Research Topic:

Engineering High Performance Concrete Reinforced Multi Dimension Steel Fiber

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High Performance Fiber Concrete (BSPT) is the material / construction materials that have specifications: high quality (compressive strength (F_c), tensile strength (F_t), and (ductility) and specifically for high performance in addition to high quality, concrete must meet specific requirements cannot be achieved by normal concrete, for example: long-term mechanical properties.

Recently, because of the complexity of the geometric and construction methods, more and more construction of buildings (e.g: main bridge) using high strength concrete materials, high perform conrete, and also ultra high strength concrete. Bridge Akihabara in Japan using 120 MPa concrete. In fact, Sakata Mirai Bridge also in Japan, using ultra high-strength concrete with the compressive strength to 180 MPa (about K2000).

In this study of high-performance concrete, with a base line of high strength concrete and reinforced with steel fibers, it is expected that performance will be improved so that they meet one of the requirements as high-performance concrete. It is a multi-year research grant, the distribution of stages achievements according to plan study schedules. During 1st year, the research focused on study of the mechanical properties of materials. The series of studies started from the concrete composition design (mix design) when the mix design is obtained which can produce high quality concrete, then proceed to the next study that is the modulus of elasticity and Modulus of Rupture. The results are the property of High Performance Concrete, e.g: Compressive Strength (F_c), Modulus of Elasticity and Modulus of Rupture (MOR).

The second year research activity includes study of the durability of high performance concrete and focused on the parameters of permeability, penetration and porosity. It also conducted tests of reinforced concrete beam structure for the purpose of collecting data about the flexural behavior of concrete beam reinforced steel fibre as a preliminary study for application in structural elements such as applications for railway sleepers and earthquake resistant structures.

The overall result of research in 2nd year, shows a good prospect. High-performance concrete materials have excellent durability (durability), so the use of concrete in the field where direct contact with the extreme weather will not affect significantly of estimated economic life of 60 years. From data published by manufacturers of railway sleepers, materials used in production concrete sleepers is about K600 or ranges F_c = 50 MPa (compressive strength). Results of testing in the laboratory showed that a high-performance multidimensional steel fiber concrete can achieve F_c > 70 MPa even some of the samples may exceed F_c = 100 MPa. Testing structural elements also indicate that the ductility of high-performance fiber concrete is higher than high-strength concrete is not fibrous.

Key words: concrete, ductility, high performance, fiber