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# Development of Composite Slab with Truss-Type Connector

Développement de dalles mixtes avec goujons en treillis

Entwicklung von Verbundplatten mit Fachwerkdüben

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## 1. INTRODUCTION

The composite slab with truss-typed connectors is illustrated in Fig. 1. The connectors composed of corrugated thin plates and flat bars are welded on the bottom plate of bridge slab, and finally cast concrete on them. For the purpose of applying this composite slab to road bridges, a series of tests were carried out.

The summary of the tests and their results are reported in this paper.

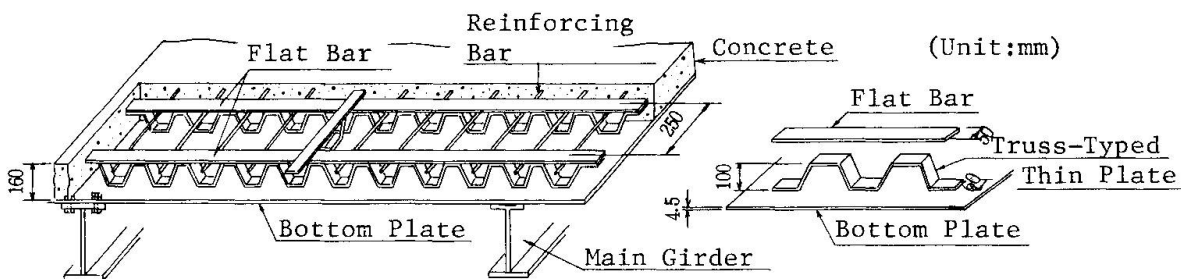


Fig.1 Illustration of composite slab with truss-typed connectors

## 2. OUTLINE OF TESTS

Outline of tests is summarized in Table 1.

Table 1 Contents of Test

(Unit:mm)

| Items  | Test Methods | Aims of Test   |
|--|--------------|--|
| Push out test                                |              | <ul style="list-style-type: none"> <li>Load-slip curve</li> <li>Ultimate strength of shear connector</li> <li>Failure pattern</li> </ul>                                     |
| Test for ultimate strength of composite slab |              | <ul style="list-style-type: none"> <li>Load-deflection curve</li> <li>Load-strain curve for bottom plate, concrete and shear connector</li> <li>Ultimate strength</li> </ul> |
| Test for fatigue strength of composite slab  |              | <ul style="list-style-type: none"> <li>Number of cycles-stress curve</li> <li>Number of cycles-deflection curve</li> <li>Crack width</li> <li>Fatigue strength</li> </ul>    |



### 3. TEST RESULT AND CONSIDERATION

#### 3.1 Push Out Test

Load-slip curve and failure pattern illustrated in Fig. 2 present that there are enough ductility because of adequate slip between truss-typed connector and H-beam up to the failure.

#### 3.2 Test for Ultimate Strength of Composite Slab

Load-deflection and load-strain curves in typical specimen are respectively shown in Figs. 3 and 4. From these results, when concrete and bottom plate enter in plastic zone, strain and deflection increase radically and reach to bending failure. It was also recognized that the ultimate load value,  $P_u$ , brought by this test was almost as same as the calculated value on reinforced concrete assumption. So that, it is considered that the truss-typed connector plays a full role in composite effect.

#### 3.3 Test for Fatigue Strength of Composite Slab

Relationships between number of cycles and stress are shown in Fig. 5, and they are brought by conducting the static test under maximum and minimum load at each 500,000 cycles during fatigue test. From Fig. 5, it is considered that the alteration of stress by cycle load is relatively small, and this composite slab remains enough fatigue strength. It was also observed that the crack width from 0.04 mm to 0.1mm was less than the allowable one of 0.2mm.

### 4. CONCLUSION

Through these loading tests, it can be said that the composite slab with truss-typed connectors is available for bridge slab. After these tests, the static and fatigue tests are being conducted to select the most reasonable and practical truss-typed connector, and to investigate the durability and ductility.

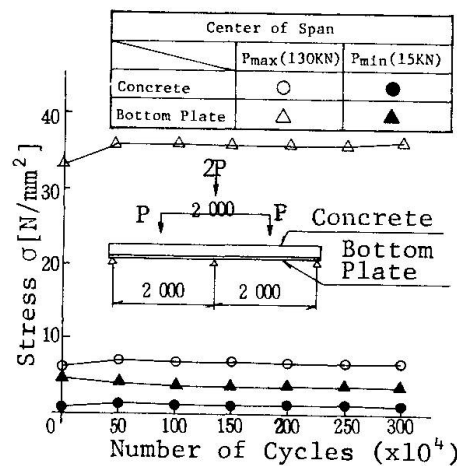


Fig.5 Relationships between number of cycles and stress

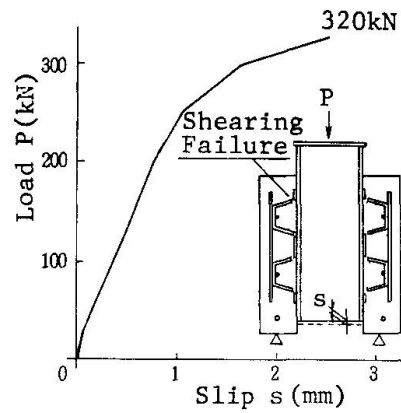


Fig.2 Load-slip curve

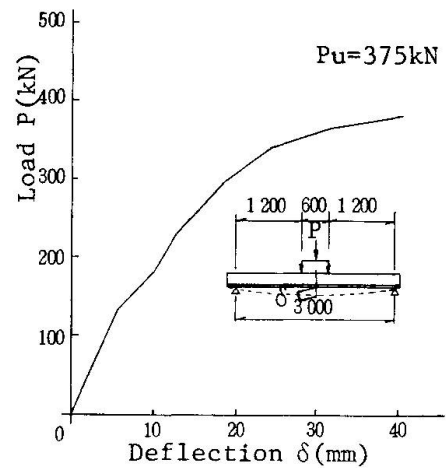


Fig.3 Load-deflection curve at center of span

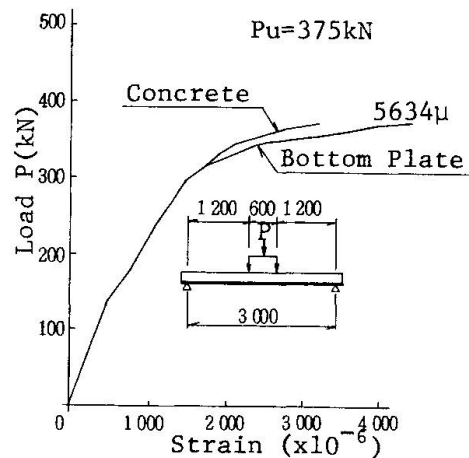


Fig.4 Load-strain curves at center of span