THE STUDY OF CONCRETE MIXTURES PERFORMANCE TO SUPPORT THE NON- DESTRUCTIVE TESTING EVALUATION

by Pramudiyanto, Slamet Widodo, Joko Sumiyanto

ABSTRACT

Concrete (reinforced concrete) is still one of the selected materials for construction purposes. Concrete is ubiquitous in modern construction and has earned this position through characteristics that no other construction material possesses. Concrete and the materials we used in combination with it are no exception. One of the main factors in the evolution of construction technologies has been driven by the need to use materials that are capable of lasting for long periods of time – that are durable. This is one of the reasons for concrete's success – it is a strong and largely chemically inert material that can potentially last for centuries. However, the relative immaturity of concrete construction as a technology has meant that much of the concrete building stock has experienced unexpected problems with inadequate durability performance within the design service life. Moreover, there has been a growing trend among governments and the operators of structures to extend the service life of structures for economic and practical reasons: The emergence of unexpected durability problems has meant that the last few decades have been a learning process for engineers involved in concrete construction: it has been estimated that the annual cost of repair of concrete structures in Europe is in excess of $20 billion.

An experimental program is conducted which three type of concrete mixtures are made to express the different in quality of concrete. Each type of concrete mixture will be consisting of two type of specimens, i.e. Ø100mm x 200mm in height and Ø150mm x 300mm in height. Each set will be 30 specimens, so the total specimens will be 180 specimens. All of the specimens will be tested in the standard age of 28 days. All of them will be tested as follow: (1) Rebound hammer test, (2) ultrasonic pulse velocity, and (3) compressive test.

The Æ100mm test specimens having correlation ranged from 90% to 95% against Æ150mm test specimens. The founding is in line with the ACI standard, which allows to use the small specimens if it is not possible to gain the large specimens. The rebound number of Schmidt hammer test having good correlation to the compression strength since it has the R^2 of 0.8259, so that the regression value to be 0.9088. It can be used to directly correlate between the rebound number and the predicted compression strength. The ultrasonic pulse velocity reading also having good correlation to the compression strength since it has the R^2 of 0.8006, so that the regression value to be 0.8946, which is slightly the same to the rebound number. It is also can be used to direct correlate between the ultrasonic pulse velocity reading and the predicted compression strength. The combine between rebound number, ultrasonic pulse velocity against the compression strength, after being normalize and analyze using nonlinear dynamic regression, having the good correlation since it has the R^2 of 0.9843 and so that the regression value to be 0.9921. The chart produced from the nonlinear dynamic regression can be used directly to predict the concrete compression strength from the rebound number and the reading of ultrasonic pulse velocity.

Kata Kunci: *concrete, non-destructive testing, hammer test, ultrasonic pulse velocity*