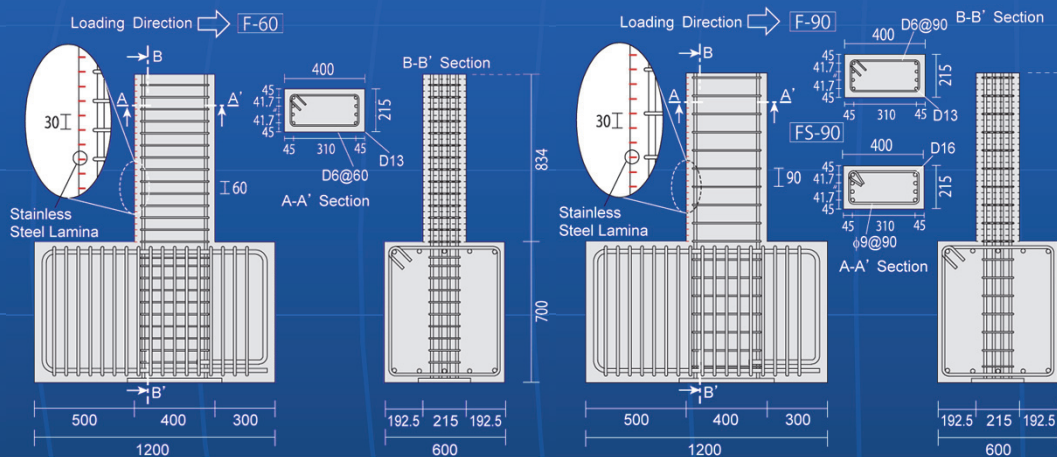


A QUANTIFICATION MODEL FOR CRACK PROPAGATION OF R/C MEMBERS UNDER EARTHQUAKE LOADING

0. Outline

To evaluate visible damage of reinforced concrete (R/C) members such as crack width and length, cyclic and monotonic load tests of scaled R/C members were carried out. Firstly, a predictive model is proposed to quantify the propagation of crack length. Secondly, a predictive model is proposed to quantify the crack width. Finally, a predictive model is proposed to quantify crack length distribution to crack width. The model consists primarily of a probabilistic model between crack widths and lengths.

1. Description of Test Specimens and Results –Series 2011–



1/2 scaled beams under monotonic loading
Shear-to-flexural strength ratio: Specimen F-60, F-90=2 / FS-90=1

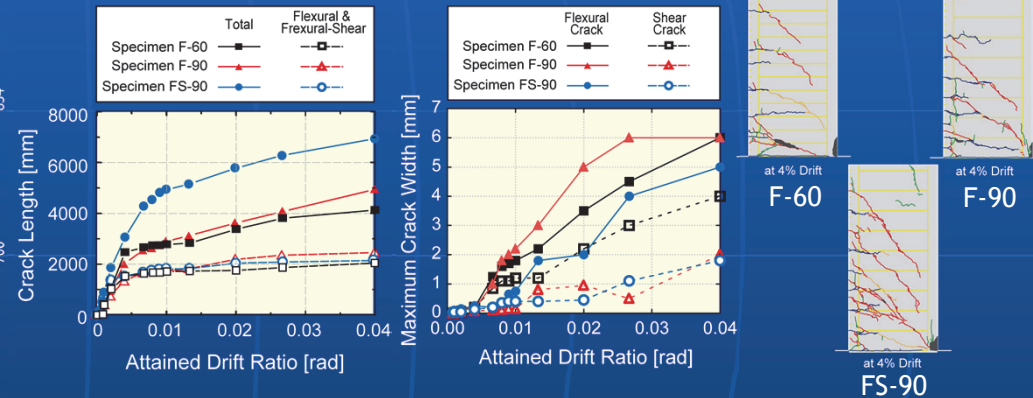
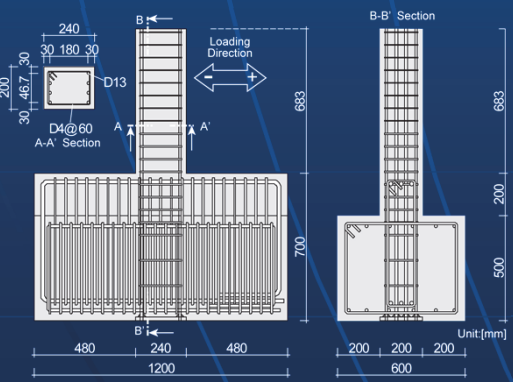


Fig.1 Description of Test Specimens -Series 2011-

Fig.2 Test Results (Crack Length & Width Propagation) Fig.3 Crack Pattern

2. Description of Test Specimens and Results –Series 2008–



1/3 scaled beams with unified geometrical spacing under cyclic loading
Shear-to-flexural strength ratio: Specimen F-1=1.9 / Specimen S-1=0.7

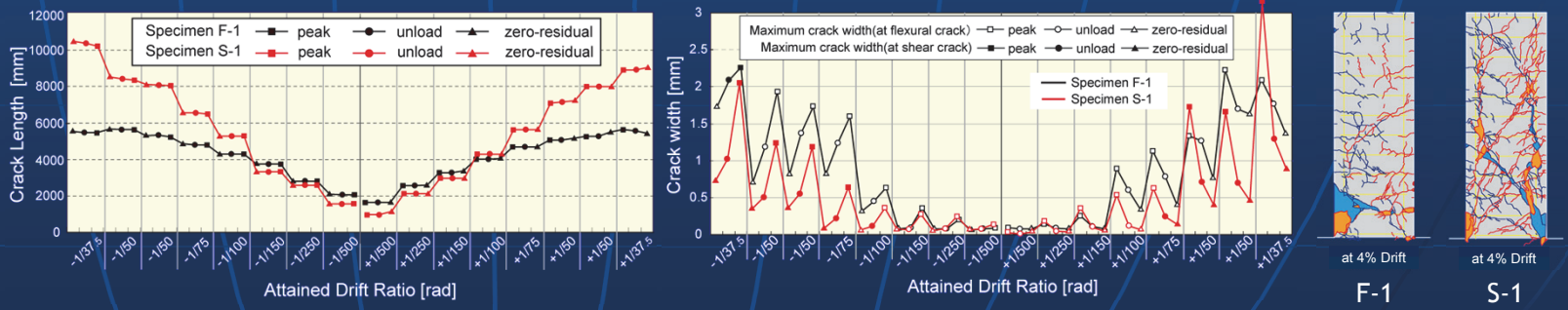
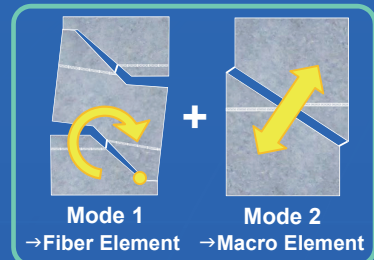


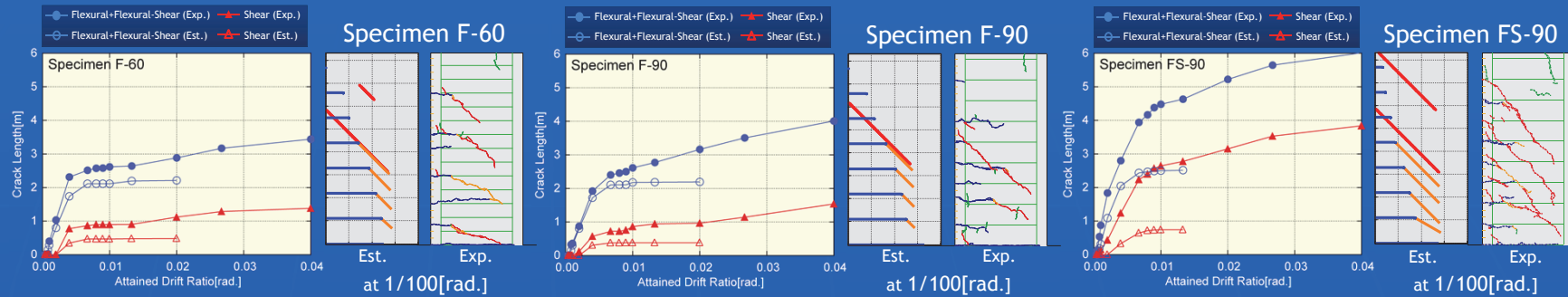
Fig.4 Test Specimen -Series 2008-

Fig.5 Test Results (Crack Length & Width Propagation due to IDR) Fig.6 Crack Pattern

3. Crack Length Estimation



Combined Model of Fiber & Macro Elements Analysis (Crack Length vs. IDR)

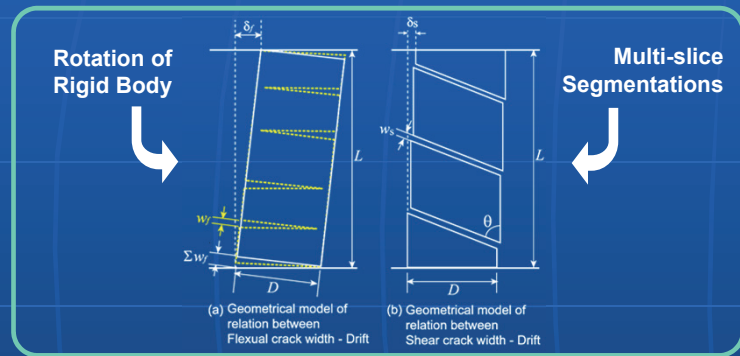


Estimated Results → Good Agreement for Visible Outline, but Underestimation for shear-dominated crack length

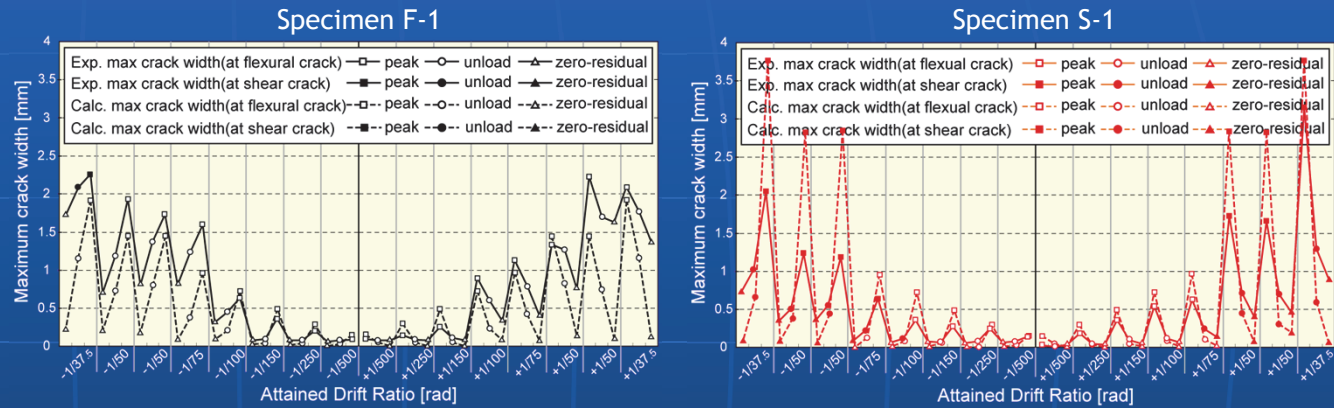
Fig.7 Model for Crack Length

Fig.8 Estimated Results for Crack Length

4. Crack Width Estimation



Geometrical Model (Crack Width vs. IDR)

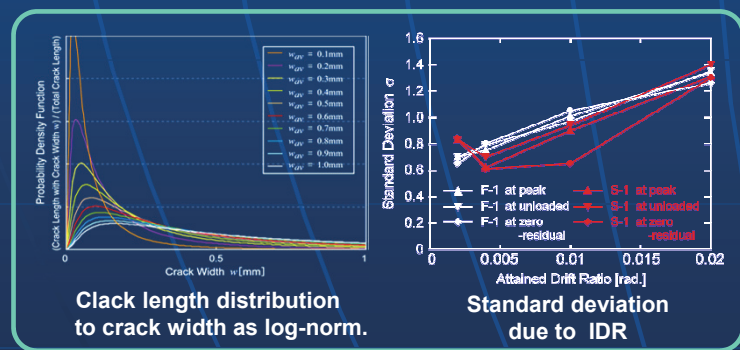


Estimated Results → Good agreement at unloaded drift, Disagreement at peak and zero-residual drift

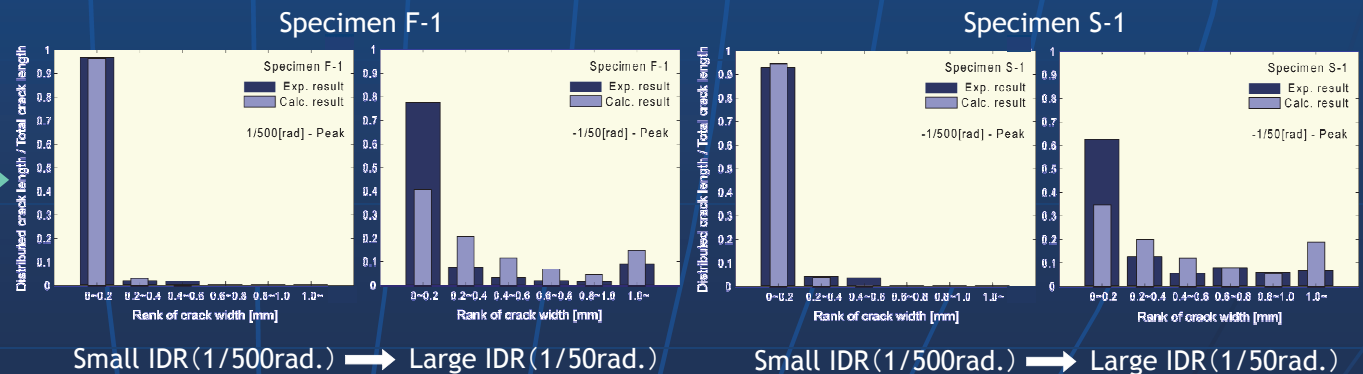
Fig.9 Model for Crack Width

Fig.10 Estimated Results for Crack Width

5. Relationship between Crack Width and Crack Length



Probabilistic Distribution Model (Crack Width vs. Crack Length)



Small IDR → Good Agreement / Large IDR → Disagreement... need to be modified

Fig.11 Model for Crack Length Distribution to Crack Width

Fig.12 Estimated Results for Crack Length Distribution to Crack Width