6th Quarterly Progress Report to the FEDERAL HIGHWAY ADMINISTRATION (FHWA)

On the Project:
THE IMPACT OF WIDE-BASE TIRES ON PAVEMENT DAMAGE
DTFH61-11-C-00025

For period
July 1st to September 30th 2012

Submitted by
Illinois Center for Transportation
University of Illinois at Urbana-Champaign

FEDERAL HIGHWAY ADMINISTRATION
QUARTERLY PROGRESS REPORT

FHWA Project DTFH61-11-C-00025 FY: 2012 Quarter: July - September
Research Agent Illinois Center for Transportation
Principal Investigator Imad L. Al-Qadi

PHASE	RESEARCH TASK	2011									2012											2013											ESTIMATED % COMPLETION
		A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	
1	1.1. Comprehensive literature review and synthesis on past and current research																																		100
		20	60	90	100																														
	1.2. Experimental plan and modeling framew ork																																		100
				50	60	80	100																												
	1.3. Implementation and marketing plan																																		100
			10	50	70	80	100																												
	1.4. Phase I report																																		100
				60	70	80	100																												
	1.5. Conference call w ith panel																																		100
		0	50			100																												
	1.6. Presentations to relevant conferences and symposiums																																		0
2	2.1. Prepare experimental equipment, test structures, and instrumentation																																		85
						0	0	0	0	0	10	30	40	45	50	60	70	85																
	2.2. Conduct experiments, including material characterization and accelerated loading																																		70
							0	0	0	0	5	10	20	25	30	40	50	60	70															
	2.3. Conduct modeling																																		30
						0	0	0	0	0	1	2	5	6	8	10	20	25	30															
	2.4. Develope of analysis tool																																		5
														0	0	0	0	5	5															
	2.5. Delivery of draft Phase II report and analysis tool																																		0
	2.6. Present to relevant conferences and sumposiums																																		0
	2.7. Prepare article and technical papers																																		0
	Estimated Progress (%)	1	3	7	8	10	11	11	11	11	13	15	19	21	23	27	33	38	43																43
	Planned Progress (%)	1	3	7	10	13	17	21	25	29	33	36	40	44	47	51	55	59	61	63	64	66	68	70	71	73	75	77	81	85	89	93	97	100	61

QUARTERLY PROGRESS REPORT

QUARTER 6

The Impact of Wide-Base Tires on Pavement Damage – A National Study

1. Work Performed

During this quarter, the following tasks have been accomplished:

- Three dimensional contact stresses, static footprints, and load-deflection curves were processed and analyzed. A paper on tire contact-stress measurements was written and submitted to the Airfield and Highway Pavement Conference to be held in Los Angeles, CA on June 2013.
- The pavement structures at UC-Davis (2) were built and instrumented. The pavement structure and instruments' layout was modified. The thickness of the aggregate base was reduced to 270 mm while the thickness of the recycled layer was increased to 250 mm. The instrumentation was properly staggered. See appendix A for updated drawings
- Pavement sections in Florida are partially constructed and instrumented. Pictures from the project can be seen in Appendix B.
- Perpetual pavement sections in Delaware, OH were instrumented and built. In addition, samples were collected from the plant. A total of 60 compacted samples, 60 bags of loose mix (70-lb each approximately) and 20 steel buckets for MRL were collected per each material. See Appendix C for a brief report.

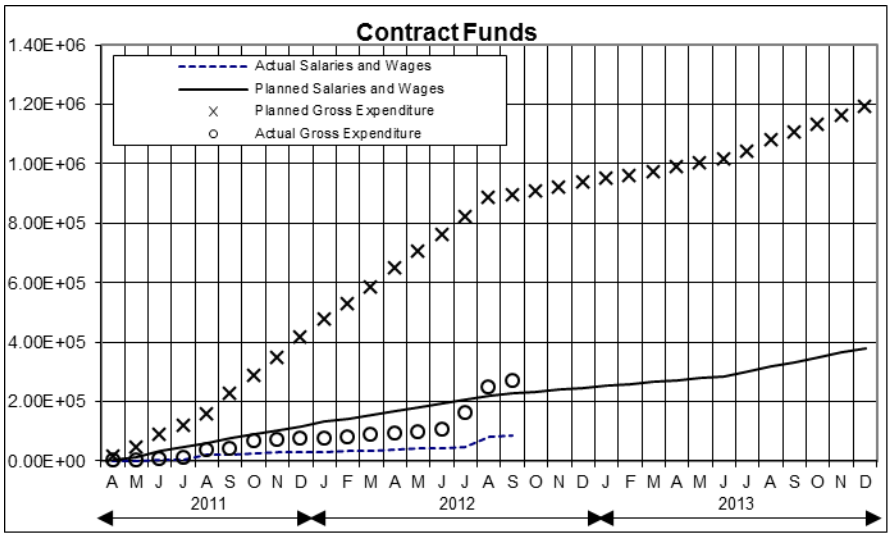
2. Work to be accomplished next quarter

- The input files for finite element analysis of all the pavement structured for five loading conditions will be prepared.
- Truck load test in Ohio is expected to start during the next quarter.
- Accelerated pavement testing of pavement sections in Florida DOT and UC-Davis will be starting during next quarter.

3. Problems encountered

No problems have been encountered in this quarter.

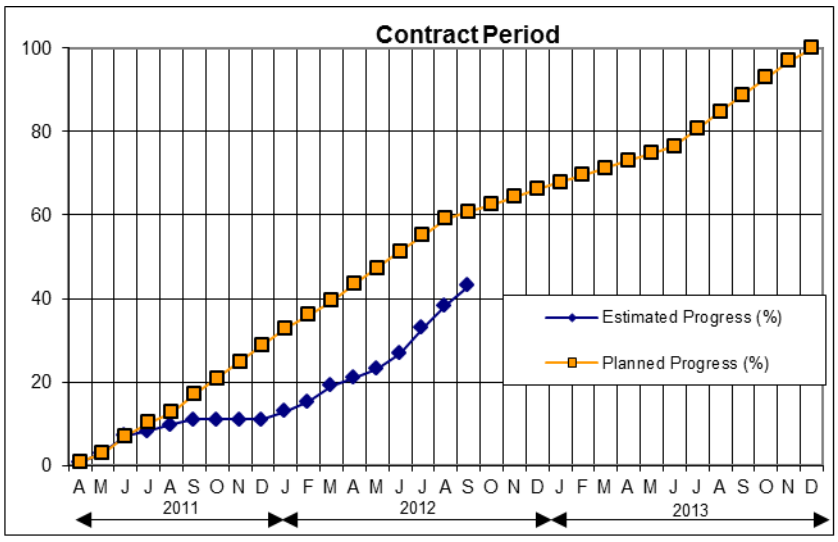
4. Current and cumulative expenditures



funds expended	22.7%	time expended, hrs	3615.5
contract amount	$1,190,456.00	starting date	July 1, 2012
expended this quarter	$165,738.26	completion date	September 30, 2012
total expenditures to date	$270,725.45		
balance	$919,730.55		

salaries and wages estimated this quarter	$39,912.54
salaries and wages spent this quarter	$41,248.99
accumulated salaries and wages to date	$85,060.68

5. Planned, actual, and cumulative percent of effort



6. APPENDIX A: UPDATED PAVEMENT STRUCTURE AND INSTRUMENTATION AT UC-DAVIS

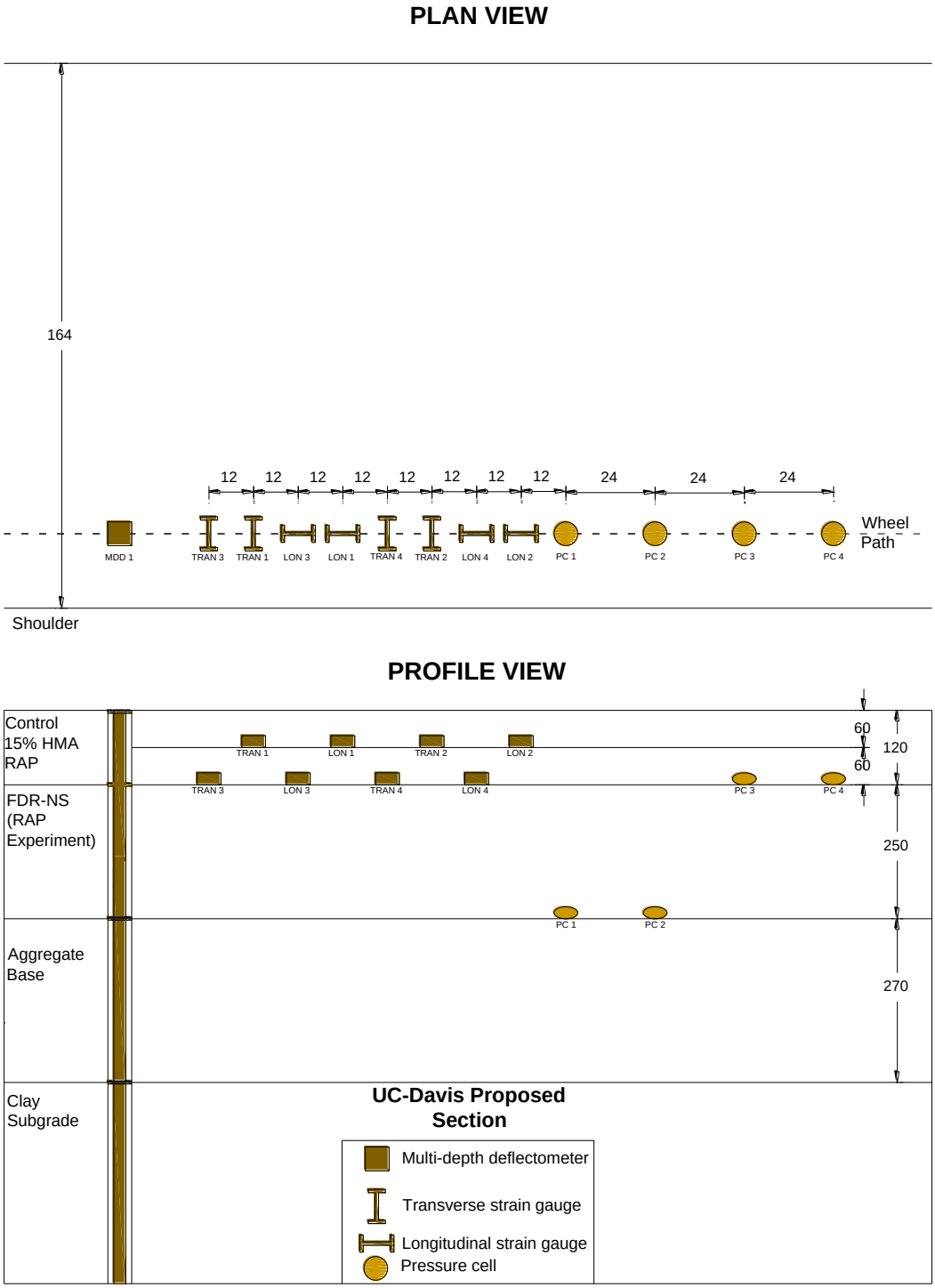


Figure A-1. Plan and profile view of pavement structure and instrumentation for the 15%-RAP-HMA test section at UC-Davis

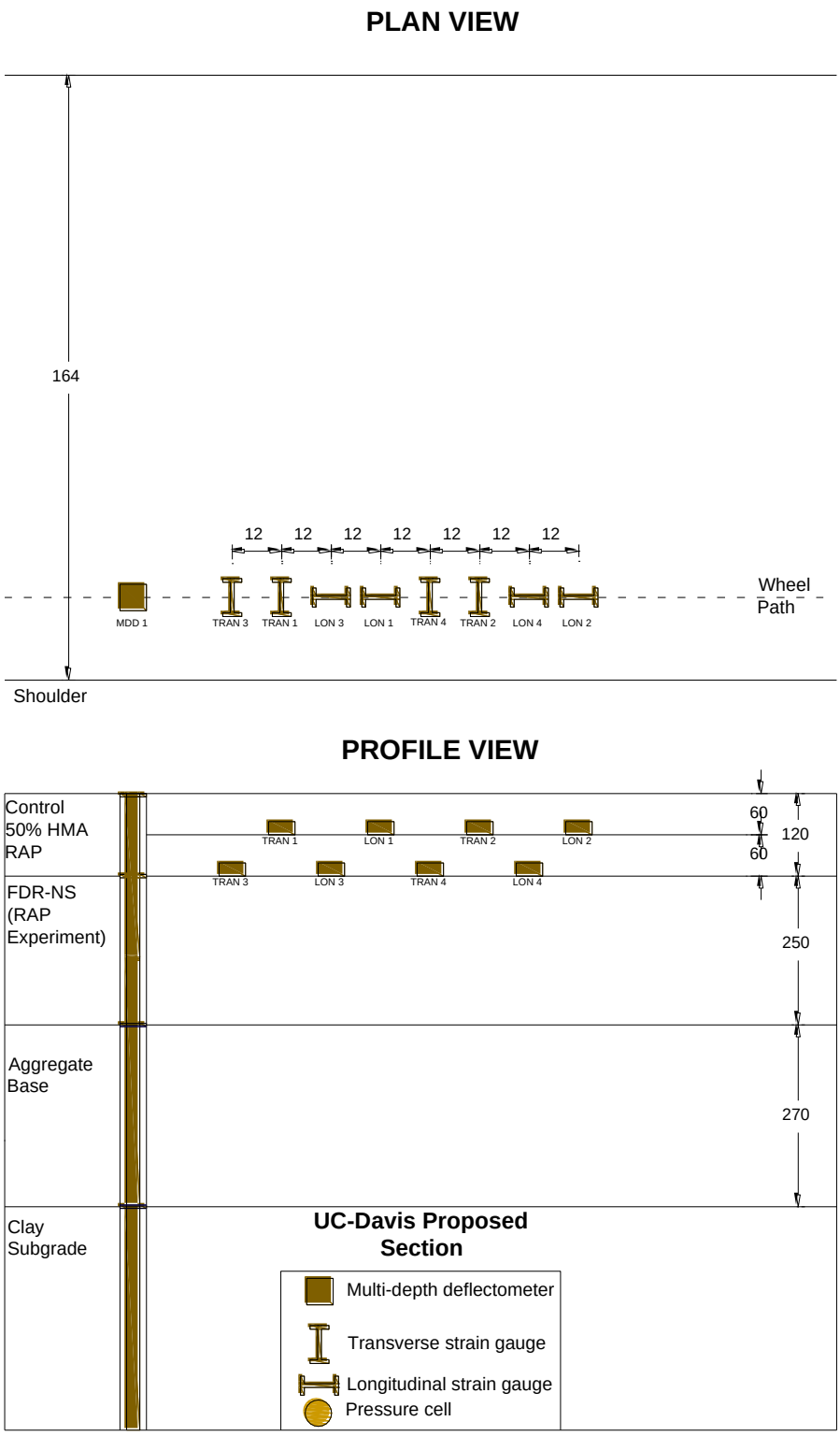


Figure A-2. Plan and profile view of pavement structure and instrumentation for the 50%-RAP-HMA test section at UC-Davis

7. APPENDIX B: PICTURES OF PROJECT AT FLORIDA DOT

Figure B-1. Sensors before and after paving Florida DOT

8. APPENDIX C: BRIEF REPORT ON PERPETUAL SECTIONS CONSTRUCTION AND INSTRUMENTATION

Date	Tasks Accomplished	Observations
Wednesday, Sep 12/2012	• Mobile lab was set at the plant (C-1) • Test pad for fatigue resistance layer (FRL) and asphalt treated base (ATB) was built • 16 pilots of FRL and 16 of ATB were collected	
Thursday, Sep 13/2012	• 6 strain gauges, 2 thermocouples, and 2 pressure cells were installed in each section at the bottom of the FRL (Figure C-3, Figure C-4, and Figure C-5) • FRL was placed • 4200 lb of loose mix stored in bags (60 bags, 70 lb per bag), 60 compacted samples, and 1400 lb of loose mix stored in steel buckets (20 buckets around 70 lb each) of FRL were collected	• DGAB was previously built and instrumentation on top of the subgrade was already installed (2 Geokon pressure cells [Figure C-2]) • DGAB was weak due to rain the previous weekend. As a consequence, the trucks and paver created rutting on the DGAB (Figure C-6). It is expected that the structural capacity of the pavement structure will not be affected since the moisture content will decrease with time.
Friday, Sep 14/2012	• 6-in-thick lift on sections A and B, and 4-in-thick lift on section C were placed • 4200 lb of loose mix stored in bags (60 bags, 70 lb per bag), 60 compacted samples, and 1400 lb of loose mix stored in steel buckets (20 buckets around 70 lb each) of ATB were collected • 8 strain gauges were installed at the bottom of the ATB in each section, 2 of them with a 45° orientation (Figure C-7)	• 45° sensors were 1 ft apart from adjacent sensors (FigureC-8). Some disturbance between sensors might occur. • Truck might have misaligned sensors on Section B due to truck passing close to the sensors (FigureC-9) • Rutting of FRL (FigureC-10)
Saturday, Sep 15/2012	• Test pad for Intermediate layer was built • 16 pilots of intermediate layer were collected	• The mix was sitting on the silo for too long (around 5 hours). As a result, the test pad for the intermediate layer was repeated.
Sunday, Sep 16/2012	• Bagged samples of FRL and ATB were unloaded at ATREL	
Monday, Sep 17/2012	• 8 pilots of intermediate layer were sampled (due to unsatisfactory results with Saturday's test pad)	• Due problems with Intermediate test pads and error with ATB thickness in Section A, no paving was performed
Tuesday, Sep 18/2012		• Due to weather conditions, no paving was performed
Wednesday,		• Due to broken plant, no paving was performed

Sep 19/2012		
Thursday, Sep 20/2012	• Intermediate and surface layers were placed • Six strain gauges (2 with an orientation of 45°) were installed in each section (FigureC-11) • 4200 lb of loose mix stored in bags (60 bags, 70 lb per bag), 60 compacted samples, and 1400 lb of loose mix stored in steel buckets (20 buckets around 70 lb each) of Intermediate and Surface layer were collected (FigureC-12) • Small length of section A was paved with ATB (FigureC-13)	• The contractor placed the wrong thickness in Section A; milling and re-placement of ATB was needed (FigureC-13) • Truck ran over sensor on Section A (FigureC-14). After checking the status of the sensor, it was found that none of them died; however, some misalignment might have been created • Sensors were placed on Wednesday, but paving was done on Thursday
Friday, Sep 21/2012	• Mobile laboratory removed from plant (FigureC-15) • Bagged and compacted samples moved to storage unit (FigureC-16) • Steel buckets with material for MRL properly placed at plant (Figure C-17)	

Figure C-1. Set up of mobile lab

Figure C-2. Geokon pressure cells on top of the subgrade

Figure C-3. Instrumentation at the bottom of DGAB in section A

Figure C-4. Installation of sensor at the bottom of the FRL in Section A

Figure C-5. Instrumentation at the bottom of FRL in Sections B and C

Figure C-6. Weak DGAB in Section B

Figure C-7. Instrumentation at the bottom of the ATB

FigureC-8. 45° strain gauge 1 ft apart from adjacent sensors

FigureC-9. Possible misalignment of sensors after truck passes

FigureC-10. Rutting of FRL due to weak DGAB

FigureC-11. Instrumentation at the bottom of the intermediate layer

Figure C-12. Compacted samples of Intermediate and Surface layer

FigureC-13. Milling and fill of ATB in Section A

FigureC-14. Truck ran over sensor in Section A

FigureC-15. Mobile laboratory removed from plant

Figure C-16. Bagged and compacted samples of Intermediate and Surface materials at storage unit

Figure C-17. Steel buckets for MRL