# Fracture Energy Measurement in Different Concrete Grades


## ABSTRACT

Fracture energy is regarded as an intrinsic (material) properties that dominates crack mechanisms and associated crack growth in concrete damage under applied stress. In recent times, significant advancements in computing technology have driven the adoption of finite element analysis (FEA) methodologies that necessitate the integration of constitutive models, including the traction-separation relationship derived from cutting-edge fracture mechanics. A physically-based model requires fracture energy values; therefore, a properly measured fracture energy value is essential to exhibit better structure response within FEA models. There are large arrays of parameters involved during the concrete mixture, such as beam size effect, aggregate size, and concrete grade, that affect the flexural resistance of the concrete. The fracture and failure in concrete ahead of the crack tip are represented by fracture energy values where micro-damage events such as interfacial failure, fiber-bridging, and matrix cracking occurred. This study aims to determine the fracture energy of concrete specimens with combination of notch depth ao at mid-span, design concrete strength as specified in the testing series. Independent compression strength, fc and measured load-displacement profiles under a three-point bending test were used to determine fracture energy by incorporating three available fracture energy expressions such as Bazant, Hillerborg, and CEB-FIP models.