In-Situ Diagnostic Load Testing of PC Double-T Beams

Investigators: Paolo Casadei (Graduate Student – PhD Candidate)  
Dr. A. Nanni (Faculty Advisor)  
Sponsored by: SPS/University Cooperative Research Center

Objectives:
To evaluate the behavior of full-scale PC structure elements tested following the Load Test procedures according to ACI 318-02 ch.20 and cyclic loading as illustrated in the CIAS Report 00-1, and compare the two methodologies.

Background:
Information regarding the health and performance of an existing structure may be gained by simply measuring its response to load. For these reason, in-situ load test is a fundamental procedure for structure evaluation. Cyclic in-situ load testing takes the same approach as the 24 hr load test described in ACI-318 (ch.20) to loading a structure and measuring its response, but the loads and measurements are specifically designed to reveal a certain characteristic of the structure and are applied in several cycles instead that in just a single one hold for 24hr. This approach allows for a much simpler evaluation that can be carried out in shorter time and at a much lower cost respect to a standard 24hr load test.

Conclusions:
• The lack of meeting the acceptance criteria of the two Load Tests ensure that both of them are as demanding for the member tested
• Similar ultimate load reached at collapse and Identical ultimate type of failure (rupture of tendons)
• The Residual Capacity R(%) defined as:

$$ R_{(\%)} = \left( 1 - \frac{P_{\text{load}}}{P_{\text{collapse}}} \right) \times 100\% \approx 15\% $$

Is similar for both member tested and ensures a sufficient margin of safety