International Journal of Engineering &Technology, 8 (4) (2019) 550-551

International Journal of Engineering & Technology

Website: www.sciencepubco.com/index.php/IJET

Research paper



Steel rebar categories data and statistical properties of Nigerian reinforcement used for structural strength

Christopher Ehizemhen Igibah [1] *, Lucia Omolayo Agashua [2], Adavudi Abubakar Sadiq [3]

[1] Department of Civil Engineering, University of Abuja, F.C.T Abuja, Nigeria
[2] Department of Civil Engineering, Afe Babalola University, Ado-Ekiti, Ekiti State, Nigeria
**Corresponding author E-mail: igibahchrist1@gmail.com*

Abstract

The paper was aimed at evaluating effect of cost prices of reinforcement on its strength since dispersal in the size geometry of locally available and imported bars is very essential to the development of stable standard of practice for both civil and building engineering sector. Steel rebar from some locations in Lagos state, Nigeria was obtained so as to determine its cost price and strength. The results disclosed that both yield and ultimate loads of 45.67 and 65.54% respectively, as regards to flexural strength, Ogba reinforcement is the highest.

Keywords: *Reinforcement; Steel Rebar; Structural Strength; Lagos; Nigeria.*

1. Introduction

Structural reliability of reinforced concrete structures is rest on the integrity of the ductility parameters as well as characteristic strength of ribbed steel bars in the Nigeria bar market. Determination of extent at which steel bars conform to the conditions of several National Standards for Characterization and Standardization isn't merely new ideal and trendy approach, but it reduces building failures and cost involved. Cost and strength of steel bar from south-west Nigeria is worth investigating upon so as to reduce or eradicate collapse structure problems. Nigerian Reinforcement had been previously studies for various structure stability purposes [1 - 3].

2. Method

Reinforcement sampled from various locations (Yaba, Obalende, Sura, Agege and Ogba) in Lagos State, Nigeria were obtained from major distributors as shown in Fig. 1. Costing was done via random survey for ten years, while strength capacity is through laboratory analysis. The bonding and flexural strengths of concrete structures reinforced with steel bars samples via pull-out test on 150mm diameter by 700mm long concrete with 150mm x 150mm x 750mm beam specimens of grade 20N/mm^2 concrete in accordance with BS 1881 [4]. Flexural stress was measured at the extreme bottom fibre of the RC beams, while fractures final over original length was measured using steel rule after each specimen was removed from Avery Universal Testing Machine (UTM) that have maximum capacity of 500 KN.

3. Results and conclusions

The Statistical analyses values of the Lagos reinforcement samples are itemized in Table 1. Flexural, bonding and pull out failure (as result of inadequate bonding grip with concrete) characteristics was listed in (Table 2). Cost assessment through random field survey of steel rebar revealed higher fluctuations (Table 3). From the results, the cheapest local reinforcement (Ogba steel) had the highest yield and ultimate loads of 45.67 and 65.54% respectively, in terms of flexural stress.

Copyright © Christopher Ehizemhen Igibah et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

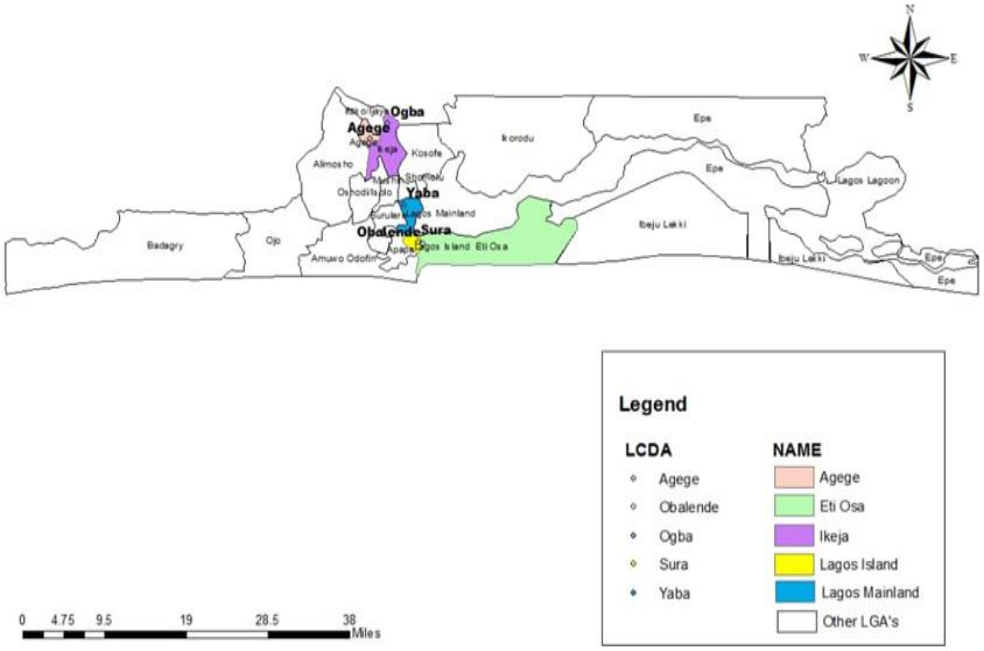


Fig. 1: Map of Lagos Island and Highland Showing Study Localities.

Table 1: Statistical Analysis of the Lagos Steel Bars Distribution

Steel samples	Mean ($\overline{X}$) Y10 Y12 Y16	Standard deviation (σ) Y10 Y12 Y16	Coefficient of variation (%) Y10 Y12 Y16
Yaba steel	9.76 11.7 15.70	0073 0.063 0.085	0.75 0.53 0.61
Obalende steel	9.76 11.6 15.72	0.073 0.078 0.082	0.76 0.55 0.61
Sura steel	9.75 11.7 15.71	0.074 0.090 0.084	0.76 0.74 0.60
Agege steel	9.77 11.8 15.73	0.075 0.092 0.090	0.77 0.80 0.50
Ogba steel	9.78 11.9 15.74	0.076 0.095 0.095	0.78 0.81 0.52

Table 2: Flexural Stress, Bonding and Failure Properties of the Lagos Steel Bars

Steel samples	Flexural stress (N/mm^2)		Design bond strength (N/mm^2)		Pull out failure (%)	
	Y12	Y16	Y12	Y16	Yield loads	Ultimate load
Yaba steel	11.1	15.6	2.23	2.23	45.66	65.53
Obalende steel	11.0	15.5	2.23	2.23	45.65	65.52
Sura steel	11.0	15.5	2.23	2.23	45.65	65.52
Agege steel	11.1	15.6	2.23	2.23	45.66	65.53
Ogba steel	11.2	15.7	2.24	2.24	45.67	65.54

Table 3: Cost Evaluation of the Lagos Steel Bars Distribution

Years	Costing assessment ($)					Yearly increment ranges ($)	
	Yaba steel	Obalende steel	Sura steel	Agege steel	Ogba steel	Low	High
2019	680.82	683.20	643.84	643.83	643.82	0.00	0.00
2018	650.68	658.91	658.90	616.44	616.42	-15.06	-30.14
2017	624.66	632.88	632.88	597.26	593.15	-19.18	-26.03
2016	563.01	575.34	572.34	543.84	541.37	-51.78	-61.65
2015	521.92	561.64	561.64	505.48	505.47	-13.70	-41.09
2014	521.92	561.64	561.64	505.48	505.47	0.00	0.00
2013	487.67	498.63	493.15	461.64	453.43	-34.25	-68.49
2012	397.26	416.44	410.96	379.45	373.97	-79.46	-90.41
2011	364.38	378.08	379.45	342.47	342.47	-31.50	-38.36
2010	487.67	493.63	493.63	461.62	453.42	+110.95	+123.29

References

[1] F. I. Alo, P. O. Atanda, A. A. Daniyan, O. W. Abodunrin, K. M. Oluwasegun, An Assessment of Imported and Local Constructional Steel in Nigeria: Analysis by One-Way ANOVA. International Journal of Materials Engineering, 7 (2017) 45-51.

[2] S.P. Ejeh, M.U. Jubrin, Tensile Tests on Reinforcing Steel Bars in the Nigerian Construction Industry. IOSR Journal of Mechanical and Civil Engineering (IOSR -JMCE), 4 (2012) 06 – 12. https://doi.org/10.9790/1684-0420612.

[3] O. Joshua, O. Kolade, C. Ayegba, I.A. Yusuf, Assessment of the Quality Steel Reinforcement Bars Available in Nigerian Market. Architectural Engineering Conference, 1(2013) 296-305. https://doi.org/10.1061/9780784412909.029.

[4] BS 1881-124:2015 Testing concrete. Methods for analysis of hardened concrete.