(a) TIB shear connector

(b) The covering plate and conical iron plug

(c) The retaining washer

(d) The inner sleeve
(c) HSFG bolt shear connectors [18]

Figure 1. Tapered iron bolt (TIB) and high-strength friction-grip (HSFG) bolt shear connector
(a) Covering plate and conical iron plug

(b) Retaining washer

(c) Inner sleeve

Figure 2. Dimensions and details of TIB shear connector (Unit: mm)
Figure 3. Prefabricated steel-concrete composite beam with TIB shear connector
Erection reinforcement, HRB335, 8 Φ6

Steel beam, HM 250 × 250 × 9 × 14

Transverse reinforcement, HRB335, 24 Φ16

Longitudinal reinforcement, HRB335, 20 Φ16

Concrete slab, C45 700 × 600 × 150

(a) Front view

Erection reinforcement, HRB335, 8 Φ6

Transverse reinforcement, HRB335, 24 Φ16

Longitudinal reinforcement, HRB335, 20 Φ16

Concrete slab, C45 700 × 600 × 150

(b) Plan view

(c) Steel beam
Figure 4. Pushout test specimen (Unit: mm)
Figure 5. Assembly of test specimens

(a) Formwork  (b) Demoulding  (c) Install the conical iron plug

(d) Install the connecting bolt  (e) Tighten the connecting bolt  (f) Complete assembly
Figure 6. Test set-up
Figure 7. Instrumentation arrangement (Unit: mm)
(a) Standard loading scheme for newly assembled specimens

(b) Loading scheme for re-assembled specimens

Figure 8. Loading schemes
(a) Connecting bolts

(b) Conical iron plug

Figure 9. Corroded TIB shear connectors
Figure 10. Typical failure modes of newly assembled connectors
Figure 11. Comparison between the shear capacity and tensile strength of connecting bolts.
(a) **Load-vertical slip curves of pushout test specimens**

(b) **Curves of load-displacement between the steel beam and concrete slab**

Figure 12. Load versus slip and transverse separation of the M12 series
Figure 13. Load versus slip and transverse separation of the M16 series

(a) Load-vertical slip curves of pushout test specimens

(b) Curves of load-displacement between the steel beam and concrete slab
Figure 14. Shear stiffness of TIB shear connectors
Figure 15. Comparison between the shear capacity from test results and design code
(a) Force on the plug-concrete interface

(b) Schematic diagram of the integration area

Figure 16. Schematic diagram of a simplified calculation model