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BEHAVIOR OF RC BEAMS IN SHEAR USING SAUDI STEEL

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ABSTRACT

Previous studies on the characteristics of the Saudi reinforcing bars indicated that these bars have high yield strength. This will lead to an increase in mean –to-nominal ratio of the yield strength, which has a negative effect on the performance of R.C. beams in shear and bending. This study consisted of two main steps. In the first step, tension tests of Saudi rebars after extensive collection of rebar samples from different suppliers, shops and the construction sites was made to determine the statistical characteristics of Saudi reinforcements. The test results were used to obtain stress-strain curves and determination of yield strength, ultimate strength and fracture strength. Statistical analysis involved computation of means, standard deviations and coefficient of variations. Steel bars with diameter 8, 10,16 and 20 mm were used in this investigation.

The second step of this study was experimental investigation of reinforced concrete beams. These beams were designed based on the data obtained from the first step of this study. The purpose of this was to study the effect of high mean to nominal ratio of yield strength of Saudi rebars on the shear and flexural behavior. Fourteen beams were cast and tested. These beams were divided into three groups. The parameters of study included two tensile steel ratios, and shear strength factor. The beams were tested using symmetrical two points loading with shear spans to obtain a flexural failure. The beams were instrumented to obtain load versus mid-span deflections, longitudinal tension steel strains, and maximum

stirrup strains curves and moment curvature curves. This data and crack patterns were used to identify the mode of failure and determine the ductility of beams.

It was found that the mean value of yield strength was 26% higher than 420 MPa specified by ASTM for Grade 60 rebars. Investigation also indicated that beams designed according to ACI code may fail by shear when Saudi rebars were used. It was also found that the reduction in the shear strength factor ϕ, improves the flexural behavior by reverting shear failure.