A et.al (2013) Tested and reported in their paper compressive and tensile strength. After trial study they finished up Water ingestion of bamboo is very high, rigidity of bamboo is acceptable and can be utilized as support in R.C.C structure for ease lodging project. And compression strength of round bamboo ranges from 47.9 to 69.9 MPa. They also conclude bamboo is weak in shear and bond, it cannot be used as shear reinforcement in R.C.C structure, hence it should be treated by epoxy coating, tar coating etc.

Nirav B. Siddhpuraa, et.al (2013) have carried out study on flexural element using bamboo as reinforcement. They have concluded in their study Bamboo specimen failed at the mid height by splitting of the fibers, all the beam elements reinforced with surface coated bamboo strips showed ductile failure.

Jaazim Salahudin et.al (2014). Physical and mechanical properties of bamboo. Sturdiness of Bamboo and protection Techniques. The typified energy of various materials. The cost of making one cubic meter of concrete is calculated for both steel reinforcement and bamboo reinforcement. The cost analysis further emphasis its feasibility to be used in construction

Ashok Kumar et.al (2015). To check the attainability and unwavering quality of utilizing bamboo braces as fortifying material in solid components and to choose and set up the most suitable sort of bamboo example to be utilized on solid component as fortification. Density Test, Initial Moisture content test, Water absorption test, Compression test, Tension test are conducted on bamboo. The following test values have been used to select and prepare the most appropriate kind of bamboo specimen to be used in concrete element as reinforcement

Hector Archila et.al (2018). It examines about these issues, giving a comprehensive audit of the writing in the field and a primary correlation between steel support and bamboo fortification in an ordinary solid structure. The standard extent of this audit is purposefully restricted to the utilization of little breadth entire culm (bars) and additionally split (a.k.a. braces or round strips) bamboo. Ongoing advances in bamboo-compos-ite materials may speak to a suitable bamboo-based cement strengthening item that will be just quickly examined in this paper.

Mritunjay Kumar Singh et.al (2020). The hypothetical exhibition of the exhaustive utilization of bamboo as a fortifying material in solid development and its broad use in the replacement with steel as fortification in solid burden bearing individuals. The development standards associated with the planning of bamboo strengthened individuals and structures have been talked about in this paper, the utilization of bamboo instead of steel as entire just as with steel is appeared to guarantee the decrease in weight, monetary preferences which is strength bargained to a slight and safe level

III. CONCLUSION

From the detailed review of the literature we can infer that the distinctive mechanical and physical properties of bamboo. The outcomes will be utilized for the derivation of a strategy generally reasonable for the substitution of bamboo as fortifying material in the perfect sum and the correct extent and the most ideal arrangement instead of steel and additionally with steel. It is a hypothetical exhibition of the exhaustive utilization of bamboo as a strengthening material in solid development and its broad use in the replacement with steel as fortification in solid burden bearing individuals. What's more, same properties have been utilized in the plan and examination of bamboo as the substitution for RCC in programming. The utilization of bamboo in the spot of steel overall just as with steel is appeared to guarantee the decrease in weight, financial favorable circumstances with its solidarity traded off to a slight and safe level.

IV. REFERENCES

- [1] Francis E Brink and Paul J Rush (1966), "Bamboo reinforced", U. S. Naval Civil Engineering Laboratory, February 1966
- [2] Suresh Bhalla, Supratic Gupta, Puttagunta Sudhakar and Rupali Suresh (2008), "Bamboo As Green Alternative To Concrete And Steel For Modern Structures", Journal of Environmental Research And Development Vol. 3 No. 2, OctoberDecember 2008
- [3] Agarwal A., and Maity, D. (2011), "Experimental investigation on behavior of bamboo reinforced concrete members", 16th International Conference on Composite Structures ICCS 16
- [4] Anurag Nayak, Arehant S Bajaj, Abhishek Jain, Apoorv Khandelwal and Hirdesh Tiwari(2013), " Replacement of Steel by Bamboo Reinforcement", IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE), Volume 8, Issue 1 (Jul. - Aug. 2013), e-ISSN: 2278-1684,p-ISSN: 2320-334X,, PP 50-61
- [5] Kaware, A., Awari, U. R. and Wakchaure, M. R. (2013), "Review of bamboo as reinforcement materials in concrete structure", International Journal of Innovative Research in Science, Engineering and Technology, Vol.2(6), pp. 2461-2464
- [6] Nirav B. Siddhpuraa, Deep B. Shaha, Jai V. Kapadiaa, Chetan S. Agrawal and Jigar K. Sevaliaa (2013), "Experimental study on flexural element using bamboo as reinforcement", International Journal of Current Engineering and Technology, Vol.3(2), pp. 476-483
- [7] Jaazim Salahudin (2014), "Using Bamboo to replace steel in reinforced cement concrete structures in India", Manipal University, November 2014
- [8] Dr. Ashok Kumar Gupta, Dr. Rajiv Ganguly and Ankit Singh Mehra(2015), "Bamboo as Green Alternative to Steel for Reinforced Concrete Elements of a Low Cost Residential Building", EJGE, Vol. 20, Bund. 6 Pg 1523-1545
- [9] Hector Archila, Sebastian Kaminski, David Trujillo, Edwin Zea Escamilla and Kent A Harries (2018), "Bamboo reinforced concrete: a critical review", International Union of Laboratories and Experts in Construction Materials, Systems and Structures(RILEM), Materials and Structures (2018) 51:102
- [10] Mritunjay Kumar Singh, Shiv Pratap Singh, Kaisar Jamal & Piyush Verma (2020), "BAMBOO REINFORCED CONCRETE: A Review", International Research Journal of Engineering and Technology (IRJET) Volume: 07, Issue: 06(June2020) e-ISSN: 2395-0056 p-ISSN: 2395-0072
- [11] IS 456:2000 (2000), "Plain and Reinforced Concrete" , Bureau Of Indian Standards, New Delhi.
- [12] IS 875 (Part 1) – 1987 (1989), "Dead Loads – Unit weight of Building materials and Stored materials", Bureau Of Indian Standards, New Delhi.
- [13] IS 875 (Part 2) – 1987 (1989), "Imposed Loads", Bureau Of Indian Standards, New Delhi.
- [14] IS 15912 : 2018 (2018), " Structural Design Using Bamboo — Code of Practice (First Revision)", Bureau Of Indian Standards, New Delhi.