ABSTRACT

The experiment conducted at the *Material and Structural Laboratory, Diponegoro University* investigates the contribution of reinforcing steel to the load carrying capacity of concrete beams and their flexure and shear behavior failure mode.

The reinforcement is defined as the ratio of steel bar reinforcing steel area to the concrete element area. In the study, this ratio (ρ) is varied from zero for un-reinforced beams to 3.48% for the over-reinforced sections. The condition of under-reinforcement is recognized as a failure condition due to yielding of steel bars, while over-reinforcement is marked by the crushing of concrete at ultimate.

The concrete is designed based on the DOE (Department of Environment) Method for a specific cylinder compression strength f'_c = 25 Mpa at age 28 days. The beam has a dimension of 150 x150 x 600 mm.

The test results show that for the low reinforcement ratio, the beam fails in flexure; but at higher ratios, the shear capacity is reached *before* flexure. In all conditions, no shear reinforcement is used. The increase of load carrying capacity is 275% for a ratio raise of 0.69% from un-reinforced to under-reinforced beams and 36.4% for a ratio increase of 1.3% from under-reinforced to balance-reiforced beams. However, a decrease of 2.8% is observed when the beam reached the shear failure mode because of slip reinforced steel.

Keywords: under and over reinforcement, steel balance ratio, flexure, and shear.