

**Connection between Concrete Filled Tube (CFT) Columns and Prefabricated elements  
using UHPC**

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**Extended Abstract**

Concrete filled tube (CFT) is a composite member consisting of concrete filled inside a steel tube encasement which acts as longitudinal and transverse reinforcement. The confinement provided by the steel tube improves the flexural and cyclic behavior of the composite. In general, CFT eliminates the use of transverse and longitudinal reinforcement in the concrete fill and acts as a stay in place formwork. This reduces the onsite construction time and formwork cost which makes it a feasible choice for accelerated bridge construction (ABC) applications. An extensive research on component testing of CFT has led to well-developed design expressions. However, the behavior of the connection for CFT to prefabricated footing and cap beams has not been investigated in detail, and, as a consequence their application in bridge industry has been limited.

In this research, a new detail is envisioned for connection of prefabricated elements with CFT using ultra-high performance concrete (UHPC). Due to superior mechanical and durability properties, UHPC allows reduction in embedment depth of the tube while providing durability. The connection is aimed at providing full flexural capacity of the tube. The schematic of the construction stages is shown in Figure 1. The connection is constructed by forming a recess in the precast element. The CFT is placed inside the recess and filled with an UHPC which encases the

tube. The remaining CFT is filled with normal strength concrete. The force transfer is accomplished through dowels which are embedded in the structural element.

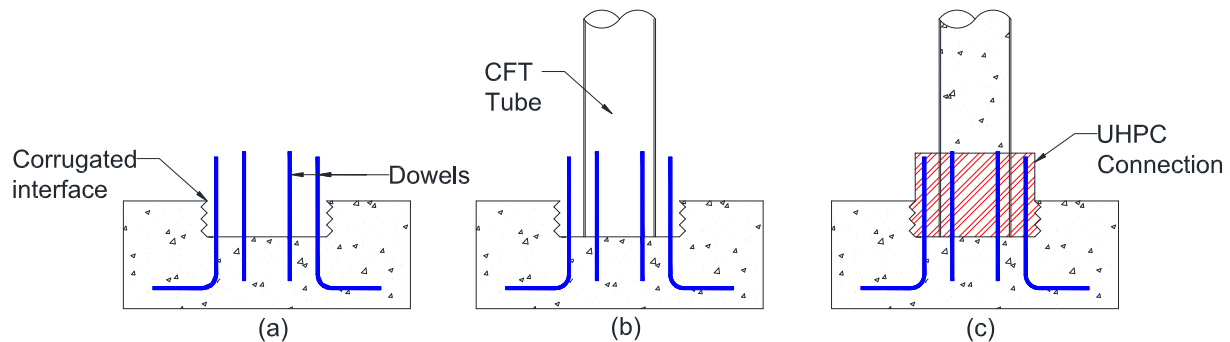


Figure 1: Construction stages for CFT to precast element

The detail allows large tolerances for connecting prefabricated elements mitigating one of the major challenges in precast construction. A test specimen is designed based on an analytical and numerical study as shown in Figure 2. The specimen is subjected to a combination of cyclic load and axial load and the response is measured through extensive instrumentation. It is anticipated that the CFT will undergo the ductile tearing of the tube as a preferred mode of failure while the capacity protected element does not undergo any damage.

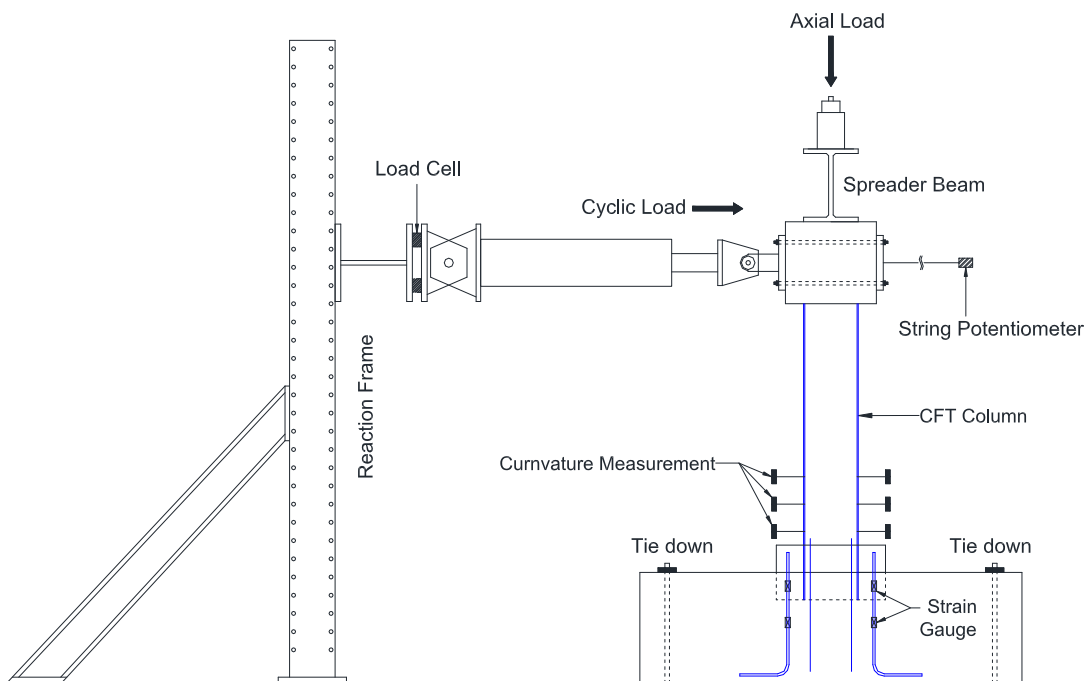


Figure 2: Test Setup and instrumentation detail