



Structural Concrete Laboratory

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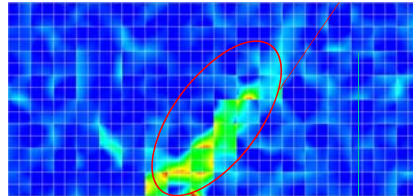
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Crack propagation in concrete damaged by ASR using image analysis

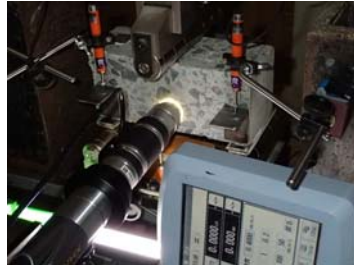
The alkali-silica reaction (ASR) is a reaction which occurs over time in concrete between the alkali in cement matrix or permeating from outside and the silica causing cracking in concrete. Image analysis technique is very suitable to understand the tensile strain developed at crack tip due to ASR.

Tensile strain



Cracking caused by ASR

Image analysis



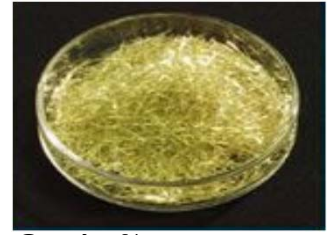
Loading test setup
Observations are made using high-quality digital camera and microscope.

Shrinkage properties and shear strength analysis in UFC beams

Ultra High Strength Fiber Reinforced Concrete, corresponds to pre-mixed concrete powder enriched with steel fibers. Using steel fiber, high-performance AE water reducing agent, makes an excellent material in durability with high strength.



Pre-mixed powder



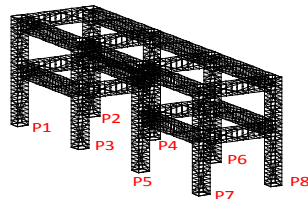
Steel fibers (Length=15mm, Thickness=0.2mm, Strength=2700N/mm²)

To understand the characteristics of the shear failure of UFC beam, we examine the effect of steel fiber mixing rate and the amount of shrinkage on the shear strength of the beam.

The progress of cracking is observed using a high-speed camera (4000fps, 130 million pixels).

Loading test of UFC beam

Seismic performance evaluation of RC structures



Unit: mm

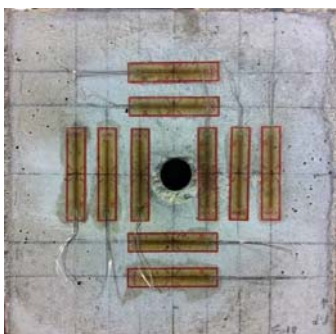
Seismic performance is verified under cyclic loading using the 3D Lattice Model. The damage evaluation in RC piers is studied from the energy dissipation approach.



Analysis of pre-stressed concrete

It is required to introduce more of prestressing force to degraded PC structures to satisfy the designed prestress level. However, if not properly grasped the remaining prestressing force, and excessive pre-stress is introduced, the result may be the buckling of the structure. Thus, to accurately estimate the pre-stressing force, we propose an estimation method using the newly developed force applicator device (we call Expansive Jack) and the circular hole near the stress concentration.

We can measure the strain in a specific point in the strain gauges, in addition to measuring the planar strain distribution around a circular hole by using image analysis.



Specimens



Loading test setup



Developed jack



Concrete strain measurement by using image analysis