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# Use of Primary Steel Rebar and Its New Techniques Used in High-Rise Building in Construction Industries: A Review

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***Abstract:*** ***Steel concrete composite structures have gained widespread recognition worldwide for the construction of various types of structure. The steel utilise by various industries in India is less comparing to other developed country. The various types of steel rebar are used in the construction and some are in research mode. The various steel industries are to target to achieve the maximum strength and durability with satisfy the properties of steel bars. The articles deals with review of various research papers related to new approach adopted for construction of structure for steel bars in the concrete structure. Based on the various paper surmise report is prepared. The review of articles concluded that it is demand of current industry to assist and evolutes the primary bars and new techniques for advanced technology.***
***Keywords: Primary Bar, Concrete Structure, New Techniques, Construction Material, strength and durability***

## I. INTRODUCTION

Steel is an alloy of iron and carbon. Of all the building materials used today, steel is the most versatile and versatile civil engineering material. It is known that steel has a structure that no one else can. The durability and strength of steel do not correspond to wood or concrete. A steel structure is a set of group members that is expected to last. Steel is very elastic, ductile, malleable and wieldable. Steel has high tensile and compressive strength and is much more resistant to wear. The most important property of steel used in large-scale construction is its flexibility, so that it can bend without cracks. The steel structure is particularly good for energy dissipation. Steel is a material with a high strength per unit mass. The function of the whole structure is that it is stressed by wind, earthquake or load without failure or excessive damage, such as excessive deflection. Understanding the seismicity and seismic tectonics of the areas is important. Steel is one of the most widely used building materials in the world. The strength, toughness and high elasticity inherent in steel are properties that are ideal for seismic design. To reap these benefits in seismic applications, the design engineer must be familiar with the relevant steel design provisions and the purpose stated in their codes. As we all know today, the construction industry is rapidly exploring on a large scale and includes new techniques for fast and convenient farming. The main building material concrete plays an important role in this sector. The main component of concrete is natural resources, which are both expensive and on the verge of price. Therefore, it is very important to find an alternative.

Fig. 1 Typical Steel primary bar

 

## II. LITERATURE REVIEW

The articles present the short summary of various researchers based on use of new methods and steels bar in the civil engineering construction. The reviews are as follows:

### *A. Takumi I., Seiji F. & et. al. (2009)*

This article presents the evaluation and application of typical steel products of JFE Steel for high-rise building construction. JFE manufactures H-shaped plates, flanges, piles, and piles using TMCP Engineering. The article evaluates the properties such chemical & physical of HBL385 Steel. Articles estimating the steel sections of different sections such as BOX, HH, Tube (CFT, Beam (H-Shape) have been created. These new standards include SN, STKN, BCR standards. BCP, STKR With the help of this new technology By identifying the economical environment and technology trends, JFE Corporation intends to accurately capture the future needs of users and develop and recommend quality products that meet the requirements of more complex building structures.

### *B. Kolawole O.J., Akanni A.A. (2012)*

The researchers studied the chemical composition and microstructure of the reinforcements of three different collapsed construction sites. An emission spectrometer was used for chemical analysis and the microstructure was examined with an optical microscope. Various properties are used in the analysis, such as carbon content, sulphur, phosphorus, hardness, etc. Steel bars have a higher carbon content than BS4449 and ASTM706, but are close to the Nst-65-Mn standard. The manganese content in steel bars is lower, while the sulfur and phosphorus content is quite high compared to BS4449, ASTM706 and Nst-65-Mn standards. The hardness of the tested bars is higher than the recommended standard BS4449, but lower than the standard Nst-65-Mn. The brittle spheres of Fe3P and FeS observed in the structure may be a consequence of the higher content of harmful sulphur and phosphorus. The results conclude that it is a suggestion, because the reinforcing steel studied is brittle and thus greatly contributes to the collapse of the building structure.

### *C. Apeh Abah Joseph (2013)*

The study evaluated the mechanical properties of ribs used in the construction of the Federal Capital Territory (FCT) in Abuja, Nigeria. The test samples were obtained from the Abuja Deidei market, manufactured by four different companies (codes A, B, C, D) in the former federal capital and adjacent states. The tensile strength of rod samples with a diameter (10, 12, 16 and 20 mm) is tested using a universal tester and a digital calliper. Although their final tensile values comply with the code specification, no product that meets the minimum 12% elongation of the code indicates that their product is less plastic. For the company's products (D), the 10 mm and 12 mm rods do not meet BS 4449 in terms of productivity and final stress value, but they are sufficiently plastic, while the 16 mm and 20 mm rods meet the specification. However, the coding technique is less flexible. The articles recommend a rigorous review of the composition of the elements and alloys used in the steel industry by these companies.

### *D. Shweta A. Wagh et al (2014)*

This article uses STAAD-Pro software to analyze four different versatile commercial buildings, i.e. G + 12, 16, 20 & 24. When designing and measuring costs is done using MS-Excel programs and results obtained, R.C.C and component structure can be compared. In the case of integrated planning systems, because the final beam power and times are below the R.C.C. system, a lightweight component can be used in compound construction. Thus, it reduces the weight and cost of the components of the structure. Due to the earthquake, the steel structure of the concrete works better than the R.C.C. shape. Estimated cost of building construction does not include the construction time required for building a joint building. Compared to RCC structures, composite structures require less construction time due to the faster erection of the steel frame and the simplicity of the concrete structure. The inclusion of cost estimates as a general function of construction time costs will certainly lead to an increase in the efficiency of the joint building. Cost comparison shows that a steel-framed building has a high cost for high-rise buildings and quick construction.

### *E. Sharma V., Kumar R. & et. al. (2017)*

This article evaluates the use of steel in civil engineering. It contains important findings from the experimental work of many researchers. Due to the excessive dependence on concrete, it is becoming a problem of instability, and therefore the possibility of steel construction must be sought. People in a country like India always believe that only R.C.C buildings are long-lasting, durable and shock-resistant. Structural steel is widely used in industry, but today the need to make it has become possible in residential areas as well.

The large-scale use of concrete leads to the destruction of natural resources to a large extent due to mining, blasting, and crushing. Structural steel offers a better alternative. It is built to be light weight and fast. Steel is a fully biodegradable and recyclable product

*F. Apoorva S., Kaur M. (2018)*

In the present study, I investigate the change in the steel surface area of beams and columns under the same load conditions and in the same seismic zone, but with different steel grades Fe41 5 and Fe500 and the optimized cost of steel reinforcement in the design, but also in relation to it. Elastic properties of Fe415 and Fe500 using STAAD Pro. The result of my work is that we use Fe500 instead of Fe415, as it has many advantages over the latter.

*G. Hila H.A . Kaminski S. & et. al. (2018)*

This test considers such reinforced bamboo concrete and evaluates its design and environmental performance as an alternative to reinforced steel. Clarifying the structure of reinforced concrete with bamboo and establishing a life cycle test, is an example of an unusual three-cell portal platform in areas of the world where reinforced bamboo concrete can be considered. The authors conclude that although bamboo is a material with unique mechanical properties, its use in reinforced bamboo concrete is a misconception that has significant problems with durability, strength and durability. and it does not interfere with the environmental characteristics they are often referred to.

*H. Hamid M, Ali Joudah A. & et. al. (2018)*

In very large concrete structures, it is often difficult to distribute reinforcement bars, especially in joining areas, to maintain the distance between the bars within the minimum acceptable limit recommended by the international definition standard, with using conventional methods such as blending. or welding, so a new adhesive method has been introduced, which uses mechanical joints and electric fuse method comparing these most powerful reinforcement bars with no joints and breaking point within the maximum limit of outside the joints. The result is very similar samples of reinforcement bars with technical joints without bars reinforcement joints. Therefore, it is safer for a scientist to use within the required international criteria based on the sample length ratio to the rod diameter in accordance with US standards. Mechanical connection systems are simple and quick to implement and configure. The cost of this method is very low, as it saves a certain amount of reinforcement bars. This saves space and the distance between concrete walls and heavy reinforcement bridges.

*I. Fernandez I., Berrocal C.G. (2019)*

This paper examines the technical reaction of more than 120 corrosion reinforcement bars separated from the actual bridge after 30 years of use.

Gravimetric and 3D laser measurements were used to measure the corrosion. Expressions have been found to be related to the average and level of corrosion resistance, the latter being the main measure of regulating the strength of corrosive rods. When the strength of the material is not affected by corrosion, the final stress is greatly reduced. However, the species was affected not only by the decline in the cross section, but also by the key hole shape and code in case of failure.

*J. H. M. Mahzuz A. M.R. Choudhury & et. al. (2019)*

This study looked at the effect of twelve concrete mix ratios and two reinforcement classes on the values of 3, 7, 12 and 20-story RC buildings. The cylindrical concrete body with different composite ratios (by weight) is made of standard Portland cement and a fine and compacted mixture available at the site.

The compressive strength of the concrete was tested on the 28th day of treatment. In order to predict the density of the concrete, a straight equation is proposed, taking into account the function of the cement percentage and the roughness ratio and the fine ratio. Based on the compressive capabilities obtained by the different mix ratios, the same buildings were designed using ETABS in accordance with Bangladesh NBC 2006. Each building was also specifically rated for the two reinforcement classes as commonly used.

Therefore, a total of 96 constructions were evaluated to obtain the total product value of each combined and reinforcement ratio. It has been found that in low-rise buildings, the cost decreases when using high-strength concrete, high-strength cement in medium and high-rise buildings, can be considered cost-effective, the mix ratio is high and 4 ) The 500 MPa reinforcement rod has been found to be worth comparable to the 400 MPa reinforcement.

*K. Dongyoun Lee, Hyunsu Lim, & et. al. (2019)*

This study selected the delays points that could appear in the design of the free high-end plans and analyzes the priorities for delay control. First, the scale of the tallest free buildings was selected and specific design concepts were selected, such as height, height, floor and building, during their construction. Details of each team's delays were identified through interviews with experienced professionals on such projects. In order to set priorities for delays, the event and the depth of each point were assessed. The risk level was calculated from the results of the study and the value was assessed. The findings of this study may serve as a precautionary measure for the design of the framework for the design of free high-rise buildings.

*L. Paolinia A. , Kollmannsbergera S. (2019)*

In recent years, the use of complementary (AM) production in construction has become increasingly studied. Large hand-held robots and trusses are made for printing parts of a building using composites, metals or polymers. The key advantages of AM are the flexibility of the production process, the great flexibility of the design and the opportunity for improvement provided. However, the building blocks and the 3D printing system must be modelled correctly. This article looks at the current state of AM under construction. AM systems and processes and their use in research and construction projects are presented. In addition, digital methods for designing 3D printed building components and AM processes are described.

*M. Wanga J.H., Sun Y.P. (2020)*

This article proposes the use of concrete with a high water / cement ratio of 0.65, mixed fly ash of 455 kg / m3 and low-bond high-strength reinforcement (LBHS) for the development of round columns. Return is limited to bolted steel pipes. The test results show that the proposed LBHS-reinforced steel pipe fly ash concrete columns have a high self-bending capacity (SC) and a stable lateral load-bearing capacity up to the maximum value. great drift. Low communication causes slow yields of vertical reinforcement; therefore, the column has better deformation resistance and SC strength than a conventional reinforced column with a strong bond. Furthermore, the twisted gap of the double curved column requires a solid plate to prevent the reinforcement from slipping. The shortening of the length of the longitudinal reinforcement anchorage to the joints of the beams has no small effect on the earthquake material of the test column. Steel tubes made of bolt provide better safety for the test column than fore cast iron tubes, especially during high deformation conditions. The vibrating behavior of the test columns can be well matched to the planned Open Sees model. The current pressure of the test columns can be predicted by the same voltage block method and the calculation method taking into account the movement of the metal connection. The literature shows that the combination of reinforced LBHS and ventilated concrete and bolted steel pipes is another good method for the development of SC RC columns.

*N. Rudenko A., Biryukov A. & et.al. (2020)*

FRP boosters have limitations that can reduce their size, such as low temperature resistance, downtime, and alkaline exposure. , as well as the weakness of the lower modulus of elasticity. le deformation. Therefore, the aim of the work is to micro- and nano change the reinforcement structure using FRP reinforcement made of basalt fibers embedded in nano particles or micro particles thermosetting polymeric binder. The study discusses the key effects of composite-enhanced composite development through the addition of nano particles and particles. The FRP microstructure was detected by examining an electronic microscope. It has been found that refined polymer composites containing low silk (SiO2) and nano-alumina (Al2O3) have a much higher modulus of elasticity and strength than the original polymeric properties. head. During the test, we also inspected stored plastic material, known as non-brittle. However, it has been found that high-strength properties are achieved with a grain size of 10-500 nm, evenly distributed within the matrix and a distance between 100-500 nm. Combined reinforcement is also shown to improve adhesion properties compared to both reinforcement (1.5-2 times, depending on width) and standard non-moderate FRP performance (approx. bang 1.5 times). The use of micro powder is almost double the possible temperature for the use and use of macromolecular materials, at 286-320 ° C, which will open up a wide range of technological devices for products made from this property.

*O. Nkubana A.D. (2018)*

Many buildings and other structures of public engineering today are made of reinforced concrete, the main reinforcing material of steel bars. The quality of these steel bars is really the backbone of every reinforced concrete structure, not because of its weight in terms of quality, as most steel is used in buildings without exceeding quality control. In Rwanda, a number of buildings collapsed, and in some cases, gaps left intact as a sign of damage, leaving many residents in awe of the consequences.

Despite these shortcomings, many buildings in neighbouring countries have collapsed where these reinforcing steel was imported, and research has shown that reinforcing steel often does not meet demand. This in itself doubts the quality of the materials used in Rwanda. In general, the need for reinforcement is very high and when demand is high, there is a high risk of buying or producing unusual products and a great need for quality inspection and control. and lessons learned from other countries and cities, especially Rwanda and Africa and Asia, to identify strategies that can be used to strengthen regulatory systems. quality control. The study was limited to samples of 12 mm rods and a diameter of 10 mm from four sources located in Rwanda and focusing on Kigali, the capital of Rwanda.

*P. Kankam C. K., Asamoah M. A. (2002)*

This article describes experimental studies with steel beams and reinforced concrete beams. The physical and chemical properties of the metal alloys were considered and the final strength, type deviation and explosion width under monotonic and cyclic loading beams were included. The latest explanation, depending on whether the soft metal has intermediate products, will inevitably lead to an unnecessary high level of metal in the design. This can cause the components to become fragile and dangerous in the event of earthquakes and other dynamic loads. Reinforced concrete beams reinforced with such locally produced steel bars break unexpectedly and have very low elasticity, although they are designed in a reinforced form. Although the cyclic load is limited, it further reduces the low elasticity of the rods

## III. CONCLUSIONS

The various papers studied on use of primary steel, new technical aspect of use of reinforcement by different researcher the list out conclusions is made are as follows:

*1)* The review of articles concluded that of Steel Materials for High-Rise Buildings used with new standards include the SN , STKN, BCR BCP, STKR standard help of these new technology By ascertaining economical environments and technological trends

*2)* The nano- and micro modification of the reinforcing bars of different types of buildings is useful for almost doubling the possible temperature range for the use and application of polymeric materials, to 286-320 ◦C, which undoubtedly expands the technological applications of products made of these materials.

*3)* The currently era required new high-strength steel rebar use in all major construction.

*4)* In India Fe 500, 550, 600, 650, 700 required to take the stresses under all loading behaviour and requirement of new research and use of necessary required.

*5)* The mechanical, physical& chemical properties are evolutes by different researcher to get the assessment of steel bar properties.

## IV. FUTURE SCOPE OF ADVANCED STUDY BASED ON REVIEW

*A.* Comparative study old vs. new rebar

*B.* Joint assessment of building by the use of primary bar

*C.* Cost comparative study of primary rebar use in high-rise construction

*D.* Experimental and software analysis of tall building with primary rebar's.

*E.* Experimental Analysis of properties of primary steel bars.

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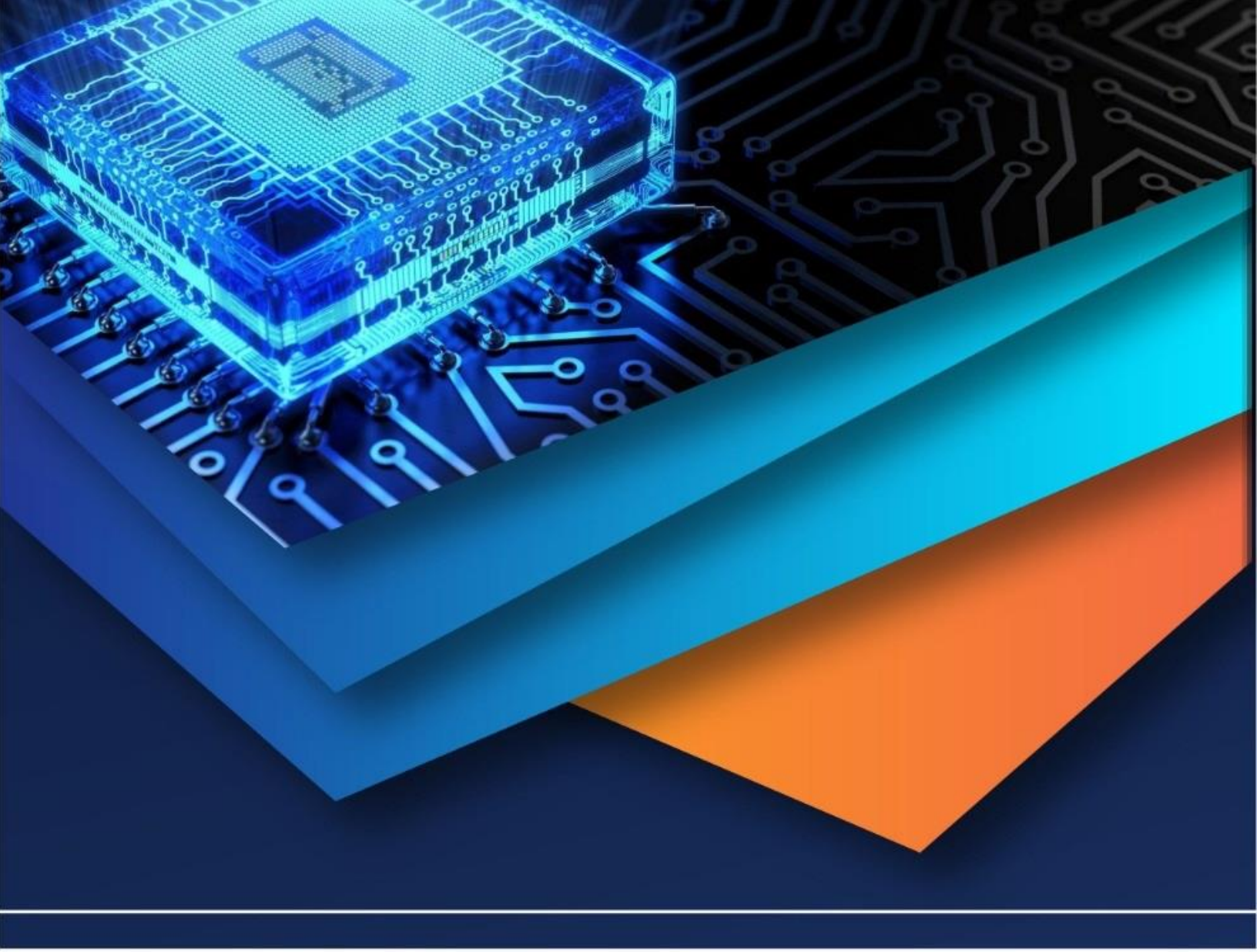
## REFERENCES

[1] Apeh Abah Joseph (2013) "Assessment Of Mechanical Properties Of Reinforcing Steel Used In Construction Works At F.C.T, Abuja" International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181, Vol. 2 Issue 6, Pp 2346-2358.

[2] Apoorva S., Kaur M. (2018) "Comparison of Fe415 and Fe500 Steel In Two-Storey Rcc Building Using Staad Pro" IJARSE: International Journal of Advance Research in Science and Engineering, Volume 9, issue 1, Pp 341-351.

[3] Dongyoun Lee, Hyunsu Lim, & et. al. (2019) Assessment of Delay Factors for Structural Frameworks in Free-form Tall Buildings Using the FMEA, International Journal of Concrete Structures and Materials, International Journal of Concrete Structures and Materials, Pp 1-11.

[4] Fernandez I., Berrocal C.G. (2019) "Mechanical Properties of 30 Year-Old Naturally Corroded Steel Reinforcing Bars" International Journal of Concrete Structures and Materials, Fernandez and Berrocal, Int J Concr Struct Mater (2019) 13:9
[5] Hamid M, Ali Joudah A. & et. al. (2018) 'Reinforcement bars tying types in reinforced concrete" MATEC Web of Conferences, 162, 04023
[6] Hila H.A . Kaminski S. & et. al. (2018) "Bamboo reinforced concrete: a critical review" Materials and Structures, Cross Mark, Pp 1-18.
[7] Kankam C. K., Asamoah M. A. (2002) "Strength and ductility characteristics of reinforcing steel bars milled from scrap metals" Materials and Design 23 (2002 ) 537–545. PII: S0261-3069 Ž 02 . 00028-6
[8] Kolawole O.J., Akanni A.A.(2012) "Analysis of Properties of Reinforcing Steel Bars: Case Study of collapsed Building In Lagos, Nigeria" Applied Mechanics and Materials Vols. 204-208 (2012) pp 3052-3056,
[9] Mahzuz H. M. A. · Choudhury M.R. & et. al. (2019) Effect of material strength on the cost of RCC building frames, SN Applied Sciences (2020) 2:46
[10] Nkubana A.D. (2018) Quality Assessment and Control of Steel Reinforcing Bars Used in Rwandan Construction Industry International Journal of Innovative Research in Science, Engineering and Technology, Vol. 7, Issue 6, SSN(Online): 2319-8753, ISSN (Print): 2347-6710, Pp
[11] Paolinia A. , Kollmannsbergera S. (2019) "Additive manufacturing in construction: A review on processes, applications, and digital planning methods" Additive Manufacturing, 2214-8604, Pp 1-13.
[12] Rudenko A.,Biryukov A.& et.al. (2020) Nano- and Micro-Modification of Building Reinforcing Bars of Various Types, Crystals 2021, 11, 323. Pp 1-11
[13] Sharma V., Kumar R. & et. al. (2017) "A Review Study on uses of steel in construction", International Research Journal of Engineering and Technology (IRJET), e-ISSN: 2395 -0056, Volume: 04 Issue: 04, p-ISSN: 2395-0072M IFV: 5.181, Pp 1140-1142.
[14] Shweta A. Wagh et al (2014) "Comparative Study of R.C.C and Steel Concrete Composite Structures, Int. Journal of Engineering Research and Applications , ISSN : 2248-9622, Vol. 4, Issue 4( Version 1), April 2014, pp.369-376
[15] Takumi I., Seiji F. & et. al. (2009) "Overview and Application of Steel Materials for High-Rise Buildings" Jfe Technical Report No. 14 (Dec. 2009), Pp 1-8.
[16] Wanga J.H., Sun Y.P. (2020) Seismic behavior of circular fly ash concrete columns reinforced with lowbond high-strength steel rebar, Structures 27 (2020) 1335–1357, Pp 1335-1357



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