Pennsylvania Technical Advisory Committee
On Diesel Powered Equipment

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September 22, 2006

Joseph Sbaffoni, Director
Bureau of Deep Mine Safety
Fayette County Health Center
100 New Salem Road, Room 167
Uniontown, Pa. 15401

RE: Brookville Equipment Corporation Daimler Chrysler OM904LA 100HP Diesel Power Package

Dear Mr. Sbaffoni:

Article II-A of the Pennsylvania Bituminous Coal Mine Act (the act) provides for the use of diesel-powered equipment in underground bituminous coal mines. Section 224-A of the act created a Technical Advisory Committee ("TAC") for the purpose of advising the Department regarding implementation of Article II-A and evaluation of alternative technology or methods for meeting the requirements of Article II-A.

Background

On June 23, 2006, Brookville Equipment Corporation (Brookville) submitted a request to the Bureau of Deep Mine Safety (BDMS") for evaluation and approval pursuant to Article II-A of the act of a Daimler Chrysler OM904LA 100HP engine (MSHA Approval No.7E-B098-0) with a M30 DST Management System in a Model ULPC 9 ton locomotive/15 man personnel carrier. Additionally, Brookville requested an alternative test procedure for the five minute carbon monoxide (CO) tests required under Sections 217-A and 218-A of the act. On June 23, 2006, the Director of BDMS requested the TAC to evaluate the diesel power package and to advise the Department regarding the TAC's recommendation as to whether the diesel power package meets the requirements of subsection 203-A(3) of the act and for the TAC's recommendation on Brookville's request for an alternate test procedure for CO testing. The TAC was unable to begin its investigation until August 2006, because the equipment was not available until then.

The diesel power package includes the following items:

- Daimler Chrysler OM904LA 100HP turbo charged diesel engine (MSHA Certification No.7E-B098-0)
- Emissions Control System – DST Management System which includes:
  - Syncat Corporation M113-210-02 Oxidation Catalyst
  - Pass Tech. M150-301-01 heat exchanger
  - Dry Systems Technologies M 30 particulate filter (MSHA efficiency rating 96%)

More detailed information on the specifications of the diesel power package is included on the General Specification Sheet which is attached as Attachment 1.

Investigation

On August 8, 2006, the TAC and DEP representatives traveled to the Brookville facilities to inspect the diesel equipment package. On that date, emissions testing of the engine and after-treatment system were performed, as well as exhaust gas temperature monitoring and stall test procedure. The results of that testing are included in Attachment 2.

The results of the emission tests showed the engine was performing within MSHA's approval specifications.

Monitoring of the exhaust gas temperature produced a high exhaust gas temperature reading of 180° F, which is well below the 302° F allowed by Section 203-A (b)(4) of Article II-A. It is our belief that the heat exchanger will maintain the exhaust gas temperature well below the required 302 ° F.

The after-treatment system is fitted with a Dry Systems Technologies M 30 disposable filter. The filter is rated by MSHA at a 96% efficiency rating, which meets the requirements of Section 203-A (b)(1) of Article II-A. The engine and filter extrapolations show that the diesel power package will result in an average ambient concentration of .022 mg/m^3 of diesel particulate matter when diluted by 100% of the MSHA approval plate ventilation rate for this engine, which is well below the .12 mg/m^3 requirement of Section 203-A (a)(1) Article II-A.

On August 8, 2006, measurements of the surface temperatures of the exhaust components of the diesel engine exceeded the 302 degree Fahrenheit limit for significant external surface temperatures of Section 203-A (b)(3) of Article II-A. Subsequently, the thickness of the HTI coating on the exhaust components was increased from 3/8" to 3/4". On September 22, 2006, the TAC traveled to Consol Energy's Bailey Mine and inspected the equipment again for the purpose of observing the HTI coating and measuring engine surface temperatures. On that date significant external surface temperatures were less than 302 degrees Fahrenheit.

In addition to the testing that was conducted, our investigation and our observations confirmed that the diesel power package is capable of meeting all the requirements of Section 203-A of Article II-A of the act without reducing or compromising the level of health or safety afforded by the act.

Although the diesel powered package can withstand the emissions tests as described in Sections 217-A and 218-A of Article II-A, we recommend approval of the attached Alternative Stall Test Procedure (Attachment 3). Test results of both the required test and the alternate test confirm comparable results and as such we recommend the use of the alternate test.

Recommendation

Our recommendation is based upon the data supplied by Brookville, the results of the tests conducted on June 8, 2006, the engine surface temperature measurements conducted on September 22, 2006, as well as the data acquired and observations made during our investigation. The TAC has determined that the Daimler Chrysler OM904LA 100HP engine (MSHA Approval No.7E-B098-0) with a M30 DST Management System meets all requirements of Section 203-A of Article II-A of the Pennsylvania Bituminous Coal Mine Act. As such, we are recommending approval of the above described diesel power package. This recommendation is provided with the understanding that the General Specification Sheet (Attachment 1) be strictly adhered to. As discussed above, we are also recommending approval of an alternate test procedure for Sections 217-A and 218-A of the act.

Stanley Geary

Ron Bowersox

ATTACHMENT 1

June 16, 2006

BROOKVILLE EQUIPMENT CORP.
MODEL ULPC
Diesel 9-Ton Loco / 15-Man Personnel Carrier

General Specifications of the Diesel-Powered Equipment Package

Engine Manufacturer		Daimler Chrysler		
Engine Model		OM 904 LA		
Horsepower		100 HP		
Rated Speed		2200 RPM		
Manufacturer's Maximum Recommended Exhaust Backpressure (In H_2O)		41 Inches Water Gauge		
Maximum Exhaust Out Temperature		302 deg F		
MSHA Engine Approval		**MSHA Part 7**		
MSHA Certification No.		7E-B098-0 (Part 7)		
Rated Speed		2200 RPM		
Rated Horsepower		100 HP		
Exhaust GAS Flow (SCFM)		318 CFM @ 25 deg C		
ISO 8178-1 Average DPM (gr/hr)		4.14 gr/hr		
Average Ambient DPM Level (mg/m3)		0.022 mg/m3		
MSHA Ventilation Rate (CFM)		4,500 CFM (Part 7)	CFM (Part 32)	
Pa. State Ventilation Rate (CFM)				
Emissions Control System		**DST Management System**		
Fuel Injection Pump	Make	Bosch		
	P/N	0280746902		
Oxidation Catalyst	Make	Syncat Corp.		
	P/N	M113-210-02		
Heat Exchanger	Make	Paas Tech.		
	P/N	M150-301-01		
DPM Filter	Make	Dry Systems Technology	Model	M 30
	P/N	M 30	Outer Filter Size	16 x 12 in Diameter
	Air Rating (CFM)	2100 CFM	Inner Filter Size	10 x 6 in Diameter
	Surface Area (in3)	42,231 in3	Filter Length	20 in
	Efficiency			96%
	Recommended Exhaust Back-Pressure			25 Inches Water Gauge

ATTACHMENT 2

Diesel-Brookville 90 second test

'5 Ton Loco

#2006-08-08 14:01:22#

Time(h:m:s	O2(%)	CO(ppm)	NO(ppm)	NO2(ppm)	NOx(ppm)	SO2(ppm)	CxHy(%)	CO2(%)	T Gas(F)	T Amb(F)	ETA	Lambda	Comments:
0:00:07	17.2	122	302	13	315	0	0	2.8	100	94.8	99.5	5.53	
0:00:16	17.2	122	299	13	312	0	0	2.8	100	95	99.5	5.53	
0:00:26	17.2	122	296	13	309	0	0	2.8	100	95.1	99.5	5.53	
0:00:37	17.2	121	293	13	306	0	0	2.8	100	95.4	99.5	5.53	start 90 sec test
0:00:47	17.2	121	290	13	303	0	0	2.8	100	95.8	99.6	5.53	
0:00:56	17.2	121	288	13	301	0	0	2.8	101	95.9	99.5	5.53	
0:01:06	17.2	121	286	13	299	0	0	2.8	102	96.2	99.4	5.53	
0:01:17	14.9	121	360	12	372	0	0	4.5	102	96.4	99.6	3.44	
0:01:27	12.5	152	316	13	329	0	0	6.2	103	96.7	99.7	2.47	
0:01:37	12.3	123	317	12	329	0	0	6.4	104	96.8	99.7	2.41	
0:01:46	12.3	94	316	11	327	0	0	6.4	105	96.7	99.6	2.41	
0:01:57	12.3	75	315	10	325	0	0	6.4	106	96.9	99.6	2.41	
0:02:07	12.2	58	312	10	322	0	0	6.5	106	96.9	99.6	2.39	
0:02:17	12.3	52	326	9	335	0	0	6.4	107	97.1	99.6	2.41	
0:02:27	12.3	42	328	9	337	0	0	6.4	107	97.2	99.6	2.41	
0:02:36	12.3	36	333	9	342	0	0	6.4	106	96.8	99.6	2.41	
0:02:47	12.3	29	342	8	350	0	0	6.4	106	96.6	99.6	2.41	
0:02:57	12.3	25	332	8	340	0	0	6.4	107	97	99.6	2.41	
0:03:07	12.3	22	327	8	335	0	0	6.4	108	97.3	99.5	2.41	
0:03:16	12.3	20	338	8	346	0	0	6.4	107	97.2	99.6	2.41	
0:03:27	13.2	19	351	8	359	0	0	5.7	108	97.1	99.4	2.69	
0:03:37	15.4	16	511	10	521	0	0	4.1	109	97.5	99.2	3.75	
0:03:47	15.7	34	538	12	550	0	0	3.9	109	97.9	99.2	3.96	
0:03:57	15.6	51	542	15	557	0	0	4	109	98	99.2	3.89	
0:04:07	15.6	52	537	17	554	0	0	4	109	98	99.2	3.89	
0:04:17	15.5	53	528	18	546	0	0	4	110	98.2	99.2	3.82	

Diesel – Brockville 15 man trip

#2006-08-08 13:26:14#

Time(h:m:s	O2(%)	CO(ppm)	NO(ppm)	NO2(ppm)	NOx(ppm)	SO2(ppm)	CxHy(%)	CO2(%)	T Gas(F)	T Amb(F)	ETA	Lambda	Comments
0:00:04	20.5	2	0	1	1	0	0	0.4	89	79.6	92.9	42	
0:00:14	20.5	2	0	1	1	0	0	0.4	89	79.7	92.9	42	
0:00:24	20.5	2	0	1	1	0	0	0.4	89	79.8	92.9	42	
0:00:34	20.5	2	0	1	1	0	0	0.4	89	79.7	92.9	42	
0:00:44	20.5	2	0	1	1	0	0	0.4	89	79.6	92.9	42	
0:00:54	20.5	2	0	1	1	0	0	0.4	88	79.5	93.7	42	
0:01:04	20.5	3	0	0	0	0	0	0.4	88	79.4	92.9	42	
0:01:14	20.5	3	0	0	0	0	0	0.4	87	79.3	92.9	42	
0:01:24	20.4	3	1	0	1	0	0	0.4	87	79.1	94.7	35	
0:01:34	20.4	2	2	0	2	0	0	0.4	87	79	94.7	35	
0:01:44	20.4	2	2	0	2	0	0	0.4	87	78.8	94.7	35	
0:01:54	20.4	2	1	0	1	0	0	0.4	86	78.8	95.4	35	
0:02:04	20.4	3	1	0	1	0	0	0.4	86	78.7	95.4	35	
0:02:14	20.4	3	1	0	1	0	0	0.4	86	78.6	95.4	35	
0:02:24	20.4	4	1	0	1	0	0	0.4	86	78.5	95.4	35	
0:02:34	19.2	4	178	2	180	0	0	1.3	87	78.5	98.2	11.67	
0:02:44	17.8	65	257	8	265	0	0	2.3	87	78.3	98.9	6.56	
0:02:54	17.7	104	267	12	279	0	0	2.4	87	78.4	98.9	6.36	
0:03:04	17.6	127	268	15	283	0	0	2.5	88	78.1	98.8	6.18	
0:03:14	17.5	137	272	18	290	0	0	2.6	88	78.1	98.9	6	
0:03:24	17.5	141	273	19	292	0	0	2.6	87	78.1	99	6	
0:03:34	17.5	143	276	20	296	0	0	2.6	87	78.1	99	6	
0:03:44	17.5	147	279	21	300	0	0	2.6	87	78.1	99	6	
0:03:54	17.5	149	279	22	301	0	0	2.6	87	77.9	99	6	
0:04:04	17.5	151	281	23	304	0	0	2.6	87	77.9	99	6	
0:04:14	17.4	153	288	24	312	0	0	2.6	87	77.7	99	5.83	raw data
0:04:24	14.1	267	324	24	348	0	0	5.1	86	77.6	99.6	3.04	
0:04:34	12.8	245	292	24	316	0	0	6	87	77.7	99.6	2.56	
0:04:44	12.8	154	292	24	316	0	0	6	86	77.5	99.6	2.56	
0:04:54	12.8	105	300	24	324	0	0	6	86	77.5	99.6	2.56	
0:05:04	12.8	82	307	23	330	0	0	6	86	77.5	99.6	2.56	
0:05:14	12.8	76	311	22	333	0	0	6	86	77.5	99.6	2.56	
0:05:24	12.7	69	309	22	331	0	0	6.1	86	77.5	99.6	2.53	
0:05:34	12.7	70	315	22	337	0	0	6.1	86	77.3	99.6	2.53	
0:05:44	12.6	69	313	22	335	0	0	6.2	86	77.3	99.6	2.5	
0:05:54	12.6	68	314	22	336	0	0	6.2	86	77.3	99.6	2.5	
0:06:04	12.6	69	322	22	344	0	0	6.2	86	77.2	99.6	2.5	

0:06:14	12.6	67	325	22	347	0	0	6.2	86	77.2	99.6	2.5
0:06:24	12.7	66	353	22	375	0	0	6.1	86	77.2	99.6	2.53
0:06:34	12.7	63	367	22	389	0	0	6.1	86	77.1	99.6	2.53
0:06:44	12.8	61	370	22	392	0	0	6	86	77.1	99.6	2.56
0:06:54	12.7	59	366	22	388	0	0	6.1	86	77.1	99.6	2.53
0:07:04	12.7	59	364	22	386	0	0	6.1	86	76.8	99.6	2.53
0:07:14	12.7	61	365	22	387	0	0	6.1	86	76.9	99.6	2.53
0:07:24	12.7	61	361	22	383	0	0	6.1	86	76.9	99.6	2.53
0:07:34	12.6	61	353	22	375	0	0	6.2	86	76.9	99.6	2.5
0:07:44	12.6	63	354	22	376	0	0	6.2	86	76.9	99.6	2.5
0:07:54	12.6	63	354	23	377	0	0	6.2	86	76.9	99.6	2.5
0:08:04	12.6	64	351	22	373	0	0	6.2	86	77	99.6	2.5
0:08:14	13.8	65	343	22	365	0	0	5.3	86	77	99.5	2.92
0:08:24	15.4	84	565	28	593	0	0	4.1	86	76.8	99.4	3.75
0:08:34	15.7	85	577	33	610	0	0	3.9	86	76.8	99.3	3.96
0:08:44	15.8	85	575	36	611	0	0	3.8	85	76.7	99.4	4.04
0:08:54	15.8	84	585	38	623	0	0	3.8	86	76.9	99.3	4.04
0:09:04	15.8	85	586	39	625	0	0	3.8	86	76.8	99.3	4.04
0:09:14	15.8	86	583	40	623	0	0	3.8	86	76.8	99.3	4.04
0:09:24	15.7	89	579	41	620	0	0	3.9	86	76.7	99.3	3.96
0:09:34	15.7	90	571	41	612	0	0	3.9	86	76.6	99.3	3.96
0:09:44	15.6	92	562	42	604	0	0	4	86	76.6	99.3	3.89
0:09:54	16.9	95	336	39	375	0	0	3	86	76.6	99.1	5.12
0:10:04	17.3	94	287	34	321	0	0	2.7	86	76.5	99.1	5.68
0:10:14	17.4	111	293	31	324	0	0	2.6	86	76.6	99	5.83
0:10:24	17.4	120	295	29	324	0	0	2.6	86	76.6	99	5.83
0:10:34	17.4	124	298	28	326	0	0	2.6	86	76.5	99	5.83
0:10:44	17.4	127	298	27	325	0	0	2.6	86	76.5	98.9	5.83
0:10:54	17.4	127	299	26	325	0	0	2.6	85	76.7	99.1	5.83
0:11:04	17.4	128	300	26	326	0	0	2.6	85	76.6	99.1	5.83
0:11:14	17.4	131	299	26	325	0	0	2.6	86	76.4	98.9	5.83
0:11:24	17.4	131	299	26	325	0	0	2.6	86	76.5	99	5.83
0:11:34	17.4	133	298	26	324	0	0	2.6	86	76.5	99	5.83
0:11:44	17.4	133	298	26	324	0	0	2.6	85	76.5	99.1	5.83
0:11:54	17.4	134	297	26	323	0	0	2.6	85	76.4	99	5.83
0:12:05	17.5	136	297	26	323	0	0	2.6	85	76.1	99	6
0:12:15	17.9	132	228	24	252	0	0	2.3	85	76.1	98.8	6.77
0:12:24	17.6	96	312	18	330	0	0	2.5	85	76.1	98.9	6.18
0:12:34	17.6	80	318	14	332	0	0	2.5	85	76.1	98.9	6.18

0:12:44	17.6	78	319	12	331	0	0	2.5	85	76.1	98.9	6.18 5 minute
0:12:54	17.5	79	320	11	331	0	0	2.6	85	76.1	99	6
0:13:04	13.4	95	359	11	370	0	0	5.6	85	76.1	99.6	2.76
0:13:14	12.8	92	341	11	352	0	0	6	86	76.1	99.5	2.56
0:13:25	12.8	60	341	11	352	0	0	6	86	76.1	99.5	2.56
0:13:34	12.7	47	336	11	347	0	0	6.1	86	76.1	99.5	2.53
0:13:44	12.7	34	342	10	352	0	0	6.1	86	76.1	99.5	2.53
0:13:54	12.7	30	357	10	367	0	0	6.1	85	76	99.6	2.53
0:14:04	12.7	26	363	10	373	0	0	6.1	85	76.1	99.6	2.53
0:14:15	12.8	21	376	10	386	0	0	6	85	76	99.6	2.56
0:14:25	12.8	19	385	10	395	0	0	6	86	75.9	99.5	2.56
0:14:34	12.8	16	390	10	400	0	0	6	86	76	99.5	2.56
0:14:44	12.8	16	389	10	399	0	0	6	86	75.9	99.5	2.56
0:14:54	12.8	14	391	10	401	0	0	6	85	76	99.6	2.56
0:15:04	12.8	14	383	10	393	0	0	6	85	75.8	99.6	2.56
0:15:15	12.8	12	383	9	392	0	0	6	86	75.9	99.5	2.56
0:15:25	12.7	12	375	9	384	0	0	6.1	86	75.9	99.5	2.53
0:15:34	12.7	11	369	9	378	0	0	6.1	86	75.8	99.5	2.53
0:15:44	12.6	12	356	9	365	0	0	6.2	86	75.8	99.6	2.5
0:15:54	12.7	11	367	9	376	0	0	6.1	86	75.7	99.5	2.53
0:16:05	12.7	11	372	8	380	0	0	6.1	86	75.8	99.5	2.53
0:16:15	12.7	10	380	8	388	0	0	6.1	86	75.8	99.5	2.53
0:16:25	12.7	10	386	8	394	0	0	6.1	85	75.7	99.6	2.53
0:16:34	12.7	10	385	8	393	0	0	6.1	85	75.7	99.6	2.53
0:16:44	12.7	10	373	8	381	0	0	6.1	85	75.7	99.6	2.53
0:16:54	12.6	9	366	8	374	0	0	6.2	85	75.7	99.6	2.5
0:17:05	12.5	10	362	8	370	0	0	6.2	85	75.6	99.6	2.47
0:17:15	12.6	9	376	8	384	0	0	6.2	85	75.6	99.6	2.5
0:17:25	12.6	9	365	8	373	0	0	6.2	85	75.6	99.6	2.5
0:17:34	12.6	9	375	8	383	0	0	6.2	85	75.7	99.6	2.5
0:17:44	12.6	9	372	8	380	0	0	6.2	85	75.7	99.6	2.5
0:17:54	12.6	9	375	8	383	0	0	6.2	85	75.5	99.6	2.5
0:18:04	12.6	8	375	8	383	0	0	6.2	85	75.6	99.6	2.5
0:18:14	13.4	9	434	8	442	0	0	5.6	85	75.5	99.6	2.76
0:18:24	15.3	10	576	11	587	0	0	4.2	85	75.5	99.4	3.68
0:18:35	15.5	20	582	14	596	0	0	4	86	75.5	99.3	3.82
0:18:45	15.6	28	590	16	606	0	0	4	86	75.5	99.3	3.89
0:18:55	15.6	39	594	18	612	0	0	4	86	75.4	99.3	3.89
0:19:05	15.6	45	586	19	605	0	0	4	85	75.5	99.3	3.89

0:19:15	15.6	49	587	20	607	0	0	4	85	75.5	99.3	3.89	
0:19:25	15.6	53	590	20	610	0	0	4	86	75.3	99.2	3.89	
0:19:35	15.6	55	589	21	610	0	0	4	85	75.2	99.3	3.89	
0:19:45	15.6	56	588	21	609	0	0	4	86	75.4	99.3	3.89	
0:19:55	15.6	58	584	22	606	0	0	4	86	75.3	99.2	3.89	
0:20:05	17.5	60	288	20	308	0	0	2.6	86	75.3	98.8	6	
0:20:15	17.7	45	290	14	304	0	0	2.4	86	75.3	98.7	6.36	
0:20:24	17.5	23	320	11	331	0	0	2.6	86	75.4	98.8	6	
0:20:34	17.5	15	325	9	334	0	0	2.6	86	75.4	98.8	6	
0:20:45	17.5	12	327	8	335	0	0	2.6	85	75.3	98.9	6	
0:20:55	17.5	12	326	8	334	0	0	2.6	85	75.2	98.9	6	
0:21:05	17.5	13	328	7	335	0	0	2.6	85	75.3	98.9	6	
0:21:15	17.5	16	329	7	336	0	0	2.6	85	75.2	98.9	6	
0:21:24	17.5	19	330	7	337	0	0	2.6	85	75.1	98.9	6	
0:21:34	17.5	22	330	7	337	0	0	2.6	85	75.2	98.9	6	
0:21:45	17.5	25	330	7	337	0	0	2.6	85	75	98.9	6	
0:21:55	17.5	29	330	7	337	0	0	2.6	85	75.1	98.9	6	
0:22:05	17.5	33	331	7	338	0	0	2.6	85	75	98.9	6	
0:22:14	17.5	38	332	6	338	0	0	2.6	85	75.1	98.9	6	
0:22:24	17.5	43	332	6	338	0	0	2.6	85	75.2	98.9	6	
0:22:35	17.5	49	332	6	338	0	0	2.6	85	75.1	98.9	6	
0:22:45	17.5	54	332	6	338	0	0	2.6	85	75.1	98.9	6	
0:22:55	17.5	60	331	6	337	0	0	2.6	85	75.1	98.9	6	
0:23:05	17.5	65	330	6	336	0	0	2.6	85	75.1	98.9	6	
0:23:14	17.5	69	330	6	336	0	0	2.6	85	75.1	98.9	6	
0:23:24	17.5	74	331	6	337	0	0	2.6	85	75	98.9	6	
0:23:35	17.5	79	330	6	336	0	0	2.6	85	74.9	98.9	6	
0:23:45	17.5	84	330	6	336	0	0	2.6	85	74.9	98.9	6	
0:23:55	16.7	87	327	6	333	0	0	3.2	85	74.9	99.1	4.88	
0:24:05	17.6	102	289	6	295	0	0	2.5	85	74.9	98.8	6.18	
0:24:15	17.6	96	321	6	327	0	0	2.5	85	74.9	98.8	6.18	
0:24:25	17.6	93	323	6	329	0	0	2.5	85	75	98.8	6.18	
0:24:35	17.6	94	324	6	330	0	0	2.5	85	74.9	98.8	6.18	
0:24:44	17.6	98	325	6	331	0	0	2.5	85	74.8	98.8	6.18	
0:24:54	17.5	102	325	6	331	0	0	2.6	85	74.9	98.9	6	
0:25:05	17.5	106	328	6	334	0	0	2.6	85	75	98.9	6	90
0:25:15	17.5	109	327	6	333	0	0	2.6	85	74.9	98.9	6	
0:25:25	17.5	111	325	6	331	0	0	2.6	85	74.9	98.9	6	90 second
0:25:35	17.6	114	325	6	331	0	0	2.5	85				

Diesel-Brookville 90 second test

#2006-08-08 14:01:22#

Time(h:m:s	O2(%)	CO(ppm)	NO(ppm)	NO2(ppm)	NOx(ppm)	SO2(ppm)	CxHy(%)	CO2(%)	T Gas(F)	T Amb(F)	ETA	Lambda	Comments:
0:00:07	17.2	122	302	13	315	0	0	2.8	100	94.8	99.5	5.53	
0:00:16	17.2	122	299	13	312	0	0	2.8	100	95	99.5	5.53	
0:00:26	17.2	122	296	13	309	0	0	2.8	100	95.1	99.5	5.53	
0:00:37	17.2	121	293	13	306	0	0	2.8	100	95.4	99.5	5.53	start 90 sec test
0:00:47	17.2	121	290	13	303	0	0	2.8	100	95.8	99.6	5.53	
0:00:56	17.2	121	288	13	301	0	0	2.8	101	95.9	99.5	5.53	
0:01:06	17.2	121	286	13	299	0	0	2.8	102	96.2	99.4	5.53	
0:01:17	14.9	121	360	12	372	0	0	4.5	102	96.4	99.6	3.44	
0:01:27	12.5	152	316	13	329	0	0	6.2	103	96.7	99.7	2.47	
0:01:37	12.3	123	317	12	329	0	0	6.4	104	96.8	99.7	2.41	
0:01:46	12.3	94	316	11	327	0	0	6.4	105	96.7	99.6	2.41	
0:01:57	12.3	75	315	10	325	0	0	6.4	106	96.9	99.6	2.41	
0:02:07	12.2	58	312	10	322	0	0	6.5	106	96.9	99.6	2.39	
0:02:17	12.3	52	326	9	335	0	0	6.4	107	97.1	99.6	2.41	
0:02:27	12.3	42	328	9	337	0	0	6.4	107	97.2	99.6	2.41	
0:02:36	12.3	36	333	9	342	0	0	6.4	106	96.8	99.6	2.41	
0:02:47	12.3	29	342	8	350	0	0	6.4	106	96.6	99.6	2.41	
0:02:57	12.3	25	332	8	340	0	0	6.4	107	97	99.6	2.41	
0:03:07	12.3	22	327	8	335	0	0	6.4	108	97.3	99.5	2.41	
0:03:16	12.3	20	338	8	346	0	0	6.4	107	97.2	99.6	2.41	
0:03:27	13.2	19	351	8	359	0	0	5.7	108	97.1	99.4	2.69	
0:03:37	15.4	16	511	10	521	0	0	4.1	109	97.5	99.2	3.75	
0:03:47	15.7	34	538	12	550	0	0	3.9	109	97.9	99.2	3.96	
0:03:57	15.6	51	542	15	557	0	0	4	109	98	99.2	3.89	
0:04:07	15.6	52	537	17	554	0	0	4	109	98	99.2	3.89	
0:04:17	15.5	53	528	18	546	0	0	4	110	98.2	99.2	3.82	

ATTACHMENT 3

ALTERNATIVE STALL TEST PROCEDURE FOR PA STATE ACT 182, ARTICLE II-A DIESEL-POWERED EQUIPMENT

ALTERNATE PROCEDURE, Section 217-A: (an alternative to items 8 through 14)

1. Place the equipment into an intake entry. Make sure no personnel are in front of or behind the equipment during test.
2. Set the brakes and chock the wheels.
3. Start the diesel engine and allow it to warm up to operating temperature.
4. Install the carbon monoxide CO sampling devices into the untreated exhaust gas port provided.
5. Allow CO sampling device to stabilize.
6. Put the transmission in high gear.
7. With brake still applied, put the engine at full throttle to induce converter stall for 90 seconds. Stop test immediately if any controls or indicators are not in their operating range, or if equipment moves while at stall.
8. Record three CO readings at 60, 75, and 90-second intervals during converter stall.
9. Return engine to low idle and put transmission in neutral. Allow the torque converter temperature to stabilize.
10. Take an average of the three readings.
11. Comply with record-keeping requirements pursuant to Section 214-A.

ALTERNATIVE PROCEDURE, Section 218-A: (an alternative to items 10-14)

1. Place the equipment into an intake entry. Make sure no personnel are in front of or behind the equipment during test.
2. Set the brakes and chock the wheels.
3. Start the diesel engine and allow it to warm up to operating temperature.
4. Install the carbon monoxide CO sampling device into the untreated exhaust gas port provided.
5. Allow CO sampling device to stabilize.
6. Put the transmission in high gear.
7. With brakes still applied, put the engine at full throttle to induce converter stall for 90 seconds. Stop test immediately if any controls or indicators are not in their operating range, or if equipment moves while at stall.
8. Record three CO readings at 60, 75, and 90-second intervals during converter stall.
9. Return engine to low idle and put transmission in neutral. Allow the torque converter temperature to stabilize.
10. Take an average of the three CO readings.
11. Install the carbon monoxide CO sampling device into the treated exhaust gas port provided.
12. Repeat steps (5) thru (10).
13. If CO reading for untreated exhaust gas is greater than twice the baseline established under 217-A(b), or if the CO reading for treated exhaust is greater than 100 ppm, the equipment has failed and must be serviced and retested before it is returned to regular service; and
14. Comply with record-keeping requirements pursuant to Section 214-A.