

## Experimental Study on Temperature Behavior of SSC (Stiffened Steel Plate Concrete) Structures

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### 1. Introduction

SSC(Stiffened Steel plate Concrete) module method uses steel plate instead of reinforcing bar and mold in existing RC structure. Steel plate modules are fabricated in advance, installed and poured with concrete in construction field, so construction period is remarkably shortened by SC module technique.

In case of existence of temperature gap between internal and external structure surface such as containment building, thermal stress is taken place and as a result of it, structural strength is deteriorated.

In this study, we designed two test specimens and several tests with temperature heating were conducted to evaluate temperature behavior of SSC structures and RC structure..

### 2. Test Procedure

#### 2.1 Outline of Specimen

The shape of specimen is shown in Fig 1 – Fig 2. All the cross section of test specimens are the same. As the major factor which gives influence to bending property of a SSC, the steel ratio is chosen as a test parameter. In the tests, SS400 steel plate and 35N/mm<sup>2</sup> concrete materials are used.

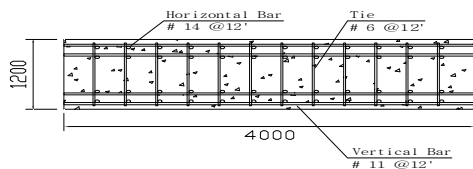


Figure 1. Test specimen (RC120T)

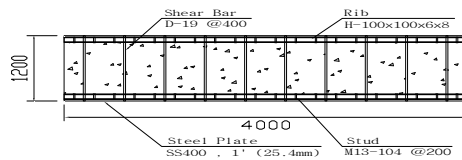


Figure 2. Test specimen(SC120T)

#### 2.2 Test Method

Maintaining 183°C maximum temperature difference between lower and upper steel plate by heating lower part of SC specimen using thermal heat panel, the flexural deformation due to heat inflation occurs (Fig 3). Fig. 4 shows time vs. temperature curve used experiment.



Figure 3. Specimen and Thermal Heat Panel

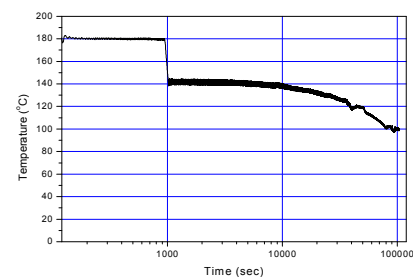


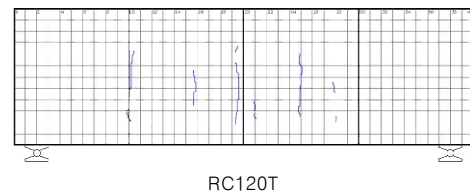
Figure 4. Time vs. Temperature Curve

### 3. Test Results and Discussion

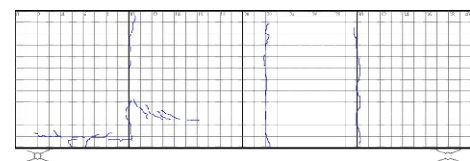
In test results, displacement and crack distribution of specimen were evaluated under temperature loading condition. Also moment-curvature relationship was analyzed.

#### 3.1 Crack distribution under temperature heating

Fig 5. shows crack distribution of RC/SSC specimen during temperature heating. The minute vertical crack occur in the bottom of specimen due to thermal stress.



RC120T



SC120T

Figure 5. Crack Pattern of Specimens

Fig 6-7 shows heat distribution of RC/SSC specimen during temperature heating.

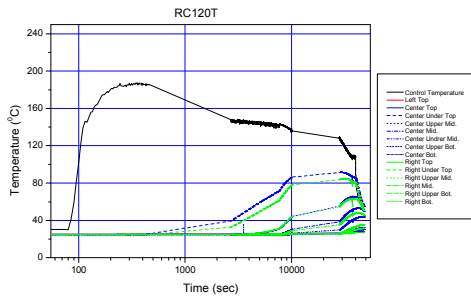


Figure 6. Heat Distribution of Specimen (RC120T)

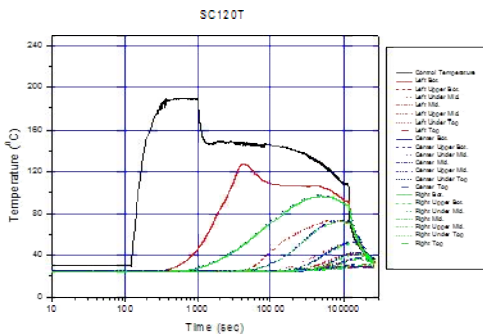


Figure 7. Heat Distribution of Specimen (SC120T)

### 3.2 Deflection distribution under Heating

The relation of Deflection-Temperature of specimen are shown in Fig 8-9. Comparison with RC120T, SC120T showed large deflection due to temperature.

The maximum center vertical deflection of RC120T is 1.15mm at 131 °C and the maximum center vertical deflection of SC120T is 1.6mm at 131 °C.

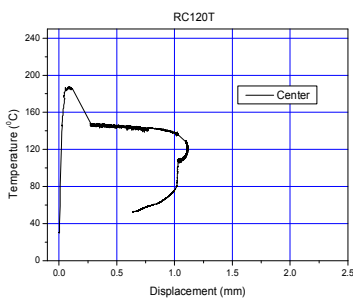


Figure 8. Relation of Temperature-Displacement (RC120T)

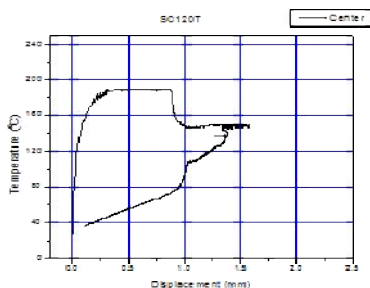


Figure 9. Relation of Temperature-Displacement (SC120T)

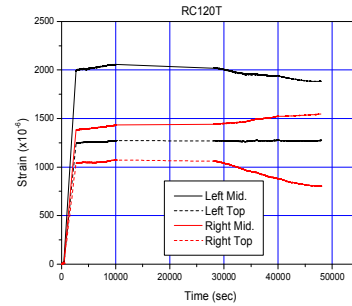


Figure 10. Relation of Time-Strain (RC120T)

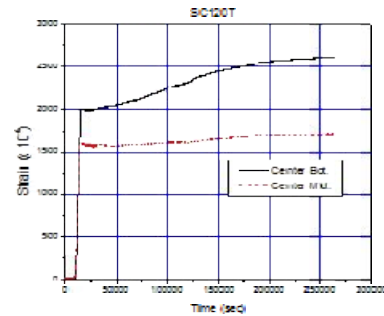


Figure 11. Relation of Time-Strain (SC120T)

The relation of Time-Strain of specimen are shown in Fig 10-11.

## 4. Conclusion

To evaluate the behavior of SSC structures when exposed to heat sources such as internal containment building, several thermal loading tests were conducted with thermal heat panel. Test results are as follows ;

- 1) The minute vertical crack occurs in the bottom of specimen due to thermal stress.
- 2) The maximum vertical deflection occurs at 131 °C.
- 3) The maximum vertical deflection of SSC structure is 39% larger than that of RC structure.

## ACKNOWLEDGEMENT

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