

MAKERERE



UNIVERSITY

EVALUATION OF THE QUALITY OF REINFORCING STEEL BARS MANUFACTURED
IN UGANDA

BY

NAMARA FLORENCE

BMME (KYU)

A DISSERTATION SUBMITTED TO THE GRADUATE SCHOOL IN PARTIAL
FULFILLMENT FOR THE AWARD OF THE DEGREE OF MASTER OF MECHANICAL
ENGINEERING OF MAKERERE UNIVERSITY

OCTOBER, 2015

ABSTRACT

To apply locally manufactured steel bars in all engineering applications with confidence requires understanding of structural materials properties beyond commercial standards to ensure that they meet demands of the fundamental assumptions underlying structural codes of practice on which designs are based. At present, there is inadequate information on the actual behavior of reinforcing steel bars which are used for construction in Uganda. This research therefore intends to generate information concerning the physical properties of reinforcement bars in relation to production practices. The researcher used the qualitative and quantitative methods to investigate the problem. Two types of reinforcement steel bars were studied; conventional cold twisted deformed (CTD) high yield bars and thermo-mechanically treated (TMT) bars made from scrap as the raw material. Steel bars of 12mm and 16mm nominal diameters were considered in the study. This dissertation presents a description of the production process and experimental (Tensile test and chemical analysis) investigations carried out on the steel bars. The chemical analysis indicates lack of control of the chemical composition in some samples, with the carbon content ranging between 0.237 and 0.33, an indication that some samples contain very high carbon levels above 0.27% as recommended by the US 155-1: 2004. The primary observations made with the physical properties are that, the characteristic tensile strength is above the ($460 \times 10^3 \text{ N/m}^2$) value recommended by the US. Elongation is also significantly high except for a few samples which are just at the threshold. The few cases with low elongation may lead to limited ductility of the steel reinforcement bars. Improvements in the scrap sorting practices and Production process are suggested in order to attain better quality.