

Diameter Inconsistency, Strength and Corrosion Characteristics of Locally-Produced and Imported Steel Reinforcing Bars in Ilorin, Nigeria

Gideon O. Bamigboye^{1,a*}, Oluwole A. Olaniyi^{2, b}, David O. Olukanni^{3, c},
Anthony N. Ede^{4, d} and Isaac I. Akinwumi^{5, e}

^{1,3,4,5} Department of Civil Engineering, Covenant University, Ota, Nigeria.

²Department of Civil Engineering, Ladoke Akintola University of Technology, Ogbomoso, Nigeria

*^agideon.bamigboye@covenantuniversity.edu.ng, ^bwole.olanyi@yahoo.com,

^cdavid.olukann@covenantuniversity.edu.ng, ^danthony.ede.@covenantuniversity.edu.ng,

^eisaac.akinwumi@covenantuniversity.edu.ng

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Abstract. There has been increasing incidents of collapse of reinforced concrete buildings in Nigeria. Many research works, suspecting the quality of concrete produced in Nigeria, have focused on concrete with few attention on steel, perhaps because its production is usually in a more controlled environment. Over the years, many clients of building construction projects or their representatives have shown preference for imported steel bars over the locally-produced steel bars. This research work sets out to investigate the quality of steel reinforcement produced locally and compare them with imported steel bars. The diameter of the two classes of bars available in the open market at Ilorin, Nigeria were measured and their deviations from their manufacturer's designated diameter were determined. Also, their response to the application of load and deterioration in different environments, simulated by their immersion in water, hydrochloric acid (HCL) and sodium hydroxide (NaOH), were studied. Locally-produced bars deviated more from their designated diameter than the imported bars. The imported steel bars have higher strength and experienced lower strain compared to the locally produced steel. They also showed better corrosion resistance, when immersed in distilled water and HCL, than the locally-produced steel bars. The preference for imported steel by clients of building projects is justified. There is a need for regulatory bodies, such as the Standards Organization of Nigeria (SON), to strictly monitor and penalize local steel manufacturers that engage in corrupt practices leading to significant dimensional and strength deviations from specification. This has the potential of minimizing the incidence of building collapse in Nigeria.

Introduction

The task of adopting any construction material for use in a project has not been an easy one for the professionals in the built environment. Many factors have to be considered before the final choice is made. The choices are based on strength, cost, accessibility, ease of erection, aesthetics, sustainability and environmental concerns [1, 2]. Of all these factors, safety remains the most fundamental because the loss of structural integrity could lead to structural failure and the consequent loss of lives, properties, investment and means of economic livelihood. Structural failure is initiated when the material is stressed to its strength limit, thus causing fracture or excessive deformations. The rate of reinforced concrete building and civil infrastructural failures in Nigeria is of great concern and such demand urgent attention [3].

Ayinuola and Olalusi in [4] identified factors contributing to building failure as including the use of substandard materials and engagement of quarks rather than professional by clients in an attempt to cut down the construction cost. Ede in [5] analyzed historical data on building collapses within the last 3 decades to identify the trend and the common features of structural collapses in Nigeria. Data on behavior of professionals and the craftsmen were also analyzed to identify how they operate in the sector and how their actions contribute positively or negatively to the collapses. It was verified