

**Demonstration and Purchase of PG Binder Testing
Equipment
Phase 1 and 2
FINAL REPORT**

James Mahoney

April 10, 2014

**CONNDOT REPORT NO. CT-TPF-5(236)-F-14-2
PROJECT NO. TPF-5(236)**

Connecticut Advanced Pavement Laboratory
Connecticut Transportation Institute
School of Engineering
University of Connecticut

Prepared for Connecticut Department of Transportation
Bureau of Engineering and Construction
AEC Applications and Research Section
Research Unit

James A. Fallon, P.E.
Manager of Design Services

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16. Abstract A pooled fund project was undertaken to purchase new asphalt binder testing equipment for state transportation agencies. The seven states that agreed to participate included: Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island and Vermont. Within the region, there were two benefits with pooling resources for the equipment purchases. The first was the ability to purchase multiple units of the various pieces of equipment, thereby reducing the individual costs. The second was with each state transportation agency having the same equipment which reduces travel costs for preventative maintenance service and the ability to contact colleagues to discuss any issues they may be having.			
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The author would like to thank all of the participants from the seven states for their contributions and patience during this process. There are far too many of you to list out, but many thanks to all of you.

Standard Metric Conversions

SI CONVERSION FACTORS				
SYMBOL	GIVEN	MULTIPLY BY	CONVERT TO	SYMBOL
AREA				
mm ²	square millimeters	0.0016	square inches	in ²
m ²	square meters	10.764	square feet	ft ²
m ²	square meters	1.196	square yards	yd ²
ha	hectares	2.47	acres	ac
km ²	square kilometers	0.386	square miles	mi ²
LENGTH				
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
VOLUME				
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m ³	cubic meters	35.314	cubic feet	ft ³
m ³	cubic meters	1.307	cubic yards	yd ³
NOTE: volumes greater than 1000L shall be shown in m ³				
MASS				
g	grams	0.036	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg (or "t")	megagrams (or metric ton)	1.103	short tons (2000 lb)	T
TEMPERATURE				
°C	Celsius	1.8C + 32	Fahrenheit	°F
ILLUMINATION				
lx	lux	0.0929	foot-candles	fc
cd/m ²	candela/m ²	0.2919	foot-Lamberts	fl
FORCE and PRESSURE or STRESS				
N	newtons	0.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in ²

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Background:

To help expedite the implementation of the Superpave methods in the mid-1990's, the Federal Highway Administration (FHWA) conducted a Pooled Fund project that allowed state transportation agencies (SHAs) to purchase shares in the Pooled Fund. A share provided participating SHAs with one full set of Superpave testing equipment – both for the asphalt binder and the HMA. This pooling of funds for purchasing new and expensive test equipment gave the SHAs bulk purchasing power that resulted in cost savings as compared to purchasing equipment individually.

The majority of equipment purchased under the Pooled Fund was for testing of asphalt binder in accordance with the Performance Grading (PG) system. The binder testing equipment was highly sophisticated and contained sensitive electronics for making necessary measurements. As most of this equipment was in service for approximately 15 years, it had reached the end of its service life.

With the advent of new test methods, such as the Multiple Stress Creep Recovery Test and proposed asphalt rubber testing, the older Dynamic Shear Rheometer (DSR) equipment became outdated, since it was not able to run these tests. Additionally, proposed crack sealant testing using the Bending Beam Rheometer (BBR) required some SHAs to upgrade their BBRs. Updating the asphalt binder testing for the state transportation agencies was paramount for the states to adopt these new methods of characterizing asphalt binders and other asphalt products.

Objective:

The objective of this project was to provide SHAs the opportunity to update their asphalt binder testing equipment to conduct the latest tests. By pooling their funds together to purchase larger quantities of equipment, the states would realize significant savings through bulk purchasing power.

Benefits:

From the original FHWA pooled fund equipment purchases in the 1990's, each of the New England SHAs had all of the same equipment from the same manufacturers. This was beneficial for two reasons. The first benefit was that the SHAs could make inquiries to other participating SHAs to see if any had experienced similar issues and how to resolve them. The second benefit came from a reduction of travel costs for servicing the equipment, as the equipment

manufacturers could group service trips into the region. The outcome of this current pooled fund activity preserved these benefits.

Project Activity:

A new pooled fund solicitation was made using the FHWA pooled fund protocol. This particular project was broken into two phases that ran concurrently. Seven SHAs chose to participate in the project. They were: Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island and Vermont. The Connecticut Department of Transportation (ConnDOT) was the lead agency for the pooled fund activity and the University of Connecticut's Connecticut Advanced Pavement Lab (CAP Lab) hosted the equipment vendors and provided lab space for the demonstration of the equipment.

Phase 1 was intended for determining the SHA's needs, conducting equipment demonstrations, and covering administrative costs associated with ordering binder testing equipment. SHAs were allowed to contribute additional funding to cover the costs of travel to the equipment demonstrations. New Hampshire, New York and Vermont added extra funding to cover these costs. Appendix A shows the additional funding provided by the SHAs and the actual amount expended.

Participating SHAs contributed funding for the actual purchases of asphalt binder testing equipment in Phase 2.

The project was initiated between ConnDOT and the CAP Lab in February 2011. The first equipment demonstration was held in February of 2011 and a second demonstration was conducted in November 2011. There was a significant delay between when the SHAs put funds into the pooled fund system for the purchase of the equipment and when they were available for issuing purchase orders. Due to the lag getting the funds through the system, the first equipment purchase orders were issued in early November 2011. The final purchase orders for Phase 2 were issued in June of 2012.

Appendix B contains a detailed list of the funding received from each state, a detailed list of the equipment purchased by state and the actual expenditures made by each state.

Appendix A
Phase 1 Unspent Travel Funds

State	Travel Funding Added to Phase 1 Contribution	Actual Travel Funding Expended	Remaining Funds for Phase 1 Travel Funds
New Hampshire	\$1,500	\$1,194.93	\$305.07
New York	\$1,590	\$641.44	\$948.56
Vermont	\$1,500	\$973.86	\$526.14

Appendix B

Phase 2 Breakdown of Equipment Purchased for Pooled Fund Equipment Purchase State-by-State

**Allowable Funding Limits and Equipment Purchase List
for TPF-5(236), "Demonstration and Purchase of PG Binder Testing Equipment" - Phase 2
9/24/2013 - FINAL**

Allowable Funding Limits for Equipment Purchased Under TPF-5(236), "Demonstration and Purchase of PG Binder Testing Equipment" - Phase 2 [1]	
9/24/2013 - FINAL	
State	Equipment Purchase Funding Not to Exceed
Connecticut	\$ 149,618.14
Maine	\$ 59,618.14
Massachusetts	\$ 215,000.00
New Hampshire	\$ 253,312.21
New York	\$ 193,028.00
Rhode Island	\$ 108,906.37
Vermont	\$ 115,618.14
Total	\$ 1,095,101.00
[1] See Equipment Purchase List below for equipment purchased under TPF-5(236), "Demonstration and Purchase of PG Binder Testing Equipment" - Phase 2.	

Equipment Purchase List							
9/24/2013 - FINAL							
Equipment Purchased Under TPF-5(236), "Demonstration and Purchase of PG Binder Testing Equipment" - Phase 2							
State	Agency	Date of Requisition	Equipment	Quantity	Unit Price	Total Price	
CT - ConnDOT							
CT	ConnDOT	2/14/12	Canon Bending Beam Rheometer	1	\$ 24,976.00	\$ 24,976.00	
CT	ConnDOT	2/14/12	Canon BBR Initial Setup	1	\$ 1,500.00	\$ 1,500.00	
CT	ConnDOT	2/14/12	BBR Additional 2 Years Warranty	1	\$ 2,500.00	\$ 2,500.00	
CT	ConnDOT	2/14/12	Canon Data Acquisition System	1	\$ 1,995.00	\$ 1,995.00	
CT	ConnDOT	2/14/12	Monochrome Laser Printer for BBR	1	\$ 275.00	\$ 275.00	
CT	ConnDOT	2/14/12	BBR Preventative Maintenance	1	\$ 2,650.00	\$ 2,650.00	
CT	ConnDOT	2/14/12	Canon BBR Crack Sealant Test Kit	1	\$ 1,117.23	\$ 1,117.23	
CT	ConnDOT	6/13/12	Rolling Thin Film Oven	1	\$ 9,840.00	\$ 9,840.00	
CT	ConnDOT	6/13/12	RTFO Bottles	8	\$ 22.00	\$ 176.00	
CT	ConnDOT	6/13/12	RTFO Silica Gel	1	\$ 52.00	\$ 52.00	
CT	ConnDOT	6/13/12	RTFO Cooling Rack	1	\$ 163.00	\$ 163.00	
CT	ConnDOT	6/13/12	RTFO Shipping	1	\$ 388.78	\$ 388.78	
CT	ConnDOT	2/16/12	Prentex Pressure Aging Vessel	1	\$ 13,195.00	\$ 13,195.00	
CT	ConnDOT	2/9/12	Malvern Dynamic Shear Rheometer	1	\$ 49,875.00	\$ 49,875.00	
CT	ConnDOT	2/9/12	TCD-05 Temperature Probe for DSR	1	\$ 3,135.09	\$ 3,135.09	
CT	ConnDOT	2/9/12	Computer for DSR	1	\$ 1,500.00	\$ 1,500.00	
CT	ConnDOT	2/9/12	Printer for DSR	1	\$ 200.00	\$ 200.00	
CT	ConnDOT	5/29/12	Rotational Viscometer - Brookfield + shipping	1	\$ 7,029.74	\$ 7,029.74	
CT	ConnDOT	5/29/12	RV Small Sample Adapter	1	\$ 775.00	\$ 775.00	
CT	ConnDOT	5/29/12	RV Spindle #27	1	\$ 170.00	\$ 170.00	
CT	ConnDOT	5/29/12	RV Viscosity Standard	1	\$ 54.00	\$ 54.00	
CT	ConnDOT	5/29/12	RV TC-150MX-115 Circulator Bath	1	\$ 1,675.00	\$ 1,675.00	
CT	CAP Lab	2/13/12	Malvern DSR - CAP Lab (ConnDOT Partial Payment)	1	\$ 26,295.50	\$ 26,295.50	
			Total Purchase Request for ConnDOT - Final			\$ 149,537.34	
Total Equipment Purchase Cost for ConnDOT						\$	149,537.34
Remaining Balance						\$	80.80

Equipment Purchase List							
9/24/2013 - FINAL							
Equipment Purchased Under TPF-5(236), "Demonstration and Purchase of PG Binder Testing Equipment" - Phase 2							
State	Agency	Date of Requisition	Equipment	Quantity	Unit Price	Total Price	
ME - ME DOT							
ME	ME DOT	2/9/12	Malvern Dynamic Shear Rheometer	1	\$ 49,875.00	\$ 49,875.00	
ME	ME DOT	2/9/12	TCD-05 Temperature Probe for DSR	1	\$ 3,135.09	\$ 3,135.09	
ME	ME DOT	2/9/12	Computer for DSR	1	\$ 1,500.00	\$ 1,500.00	
ME	ME DOT	2/9/12	Printer for DSR	1	\$ 200.00	\$ 200.00	
ME	ME DOT	2/9/12	Extra 8mm Upper Plate for DSR	1	\$ 760.00	\$ 760.00	
ME	ME DOT	2/9/12	Extra 25mm Upper Plate for DSR	1	\$ 760.00	\$ 760.00	
ME	ME DOT	2/9/12	Extra 8mm Lower Plate for DSR	1	\$ 856.00	\$ 856.00	
ME	ME DOT	2/9/12	Extra 25mm Lower Plate for DSR	1	\$ 856.00	\$ 856.00	
			Total Purchase Request for ME DOT - Final			\$ 57,942.09	
Total Equipment Purchase Cost for ME DOT							\$ 57,942.09
Remaining Balance							\$ 1,676.05

Equipment Purchase List							
9/24/2013 - FINAL							
Equipment Purchased Under TPF-5(236), "Demonstration and Purchase of PG Binder Testing Equipment" - Phase 2							
State	Agency	Date of Requisition	Equipment	Quantity	Unit Price	Total Price	
MA - MassDOT							
MA	MassDOT	6/15/12	Canon Bending Beam Rheometer	2	\$ 24,976.00	\$ 49,952.00	
MA	MassDOT	6/15/12	Canon Data Acquisition System	2	\$ 1,995.00	\$ 3,990.00	
MA	MassDOT	6/15/12	Canon BBR Initial Setup	2	\$ 1,500.00	\$ 3,000.00	
MA	MassDOT	6/15/12	BBR Preventative Maintenance	1	\$ 2,650.00	\$ 2,650.00	
MA	MassDOT	6/15/12	BBR Additional 2 Years Warranty	1	\$ 2,500.00	\$ 2,500.00	
MA	MassDOT	6/15/12	Prentex Pressure Aging Vessel	1	\$ 12,931.10	\$ 12,931.10	
MA	MassDOT	6/15/12	Prentex Vacuum Degassing Oven	1	\$ 3,176.18	\$ 3,176.18	
MA	MassDOT	6/15/12	Malvern Dynamic Shear Rheometer	2	\$ 49,875.00	\$ 99,750.00	
MA	MassDOT	6/15/12	TCD-05 Temperature Probe for DSR	1	\$ 3,135.09	\$ 3,135.09	
MA	MassDOT	6/15/12	Peltier Cylinder Environmental Chamber for DSR	1	\$ 5,728.00	\$ 5,728.00	
MA	MassDOT	6/15/12	Computer for DSR	2	\$ 1,500.00	\$ 3,000.00	
MA	MassDOT	6/15/12	Extra 25mm Upper Plate for DSR	1	\$ 760.00	\$ 760.00	
MA	MassDOT	6/15/12	Extra 25mm Lower Plate for DSR	1	\$ 856.00	\$ 856.00	
MA	MassDOT	6/15/12	Asphalt Cup for DSR	1	\$ 1,240.00	\$ 1,240.00	
MA	MassDOT	6/15/12	Asphalt Bob for DSR	1	\$ 1,344.00	\$ 1,344.00	
MA	MassDOT	6/15/12	Asphalt Vane for DSR	1	\$ 1,432.00	\$ 1,432.00	
MA	MassDOT	6/15/12	Extra Years Warranty - DSR	2	\$ 5,620.00	\$ 11,240.00	
MA	MassDOT	6/15/12	Rotational Viscometer - Brookfield + shipping	1	\$ 6,998.66	\$ 6,998.66	
MA	MassDOT	6/15/12	RV Spindle #27	1	\$ 170.00	\$ 170.00	
MA	MassDOT	6/15/12	RV Spindle #21	1	\$ 170.00	\$ 170.00	
MA	MassDOT	6/15/12	RV 10 Wire Links	1	\$ 55.00	\$ 55.00	
			Total Purchase Request for MassDOT - Final			\$ 214,078.03	
Total Equipment Purchase Cost for MassDOT							\$ 214,078.03
Remaining Balance							\$ 921.97

Equipment Purchase List							
9/24/2013 - FINAL							
Equipment Purchased Under TPF-5(236), "Demonstration and Purchase of PG Binder Testing Equipment" - Phase 2							
State	Agency	Date of Requisition	Equipment	Quantity	Unit Price	Total Price	
NH - NH DOT							
NH	NH DOT	2/14/12	Canon Bending Beam Rheometer	1	\$ 24,976.00	\$ 24,976.00	
NH	NH DOT	2/14/12	Canon Data Acquisition System	1	\$ 1,995.00	\$ 1,995.00	
NH	NH DOT	2/14/12	Canon BBR Initial Setup	1	\$ 1,500.00	\$ 1,500.00	
NH	NH DOT	2/14/12	Monochrome Laser Printer for BBR	1	\$ 275.00	\$ 275.00	
NH	NH DOT	2/14/12	BBR Preventative Maintenance	1	\$ 2,650.00	\$ 2,650.00	
NH	NH DOT	2/14/12	Canon BBR Crack Sealant Test Kit	1	\$ 1,117.23	\$ 1,117.23	
NH	NH DOT	2/14/12	Dostman Digital Thermometer	1	\$ 1,454.00	\$ 1,454.00	
NH	NH DOT	2/16/12	Prentex Pressure Aging Vessel	2	\$ 12,931.10	\$ 25,862.20	
NH	NH DOT	2/16/12	PAV Calibration Kit	1	\$ 906.50	\$ 906.50	
NH	NH DOT	8/10/12	Rolling Thin Film Oven	2	\$ 9,840.00	\$ 19,680.00	
NH	NH DOT	8/10/12	RTFO Shipping	1	\$ 788.88	\$ 788.88	
NH	NH DOT	2/9/12	Malvern Dynamic Shear Rheometer	2	\$ 49,875.00	\$ 99,750.00	
NH	NH DOT	2/9/12	TCD-05 Temperature Probe for DSR	1	\$ 3,135.09	\$ 3,135.09	
NH	NH DOT	2/9/12	Computer for DSR	2	\$ 1,500.00	\$ 3,000.00	
NH	NH DOT	2/9/12	Printer for DSR	2	\$ 200.00	\$ 400.00	
NH	NH DOT	2/9/12	Extra 25mm Upper Plate for DSR	1	\$ 760.00	\$ 760.00	
NH	NH DOT	2/9/12	Extra 25mm Lower Plate for DSR	1	\$ 856.00	\$ 856.00	
NH	NH DOT	2/9/12	Extra 8mm Upper Plate for DSR	1	\$ 760.00	\$ 760.00	
NH	NH DOT	2/9/12	Extra 8mm Lower Plate for DSR	1	\$ 856.00	\$ 856.00	
NH	NH DOT	6/3/13	Rotational Viscometer - Brookfield + shipping	1	\$ 7,185.79	\$ 7,185.79	
NH	NH DOT	6/5/13	Asphalt Binder Cracking Device	1	\$ 54,575.00	\$ 54,575.00	
			Total Purchase Request for NH DOT - Final			\$ 252,482.69	
Total Equipment Purchase Cost for NH DOT							\$ 252,482.69
Remaining Balance							\$ 829.52

Equipment Purchase List								
9/24/2013 - FINAL								
Equipment Purchased Under TPF-5(236), "Demonstration and Purchase of PG Binder Testing Equipment" - Phase 2								
State	Agency	Date of Requisition	Equipment	Quantity	Unit Price	Total Price		
NY - NYSDOT								
NY	NYSDOT	11/2/11	Canon Bending Beam Rheometer	1	\$ 24,639.57	\$ 24,639.57		
NY	NYSDOT	11/2/11	Canon Data Acquisition System	1	\$ 1,995.00	\$ 1,995.00		
NY	NYSDOT	11/2/11	Monochrome Laser Printer for BBR	1	\$ 275.00	\$ 275.00		
NY	NYSDOT	11/2/11	Canon BBR Crack Sealant Test Kit	1	\$ 1,117.23	\$ 1,117.23		
NY	NYSDOT	11/2/11	Dostman Digital Thermometer	3	\$ 1,454.00	\$ 4,362.00		
NY	NYSDOT	11/2/11	Prentex Vacuum Degassing Oven	2	\$ 3,241.00	\$ 6,482.00		
NY	NYSDOT	4/10/12	Julabo Circulator for Malvern DSR	1	\$ 5,883.09	\$ 5,883.09		
NY	NYSDOT	2/15/12	Rolling Thin Film Oven	3	\$ 8,396.29	\$ 25,188.88		
NY	NYSDOT	2/9/12	Malvern Dynamic Shear Rheometer	2	\$ 49,875.00	\$ 99,750.00		
NY	NYSDOT	2/9/12	TCD-05 Temperature Probe for DSR	1	\$ 3,135.09	\$ 3,135.09		
NY	NYSDOT	2/9/12	Computer for DSR	2	\$ 1,500.00	\$ 3,000.00		
NY	NYSDOT	2/9/12	Printer for DSR	2	\$ 200.00	\$ 400.00		
NY	NYSDOT	2/9/12	Extra 8mm Upper Plate for DSR	2	\$ 760.00	\$ 1,520.00		
NY	NYSDOT	2/10/12	Extra 25mm Upper Plate for DSR	2	\$ 760.00	\$ 1,520.00		
NY	NYSDOT	2/11/12	Extra 8mm Lower Plate for DSR	2	\$ 856.00	\$ 1,712.00		
NY	NYSDOT	2/12/12	Extra 25mm Lower Plate for DSR	2	\$ 856.00	\$ 1,712.00		
			Total Purchase Request for NYSDOT - Final			\$ 182,691.86		
Total Equipment Purchase Cost for NYSDOT							\$ 182,691.86	
Remaining Balance							\$ 10,336.14	

Equipment Purchase List							
9/24/2013 - FINAL							
Equipment Purchased Under TPF-5(236), "Demonstration and Purchase of PG Binder Testing Equipment" - Phase 2							
State	Agency	Date of Requisition	Equipment	Quantity	Unit Price	Total Price	
RI - RI DOT							
RI	RI DOT	8/10/12	Canon Bending Beam Rheometer	1	\$ 24,976.00	\$ 24,976.00	
RI	RIDOT	8/10/12	Canon Data Acquisition System	1	\$ 1,995.00	\$ 1,995.00	
RI	RIDOT	8/10/12	Canon BBR Crack Sealant Test Kit	1	\$ 1,117.23	\$ 1,117.23	
RI	RIDOT	8/10/12	Prentex Pressure Aging Vessel	1	\$ 13,195.00	\$ 13,195.00	
RI	RIDOT	8/10/12	Malvern Dynamic Shear Rheometer	1	\$ 49,875.00	\$ 49,875.00	
RI	RIDOT	8/10/12	TCD-05 Temperature Probe for DSR	1	\$ 3,135.09	\$ 3,135.09	
RI	RIDOT	8/10/12	Peltier Cylinder Environmental Chamber for DSR	1	\$ 5,728.00	\$ 5,728.00	
RI	RIDOT	8/10/12	Computer for DSR	1	\$ 1,500.00	\$ 1,500.00	
RI	RIDOT	8/10/12	Extra 8mm Upper Plate for DSR	1	\$ 760.00	\$ 760.00	
RI	RIDOT	8/10/12	Extra 25mm Upper Plate for DSR	1	\$ 760.00	\$ 760.00	
RI	RIDOT	8/10/12	Extra 8mm Lower Plate for DSR	1	\$ 856.00	\$ 856.00	
RI	RIDOT	8/10/12	Extra 25mm Lower Plate for DSR	1	\$ 856.00	\$ 856.00	
RI	RIDOT	8/10/12	Asphalt Cup for DSR	1	\$ 1,240.00	\$ 1,240.00	
RI	RIDOT	8/10/12	Asphalt Bob for DSR	1	\$ 1,344.00	\$ 1,344.00	
RI	RIDOT	8/10/12	Asphalt Vane for DSR	1	\$ 1,432.00	\$ 1,432.00	
			Total Purchase Request for RI DOT - Final			\$ 108,769.32	
Total Equipment Purchase Cost for RI DOT							\$ 108,769.32
Remaining Balance							\$ 137.05

Equipment Purchase List							
9/24/2013 - FINAL							
Equipment Purchased Under TPF-5(236), "Demonstration and Purchase of PG Binder Testing Equipment" - Phase 2							
State	Agency	Date of Requisition	Equipment	Quantity	Unit Price	Total Price	
VT - VT AOT							
VT	VT AOT	2/14/12	Canon Bending Beam Rheometer	1	\$ 24,976.00	\$ 24,976.00	
VT	VT AOT	2/14/12	Canon BBR Initial Setup	1	\$ 1,500.00	\$ 1,500.00	
VT	VT AOT	2/14/12	BBR Additional 2 Years Warranty	1	\$ 2,500.00	\$ 2,500.00	
VT	VT AOT	2/14/12	Canon BBR Crack Sealant Test Kit	1	\$ 1,117.23	\$ 1,117.23	
VT	VT AOT	2/14/12	Dostman Digital Thermometer	1	\$ 1,454.00	\$ 1,454.00	
VT	VT AOT	2/16/12	Prentex Pressure Aging Vessel	1	\$ 12,931.10	\$ 12,931.10	
VT	VT AOT	2/16/12	Prentex Vacuum Degassing Oven	1	\$ 3,176.18	\$ 3,176.18	
VT	VT AOT	2/10/12	Malvern Dynamic Shear Rheometer	1	\$ 49,875.00	\$ 49,875.00	
VT	VT AOT	2/10/12	TCD-05 Temperature Probe for DSR	1	\$ 3,135.09	\$ 3,135.09	
VT	VT AOT	2/10/12	Peltier Cylinder Environmental Chamber for DSR	1	\$ 5,728.00	\$ 5,728.00	
VT	VT AOT	2/10/12	4 mm Upper Plate for DSR	1	\$ 760.00	\$ 760.00	
VT	VT AOT	2/10/12	4 mm Lower Plate for DSR	1	\$ 856.00	\$ 856.00	
VT	VT AOT	2/10/12	Asphalt Cup for DSR	1	\$ 1,240.00	\$ 1,240.00	
VT	VT AOT	2/10/12	Asphalt Bob for DSR	1	\$ 1,344.00	\$ 1,344.00	
			Total Purchase Request for VT AOT - Final			\$ 110,592.60	
Total Equipment Purchase Cost for VT AOT							\$ 110,592.60
Remaining Balance							\$ 5,025.54