September 12, 2014

Mr. Frank Zakar
National Transportation Safety Board
Materials Laboratory Division
490 L Enfant Plaza East
Washington, DC 20594
USA

Intertek PTL # P20143394

Dear Mr. Zakar:

Enclosed you will find the results of the testing you requested.

If you have any questions regarding the data, please do not hesitate to contact me.

Sincerely,

[redacted]

Kevin E. Schuman
Quality Manager

KES/mm

Enclosures

50 Pearl Street, Pittsfield, MA 01201
Phone: (413) 499-0983 Fax: 499-2339
http://www.ptli.com

Testing	:	**Compositional Analysis By Thermogravimetry**
Test Method	:	ASTM E1131-08 (2014)
Project Number	:	P20143394
Customer	:	National Transportation Safety Board
Attention	:	Frank Zakar
Analyst	:	T. Keith
Date	:	September 10, 2014

Attachments : 2

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Cert. No. 0619.01
TESTING LABORATORY

Instrument	:	Perkin Elmer Pyris 1 TGA
Test Atmosphere	:	Air
Flow Rate	:	35 ml/min
Calibration Procedure	:	Calibrated vs. Magnetic Transitions Of Alumel, Nickel, and Perkalloy
Pre-Analysis Purge Time	:	5 minutes
Heating Rate	:	10°C/min
Starting Temperature	:	25°C
Final Temperature	:	850°C
Sample Name	:	**Bimodal HDPE Pipe**

Temperature (°C)	% Weight	Temperature (°C)	% Weight	Temperature (°C)	% Weight
30	99.99	320	97.28	610	1.05
40	99.99	330	96.71	620	0.81
50	99.99	340	96.04	630	0.55
60	99.99	350	95.24	640	0.28
70	99.99	360	94.25	650	-0.01
80	99.99	370	92.97	660	-0.30
90	99.99	380	91.33	670	-0.55
100	99.99	390	88.77	680	-0.74
110	99.98	400	85.56	690	-0.84
120	99.97	410	79.78	700	-0.89
130	99.95	420	74.76	710	-0.90
140	99.93	430	69.48	720	-0.92
150	99.90	440	60.43	730	-0.94
160	99.86	450	47.42	740	-0.96
170	99.82	460	35.42	750	-0.97
180	99.79	470	27.95	760	-0.98
190	99.75	480	22.48	770	-0.99
200	99.72	490	16.37	780	-1.00
210	99.68	500	9.90	790	-1.01
220	99.65	510	7.94	800	-1.02
230	99.61	520	7.11	810	-1.03
240	99.56	530	6.24	820	-1.04
250	99.51	540	5.26	830	-1.05
260	99.46	550	4.27	840	-1.06
270	99.42	560	3.36	850	-1.06
280	99.28	570	2.61		
290	98.81	580	2.02		
300	98.32	590	1.60		
310	97.81	600	1.30		

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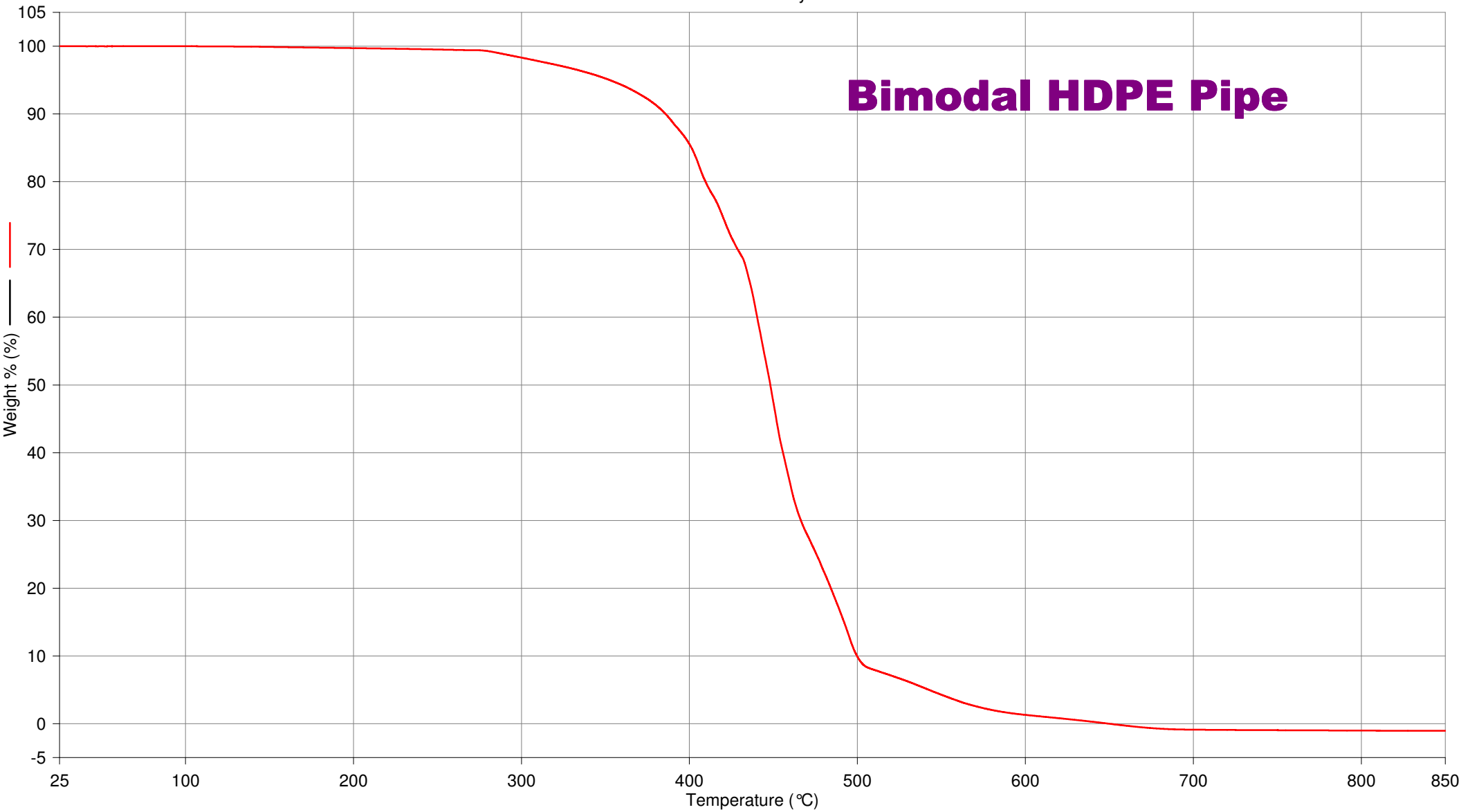
Filename:	C:\Program Files\Pyris\Data\3394-01.tg1d
Operator ID:	Teresa
Sample ID:	P20143394 National Transportation Safety
Sample Weight:	9.720 mg
Initial Purge Gas:	Nitrogen
Comment:	

P20143394 National Transportation Safety: 3394-01.tg1d
Weight % (%) : Step: 1

PerkinElmer Thermal Analysis



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1) Heat from 25.00°C to 860.00°C at 10.00°C/min

Testing	: **Compositional Analysis By Thermogravimetry**
Test Method	: ASTM E1131-08 (2014)
Project Number	: P20143394
Customer	: National Transportation Safety Board
Attention	: Frank Zakar
Analyst	: T. Keith
Date	: September 10, 2014

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Instrument	: Perkin Elmer Pyris 1 TGA
Test Atmosphere	: Air
Flow Rate	: 35 ml/min
Calibration Procedure	: Calibrated vs. Magnetic Transitions Of Alumel, Nickel, and Perkalloy
Pre-Analysis Purge Time	: 5 minutes
Heating Rate	: 10°C/min
Starting Temperature	: 25°C
Final Temperature	: 850°C
Sample Name	: **Bimodal MWD PE Fitting**

Temperature (°C)	% Weight	Temperature (°C)	% Weight	Temperature (°C)	% Weight
30	100.00	320	95.37	610	0.53
40	100.00	330	94.59	620	0.39
50	100.00	340	93.83	630	0.30
60	100.00	350	93.08	640	0.27
70	100.00	360	92.39	650	0.27
80	100.01	370	91.82	660	0.27
90	100.01	380	91.39	670	0.26
100	100.01	390	91.04	680	0.26
110	100.01	400	90.76	690	0.25
120	100.01	410	89.20	700	0.25
130	100.00	420	80.57	710	0.25
140	100.00	430	64.10	720	0.25
150	99.99	440	43.29	730	0.25
160	99.97	450	26.62	740	0.25
170	99.95	460	18.63	750	0.25
180	99.93	470	13.84	760	0.25
190	99.90	480	9.87	770	0.25
200	99.86	490	8.43	780	0.25
210	99.81	500	7.67	790	0.25
220	99.75	510	6.86	800	0.25
230	99.70	520	5.99	810	0.25
240	99.63	530	5.09	820	0.25
250	99.57	540	4.15	830	0.26
260	99.50	550	3.22	840	0.26
270	99.28	560	2.44	850	0.27
280	98.53	570	1.85		
290	97.71	580	1.39		
300	96.92	590	1.06		
310	96.14	600	0.77		

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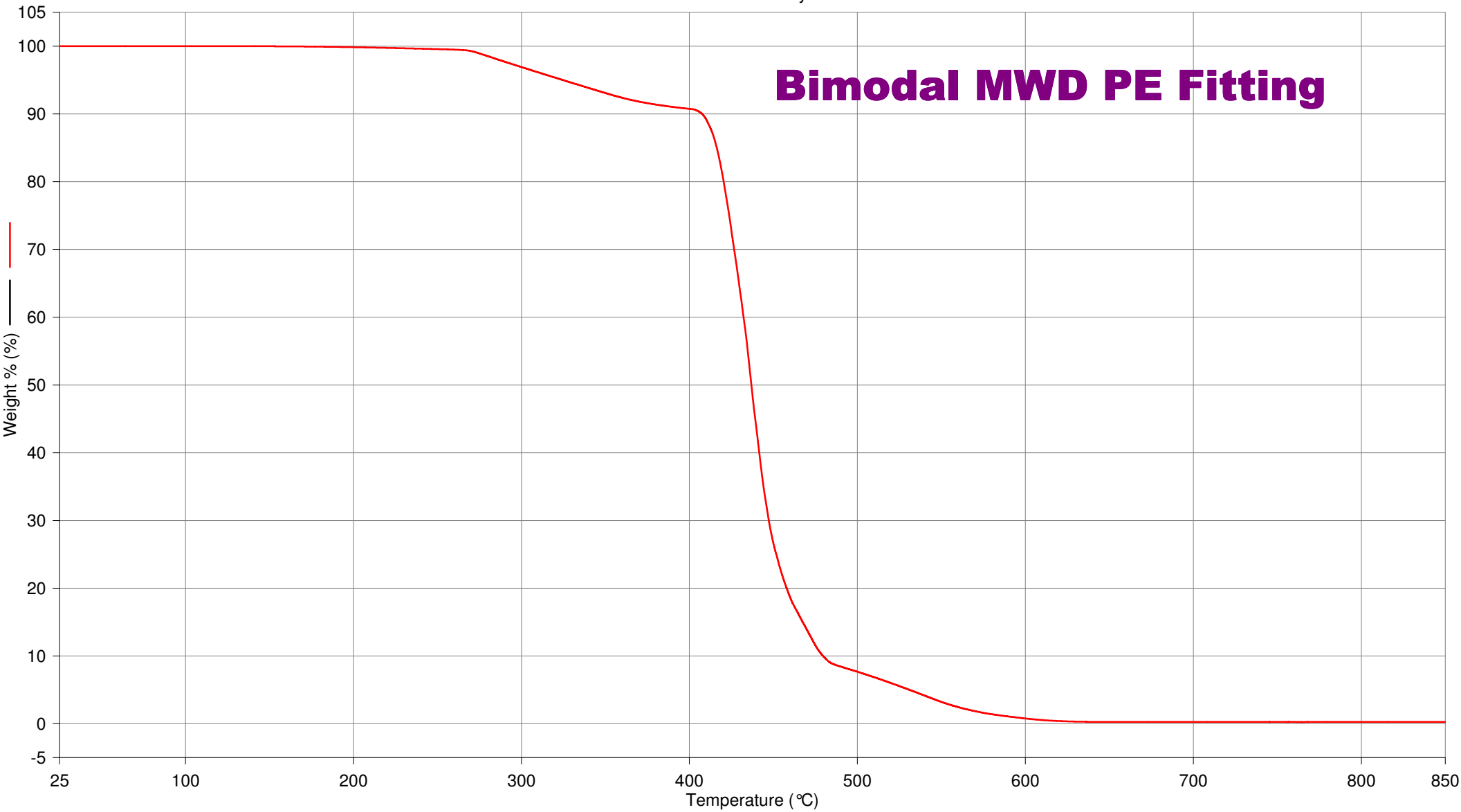
Filename:	C:\Program Files\Pyris\Data\3394-02.tg1d
Operator ID:	Teresa
Sample ID:	P20143394 National Transportation Safety
Sample Weight:	9.067 mg
Initial Purge Gas:	Nitrogen
Comment:	

P20143394 National Transportation Safety: 3394-02.tg1d
Weight % (%) : Step: 1

PerkinElmer Thermal Analysis



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1) Heat from 25.00°C to 860.00°C at 10.00°C/min

Testing	:	**Melt Flow Rate Of Thermoplastics By Extrusion Plastometer**
Test Method	:	ASTM D1238-13 / Procedure A
Project Number	:	P20143394
Customer	:	National Transportation Safety Board
Attention	:	Frank Zakar
Analyst	:	J. Goodrich
Date	:	September 9, 2014

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Material	:	**Polyethylene**
Material Form	:	Pieces Cut From Part

Drying Conditions	:	No drying required	
Test Conditions	:	Condition (°C/kg)	**FR-190/2.16**
		Orifice (in)	0.0825
		Sample Weight (g)	3
Significance	:	ASTM D1238 specifies that Melt Flow Rate be reported to three significant figures	

Sample Name	Time (sec)	**Test A** (grams)	**Test B** (grams)	**Average Melt Flow Rate (g/10min)**
Bimodal HDPE Pipe	360	0.0437	0.0459	**0.0747**
Bimodal MWD PE Fitting	360	0.0241	0.0247	**0.0407**

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Testing	:	**Melt Flow Rate Of Thermoplastics By Extrusion Plastometer**
Test Method	:	ASTM D1238-13 / Procedure A
Project Number	:	P20143394
Customer	:	National Transportation Safety Board
Attention	:	Frank Zakar
Analyst	:	J. Goodrich
Date	:	September 9, 2014

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Cert. No. 0619.01
TESTING LABORATORY

Material	:	**Polyethylene**	
Material Form	:	Pieces Cut From Part	
Drying Conditions	:	No drying required	
Test Conditions	:	Condition (°C/kg)	**FR-190/21.6**
		Orifice (in)	0.0825
		Sample Weight (g)	3
Significance	:	ASTM D1238 specifies that Melt Flow Rate be reported to three significant figures	

Sample Name	Time (sec)	**Test A** (grams)	**Test B** (grams)	**Average Melt Flow Rate (g/10min)**
Bimodal HDPE Pipe	60	0.6852	0.6655	**6.75**
Bimodal MWD PE Fitting	60	0.7310	0.7553	**7.43**

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Testing	:	**Tensile Properties**
Test Method	:	ASTM D638-10 **(modified number of test specimens)**
Project Number	:	P20143394
Customer	:	National Transportation Safety Board
Attention	:	Frank Zakar
Analyst	:	S. Polastri Attachments: 2 graphs
Date	:	September 9, 2014

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Sample Preparation	:	Machined by Intertek PTL
Sample Type	:	ASTM Type IV Tensile Bar
Cross-Head Speed	:	2.0 in/min
Extensometer	:	320% based on 25mm gage length. Meets minimum requirements for Practice E 83: Modulus (Class B-2) / Elongation (Class C).
Conditioning	:	40+ Hours At 23°C ± 2°C / 50% ± 10% RH
Test Conditions	:	23°C ± 2°C / 50% ± 10% RH
Significance	:	ASTM D 638 specifies that strength and modulus be reported to 3 significant figures, elongation and standard deviation be reported to 2 significant figures.

Sample Name	Test Number	Tensile Stress At Yield (PSI)	Elongation At Yield (%)	Tensile Stress At Break (PSI)	Elongation At Break (%)
Bimodal	1	3670	9.5	4520	650
HDPE Pipe	2	3500	9.9	4350	640
0.250" x 0.157" (Avg)	3	3660	9.0	4390	630
	Average	**3610**	**9.5**	**4420**	**640**
Bimodal MWD	1	4190	8.2	2760	530
PE Fitting	2	4120	8.4	3160	560
0.250" x 0.157" (Avg)	3	4120	8.4	3230	540
	Average	**4140**	**8.3**	**3050**	**540**

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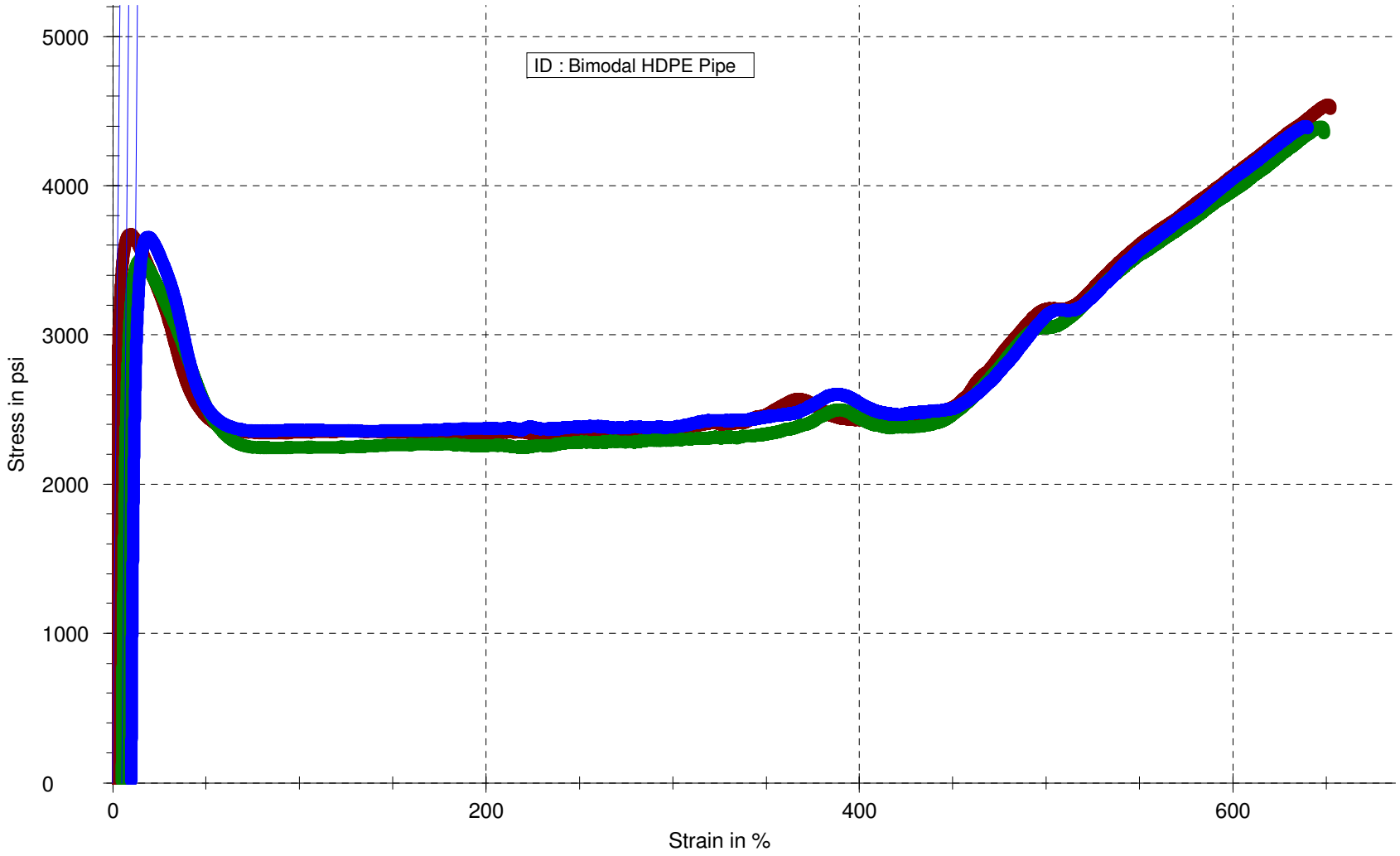
September 9, 2014

Parameter table:

Project Number	:	P20143394
Sample ID	:	Bimodal HDPE Pipe
Test Temp	:	23 °C

Series graphics:

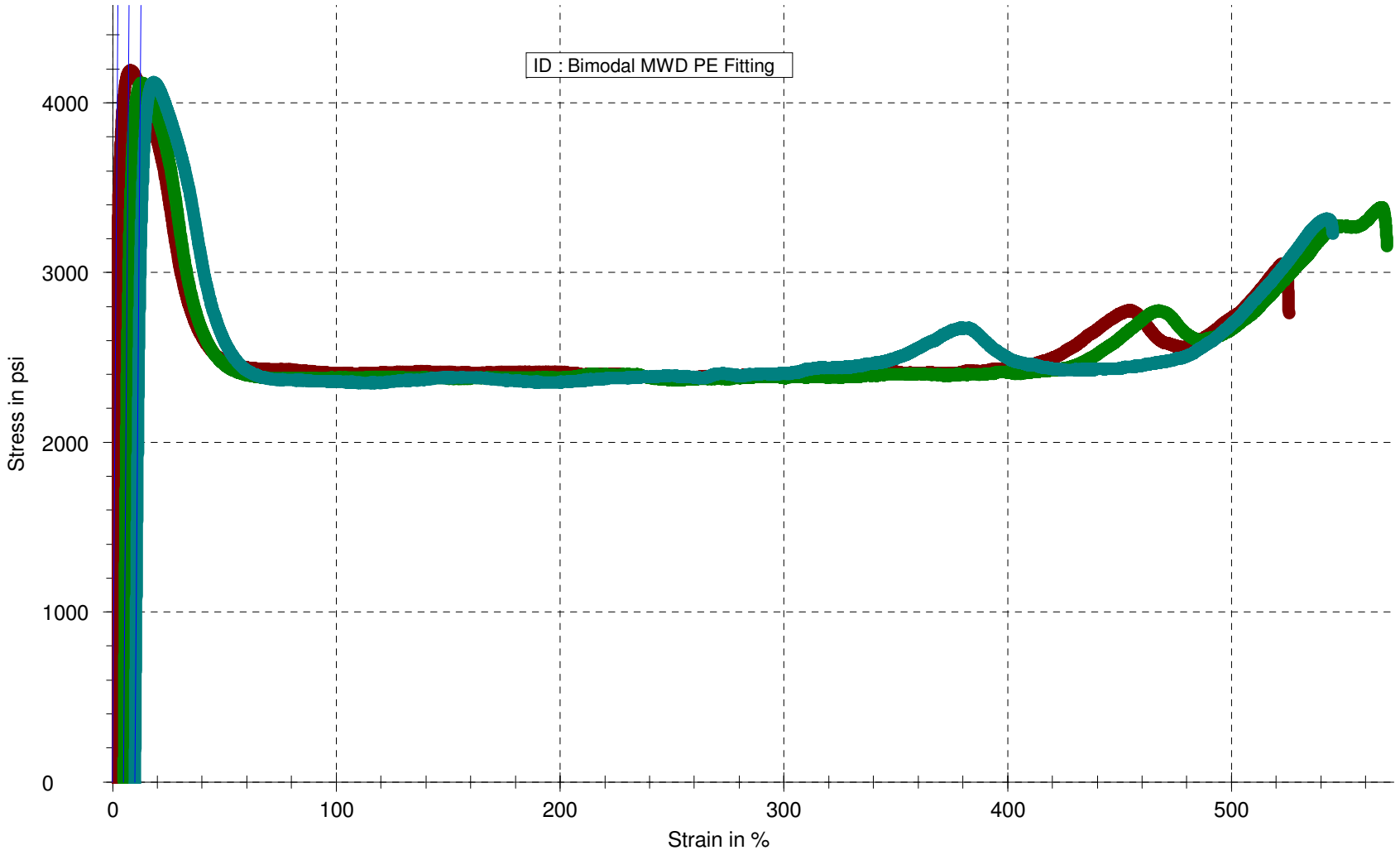


September 9, 2014

Parameter table:

Project Number	:	P20143394
Sample ID	:	Bimodal MWD PE Fitting
Test Temp	:	23 °C

Series graphics:



Testing	:	**Density And Specific Gravity Of Plastics By Displacement**
Test Method	:	ASTM D792-13 Method A Modified number of specimens
Project Number	:	P20143394
Customer	:	National Transportation Safety Board
Attention	:	Frank Zakar
Analyst	:	J. Storie
Date	:	September 8, 2014

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Sample Preparation	:	Machined by Intertek PTL
Temperature Of Water (°C)	:	23.0
Sample Type	:	Plaques
Conditioning	:	40+ Hours at 23°C ± 2°C / 50% ± 10% RH
Significance	:	ASTM D792 specifies that density be reported to 3 significant digits

Sample Name	Dry Weight (g)	Wet Weight (g)	**Specific Gravity (23/23°C)**	**Density (g/cm^3)**	**Density (kg/m^3)**
Bimodal HDPE Pipe	7.7394	-0.2672	0.967	0.964	964
Bimodal MWD PE Fitting	5.1129	-0.1788	0.966	0.964	964

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Testing	:	**Differential Scanning Calorimetry (DSC)**
Test Method	:	ASTM D3418-12$^{\varepsilon 1}$
Project Number	:	P20143394
Customer	:	National Transportation Safety Board
Attention	:	Frank Zakar
Analyst	:	T. Keith Attachments : 2
Date	:	September 11, 2014

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TESTING LABORATORY

Instrument	:	DSC Q200
Sample Holder	:	Copper/Nickel Alloy - 0.250" Round
Testing Rate	:	10°C/min
Calibration	:	ΔH of Indium and M.P. of Indium and Zinc Temperature Calibrated Rate at 10 °C/min.
Atmosphere	:	Nitrogen - 99.998% - Dried - 50 ml/min

First Heat

Sample Name	Peak Tm (°C)	ΔHm (J/g)
Bimodal HDPE Pipe	**132**	**164.7**
Bimodal MWD PE Fitting	**131**	**160.7**

The Tm is the temperature at which a crystalline polymer melts.

ΔHm is the amount of energy a sample absorbs while melting.

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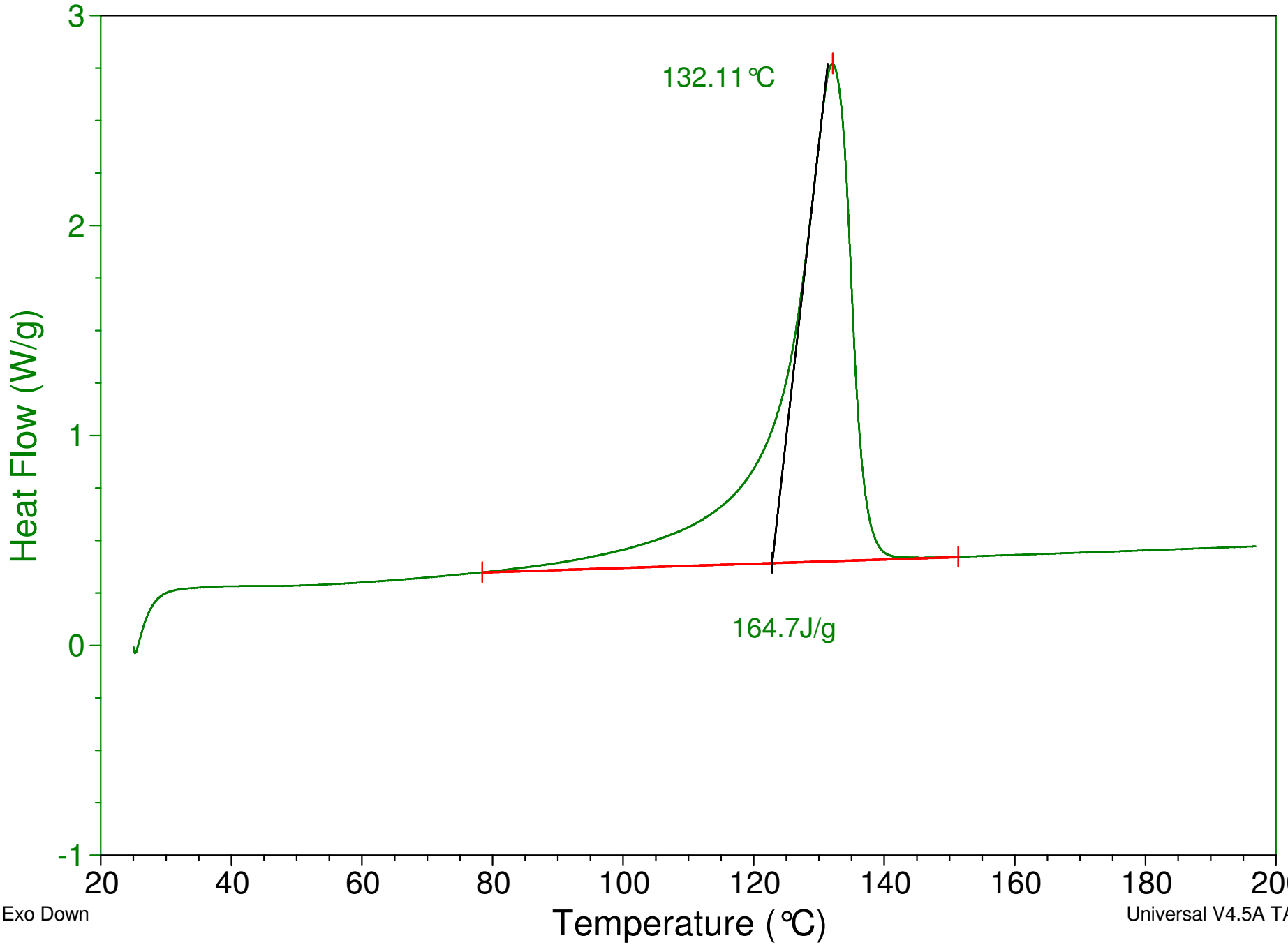
Sample: P20143394 National Transportatio
Size: 6.3100 mg
Method: Standard
Comment: Bimodal HDPE Pipe

DSC

File: N:\Instrument\TA DSC Q200\2014\3394.001
Operator: PB
Run Date: 11-Sep-2014 12:37
Instrument: DSC Q200 V24.10 Build 122



Exo Down

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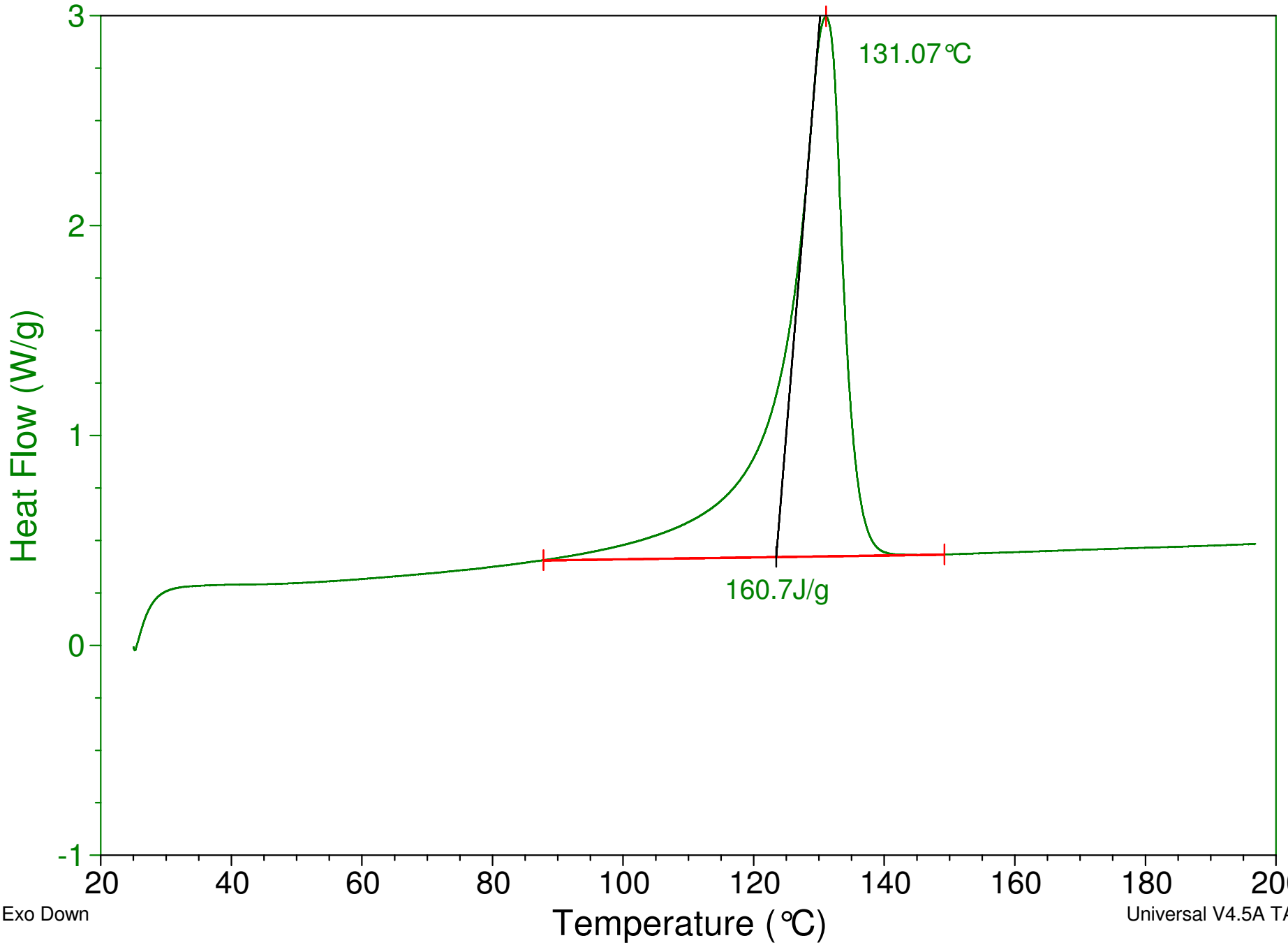
Sample: P20143394 National Transportatio
Size: 8.9100 mg
Method: Standard
Comment: Bimodal MWD PE Fitting

DSC

File: N:\Instrument\TA DSC Q200\2014\3394.002
Operator: PB
Run Date: 11-Sep-2014 13:49
Instrument: DSC Q200 V24.10 Build 122



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Universal V4.5A TA Instruments