

**Department of Civil and Environmental Engineering
University of South Florida – Tampa, Florida 33620**

Date: October 27, 2010

To: FDOT Research Center c/o Sandra Bell
From: A. Sagüés, Principal Investigator (PI) Project BDK84 977-08
cc.: Sastry Putcha, FDOT technical coordinator
Mario Paredes, FDOT State Materials Office



Subject: **Quarterly Progress Report – 5th Quarter: 7/1/10 - 9/30/10**
Project BDK84 977-06: “Reinforced Concrete Pipe Cracks -Acceptance Criteria”
(USF # 2104112600).

1) Activities performed this quarter:

- Pipe section cataloguing and characterization were completed. Internal concrete cover thickness measurement was made for all 24 specimens. Concrete cover values were measured on cut edges at exposed reinforcing bars. Initial statistical analysis of data for pipe sections from each manufacturer indicated that DelZotto pipes have a thicker internal cover (ranging from 0.6” to 1.75”) than Rinker pipes (ranging from 0.4” to 1.1”). Extreme values will be re-examined. It is anticipated that the value of internal cover thickness will play a significant role in evaluating crack acceptability.
- Calibration of cracking rig was completed and now ready for performing controlled cracks.
- Commenced fabrication of Plexiglas exposure ponds for the 24 specimens.
- Trials were made to mount the pond assembly to the curved concrete surface using various adhesives and silicone sealant. Tests were made with various epoxy products. Epoxy with appropriate viscosity was selected such that the part of the crack to be exposed to test environments will be kept free of contamination sealer during application.
- A check for leakage of exposure pond revealed that the underside of the crack was leaking and therefore had to be coated with epoxy. Unexpectedly, a leak was observed where there was a gap around wires due to locally unconsolidated concrete. Those gaps seem to intersect with the crack which is full of solution therefore all exposed wire cross sections on the four specimens edges had to be sealed. Such gaps were mostly observed in DelZotto specimens.
- An additional literature search was conducted for a reliable method to quantify autogenous healing before and after exposure. Methods applied to a cracked specimen included visual observation, measuring crack width on surface (crack mouth), measuring apparent crack depth using an insertion gage, measuring change in dynamic modulus using Resonant Frequency (vibration test) adapted from ASTM C215 for the present specimen geometry. Those methods were selected for use. Methods like electrochemical Impedance Spectroscopy, 4-pin resistivity across the crack and permeability test (falling head) were investigated as well with use pending on upcoming results.

- A preliminary exposure to autogenous healing environment was initiated by exposing a cracked specimen to wet / dry cycles of saturated calcium hydroxide solution at room temperature. Initially a 24-hour wet /24-hour dry cycle was selected.

2) Activities Planned for Next Quarter:

- Complete controlled cracking of all 24 specimens
- Finish fabrication of Plexiglas exposure ponds
- Assemble exposure ponds and seal edge cracks
- Conclude stage A of the plan
- Initiate stage B of the plan

3) Summary of Requested Modifications:

- Progress on specimen preparation was slower than anticipated primarily due to solving experimental difficulties developing specimen side sealing procedures, construction and assembly of ponds, adapting test methods to the present custom methodology, and developing adequate autogenous healing inducement method. It is anticipated that testing will need an additional 3 months than initially planned for completion. A request for a no-added-cost extension of the contract with that objective will be submitted separately for consideration by the technical coordinator.

4) Progress Schedule:

- See next page.

FLORIDA DEPARTMENT OF TRANSPORTATION
RESEARCH CENTER

PROJECT SCHEDULE

Project Title Reinforced Concrete Pipe Cracks - Acceptance Criteria
 FDOT Project No. BDK84 977-06 FY 2008-9 Month 15
 Research Agency University of South Florida
 Principal Investigator Dr. Alberto A. Sagues

RESEARCH TASK	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	ESTIMATED % COMPLETION
Task 1																						
Lit. Rev.	33	66	100																			95%
Task 2																						
Final approach				100																		100%
Task 3																						
Conduct Rsch.					10	20	25	30	40	50	60	70	75	80	85	90	95	100				50%
Task 4																						
Maximum Width																						0%
Task 5															25	50	75	100				
Draft Specificaton																						
Final Report																33	66	100				0%
																			33	66	100	0%
Overall % Complete Projected	4%	8%	10%	15%	20%	25%	30%	35%	40%	45%	50%	0.55	0.6	0.65	0.7	0.75	0.8	0.85	0.9	0.95	100	
Overall % Complete Actual			10%			18%			25%			40%			60%							60%