Experimental Study on Shear Behavior of SC Structures under Out of Plane Load

D. S. Park, K. J. Lee, K. W. Ham, Y. P. Suh
a Nuclear Power Lab., KEPRI, 65 Munji-Ro, Munji, Yuseong, Daejeon, dspark@kepri.re.kr

1. Introduction

Comparing with RC structures, SSC (Stiffened Steel Plate Concrete) module can shorten construction period.

This is an experimental study on the out of plane load behavior of SSC (Stiffened Steel Plate Concrete) wall module under shear loading. 4 tests were conducted to verify structural performance according to shear reinforcement ratio. On the basis of test results, it is found that shear reinforcement ratio is a main factor of shear strength of SC structures.

2. Test Procedure

2.1 Specimen Shape

Beam type specimens were designed as SC walls were assumed as a 1-way structure. S-4R-0S-4ST has no shear bar and S-4R-2S800-4ST has shear bars at 800mm. S-4R-2S600-4ST has shear bars at 600mm. S-4R-2S400-4ST has shear bars at 400mm. The properties of specimen are summarized in Table 1 and Figure 1 shows the schematic view of specimen (S-4R-2S400-4ST).

Table 1. Specification of specimen (Unit : mm)

Specimen	S-4R-0S-4ST	S-4R-2S800-4ST	S-4R-2S600-4ST	S-4R-2S400-4ST
B X H X L (mm)	800 X 500 x 8400			
Rib	4 rows (H-100 x 100 x 6 x 8)			
Plate (SS400)	6mm			
Stud (M13)	4 rows @200	4 rows @200	4 rows @200	4 rows @200
Shear Bar (D16)	None	2 rows @800	2 rows @600	2 rows @400
Shear Ratio	3.6 Shear			

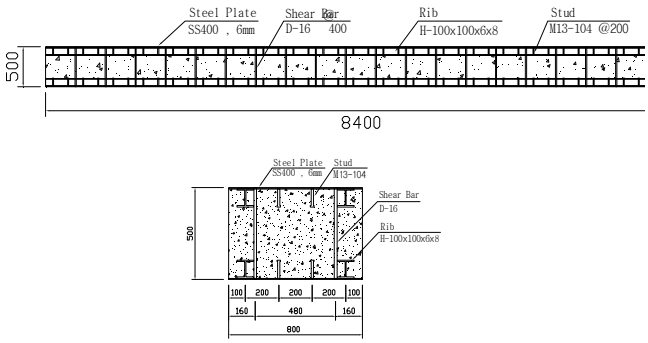
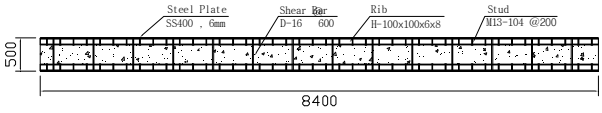
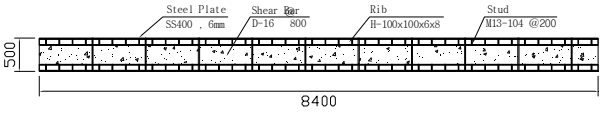


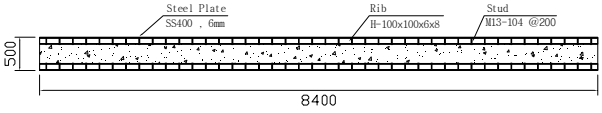
Figure 1. S-4R-2S400-4ST



S-4R-2S600-4ST



S-4R-2S800-4ST



S-4R-0S-4ST

2.2 Loading Frame

Loading frame was designed to apply shear load by strong beam. Figure 2 shows drawing of test apparatus.

Figure 2. Loading Frame(Shear Test)

3. Test Results and discussion

3.1 Failure Shape

On the basis of failure shapes, shear and flexural failure were mixed. As shear bar ratio becomes low, it has a tendency to have a flexural failure shape.

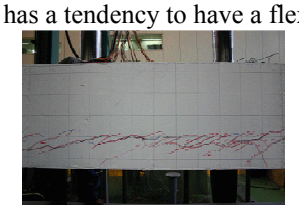
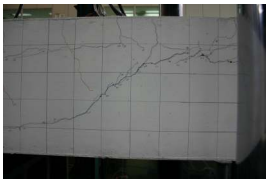


Figure 3. S-4R-0S-4ST

Figure 4. S-4R-2S800-4ST



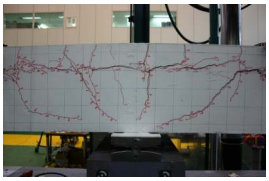
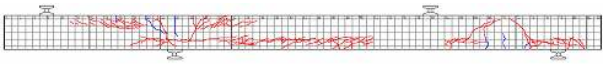


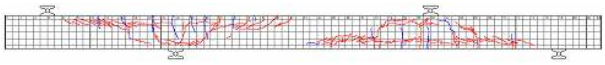
Figure 5. S-4R-2S600-4ST Figure 6. S-4R-2S400-4ST

Some cracks were inspected at the welding point between steel plate and stud, shear bar. With high shear bar ratio, the frequency and amount of crack was increased because of increasing load capacity. Figure 7 shows crack distribution.

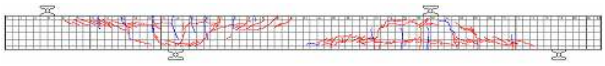


S-4R-0S-4ST(1st)

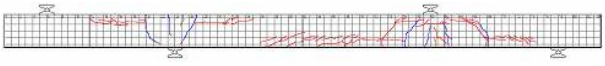
S-4R-0S-4ST(2nd)



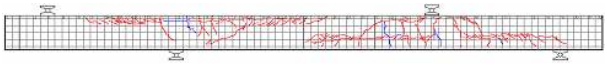
S-4R-2S400-4ST(1st)



S-4R-2S400-4ST(2nd)



S-4R-2S400-4ST(3rd)



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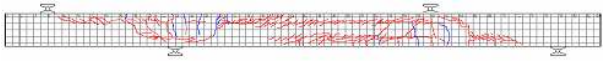

S-4R-2S800-4ST

Figure 7. Crack Distribution

3.2 Load-Displacement Relationship

In the Figure 8 show a load-displacement relation at the center of specimen.

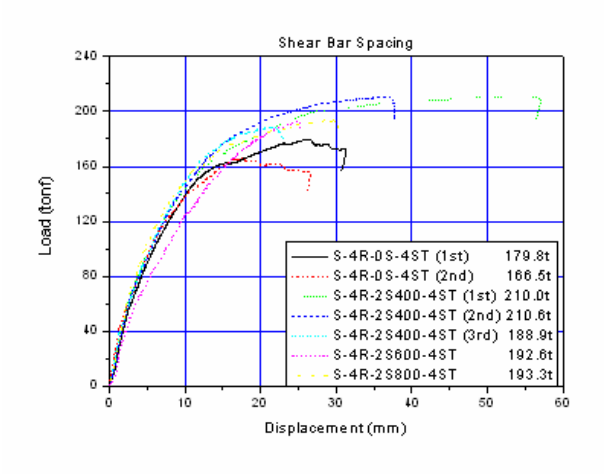

Figure 8. Load-Displacement

4. Conclusion

Several tests were conducted to verify structural behavior of SC module walls under shear loading.

As a result of experiments, Shear reinforcement ratio has a great influence on SC module structure. In case of reinforcement of shear bar, maximum capacity is increased up to 12% compared with non-reinforced one.

ACKNOWLEDGEMENT

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