Experimental Study on the Fire Resistance Performance of Prestressed Composite Beam with Corrugated Web under Standard Fire with Loading Condition

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1. Introduction

1. Introduction

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Slim Floor System

Delta Beam

Flex Frame System

Slim Floor System Improvement

Delta Beam Improvement

Flex Frame System Improvement

1. Introduction

Introduction

STEP 1

STEP 2

STEP 3

STEP 4

STEP 5

STEP 6

2. Test set-up

2. Test set-up

Test set-up

The Shape of Corrugated Web improvement

2Layer

1Layer

Tendon Profile Improvement

2. Test set-up

Test set-up

Specimen	S-1	S-2	S-3
Section	<p>H-360*236*346*14*22</p>	<p>H-360*236*346*14*22</p>	<p>H-320*236*346*14*22</p>
Elevation	<p>8200</p>

2. Test set-up

Test set-up

Specimen	Parameter	Thickness of covering material (mm)	H-beam Size (mm)
S-1	2 layer corrugated web	19	360×236×346×14×22
S-2	1 layer corrugated web	9	
S-3	1 layer corrugated web	-	320×236×346×14×22

Specimen	Design Load (ton)	Load Ratio	Test Load (ton)
S-1, S-2, S-3	82.7	0.4	33.1

2. Test set-up

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Test set-up

Limiting deflection :

$$D = \frac{L^2}{400d} \text{ mm}$$

Limiting rate of deflection

$$\frac{dD}{dt} = \frac{L^2}{9000d} \text{ mm/min}$$

L is the clear span of the test specimen, in millimetres;

d is the distance from the extreme fibre of the design compression zone to the extreme

fibre of the design tensile zone of the structural section, in millimetres.

3. Test result

3. Test result

Test result

1차 내화실험

(a) PS2leg_Fire Proofing 2h,

(b) PS1leg_Fire Proofing 1h

(c) Slimflor_Fire Proofing 3h,

3. Test result

Test result

Specimen	Time (min)	Displacement (mm)	Rate of displacement (mm/min)	Fire Resistance (min)
S-1	60	-24.9	-0.08	180
	120	-50.0	-0.66	
	180	-82.2	-0.70	
S-2	60	-25.4	-0.04	180
	120	-48.5	-0.16	
	180	-73.6	-0.28	
S-3	60	-212.0	-0.3	138
	120	-255.8	-3.0	
	139	-402.3	-49.8

4. Conclusion

4. Conclusion

Conclusion

- 1) In case of 2-layer corrugated web, a hollow space has been formed inside the beam so that the high deformation has been generated under the loading condition. In case of the corrugated web, it is considered that the improved fire resistivity has been shown by blocking the effect mentioned.
- 2) As a result of the fire resistance experiment using the actual loading, it has been shown that the specimen of the composite beam applying the fire resistance cover material have fully satisfied the standard of bending performance (deformation and its rate) for 3 hours exposed to the fire limited in accordance with ISO 834-1.
- 3) Although the size of the section is minimized and fire resistance cover material does not be used, the fire resistance performance has been secured for 138 minutes. It can be concluded that the fire resistance performance can be secured for over 3 hours with no cover which can be applied to the actual site by adjusting the size of section and type of the corrugated web.

Thank you!