CO/THC COMPLIANCE STACK EMISSION TEST RESULTS

BURLINGTON ASPHALT CORPORATION
MOUNT HOLLY, NEW JERSEY

APC ID NO. 45032
NJ STACK NO. 001

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION AND ENERGY
AIR QUALITY REGULATIONS PROGRAM
BUREAU OF TECHNICAL SERVICES
380 SCOTCH ROAD
WEST TRENTON, NEW JERSEY 08628
(609) 530-4041

PREPARED BY: FREDERICK G. BALLAY
PRINCIPAL ENVIRONMENTAL SPECIALIST

FRANK PAPP
ENVIRONMENTAL COMPLIANCE INVESTIGATOR 1

APPROVED BY: EDWARD M. CHOROMANSKI
BUREAU CHIEF

REPORT DATE: MAY 29, 1992

CO/THC STACK EMISSION REPORT
BURLINGTON ASPHALT CORPORATION
BATCH MIX ASPHALT PLANT

TABLE OF CONTENTS

SECTION I

PROJECT BACKGROUND

PROJECT BACKGROUND

The Department of Environmental Protection and Energy (DEPE) in conjunction with the New Jersey Asphalt Pavement Association (NJAPA) developed emission standards for carbon monoxide (CO) and total hydrocarbons (THC) expressed as equivalent methane. These emission standards are 250 ppmvd corrected to seven percent oxygen for THC and 500 ppmvd corrected to seven percent oxygen for CO.

The emission limits were developed subsequent to testing conducted by the DEPE in 1986 which showed wide variability in both CO and THC emissions. The variability of emissions from both drum and batch mix asphalt plants was confirmed during further stack emission studies conducted by the NJAPA in 1987 and 1988. The objective of the 1987 and 1988 emission studies was to attempt to identify the causes of the variable CO/THC emissions. The resulting data was then utilized to establish Best Management Practices (BMP) which were to be incorporated into the operating procedures of each asphalt plant. Such BMP included but were not limited to modification of flight designs in the rotary drum to prevent flame quenching, "tuning" of burner to increase combustion efficiency and pulling top, dry material from storage piles rather then bottom wet material.

A date to determine compliance with the asphalt plant emission standards for CO and THC was established as June 15, 1991 which was later extended to June 1, 1992.

SECTION II

PROJECT PERSONNEL

PROJECT PARTICIPANTS

The CO/THC stack emission tests were conducted on May 14 and 15, 1992. The stack emission tests were conducted on the Batch Mix Asphalt Plant Stack (NJ Stack No. 001). This source is covered by Certificate Number 68976 (Log No. 90-1524). These tests were conducted by DEPE, Bureau of Technical Services personnel. Those participating were as follows.

Frederick Ballay - Principal Environmental Specialist
Frank Papp - Environmental Compliance Investigator 1
Robert Kettig - Environmental Specialist Trainee

Test Run Numbers 1, 2 and 3, were conducted on May 14 while producing asphalt pavement from virgin material. Test Run Number 4 was also conducted on May 14 while producing asphalt paving material with RAP included. Test Run Numbers 5 and 6, utilizing RAP were conducted on May 15. Source operating parameters were monitored and recorded by:

Robert Frank - Project Consultant for NJAPA

This Bureau would like to acknowledge the assistance of Mr. Rodney Vetro, Plant Operator and the staff of Burlington Asphalt Corporation for their participation and cooperation in the stack test program.

SECTION III

SUMMARY OF RESULTS

STACK EMISSION TEST RESULTS

I - VIRGIN MATERIAL
MAY 14, 1992

	RUN 1	RUN 2	RUN 3
Stack Gas Moisture (%)	20.46	21.80	23.10
Stack Gas Temperature (F)	187.6	195.3	202.6
Carbon Monoxide (ppmvd)	216.67	160.48	138.29
Carbon Monoxide (ppmvd @ 7% O2)	464.16	318.21	256.30
Allowable CO Limit **	500.0	500.0	500.0
Total Hydrocarbons * (ppmvd)	59.85	51.52	52.07
Total Hydrocarbons * (ppmvd @ 7% O2)	128.20	102.16	96.50
Allowable THC Limit **	250.0	250.0	250.0
Oxygen (%)	14.41	13.89	12.23

II - 20% RECYCLED ASPHALT PAVEMENT
MAY 14, 1992 & MAY 15, 1992

	RUN 4	RUN 5	RUN 6
Stack Gas Moisture (%)	25.81	21.92	19.24
Stack Gas Temperature (F)	221.1	187.0	186.0
Carbon Monoxide (ppmvd)	82.38	94.30	138.38
Carbon Monoxide (ppmvd @ 7% O2)	132.09	172.29	270.84
Allowable CO Limit **	500.0	500.0	500.0
Total Hydrocarbons * (ppmvd)	92.39	87.15	117.94
Total Hydrocarbons * (ppmvd @ 7% O2)	148.14	159.22	230.84
Allowable CO Limit **	250.0	250.0	250.0
Oxygen (%)	12.23	13.29	13.80

* Expressed as equivalent methane
** ppmdv at seven percent oxygen

III - NITROGEN OXIDES (NOx EMISSIONS)

	RUN 1	RUN 2	RUN 3	RUN 4	RUN 5	RUN 6
Stack Gas Moisture (%)	20.46	21.80	23.10	25.81	21.92	19.24
Stack Gas Temperature (F)	187.6	195.3	202.6	221.1	187.0	186.0
NOx Emissions (ppmvd)	26.88	32.40	36.58	45.93	41.07	36.82
NOx Emissions (ppmvd @ 7% O2)	57.58	64.25	67.80	73.65	75.03	72.07
Stack Gas Flow Rate (ACFM) *	40,000	40,000	40,000	40,000	40,000	40,000
Stack Flow Gas Rate (DSCFM)	26,078	25,299	24,604	23,092	25,584	26,503
Calculated NOx Emission (lbs/hr)	4.99	5.85	6.42	7.56	7.49	6.96
Calculated NOx Emission (tons/yr) **	2.50	2.92	3.21	3.78	3.75	3.48

* From permit application
** Based on source operating hours (1,000 hrs/year)

SECTION IV

SOURCE DESCRIPTION

SOURCE DESCRIPTION

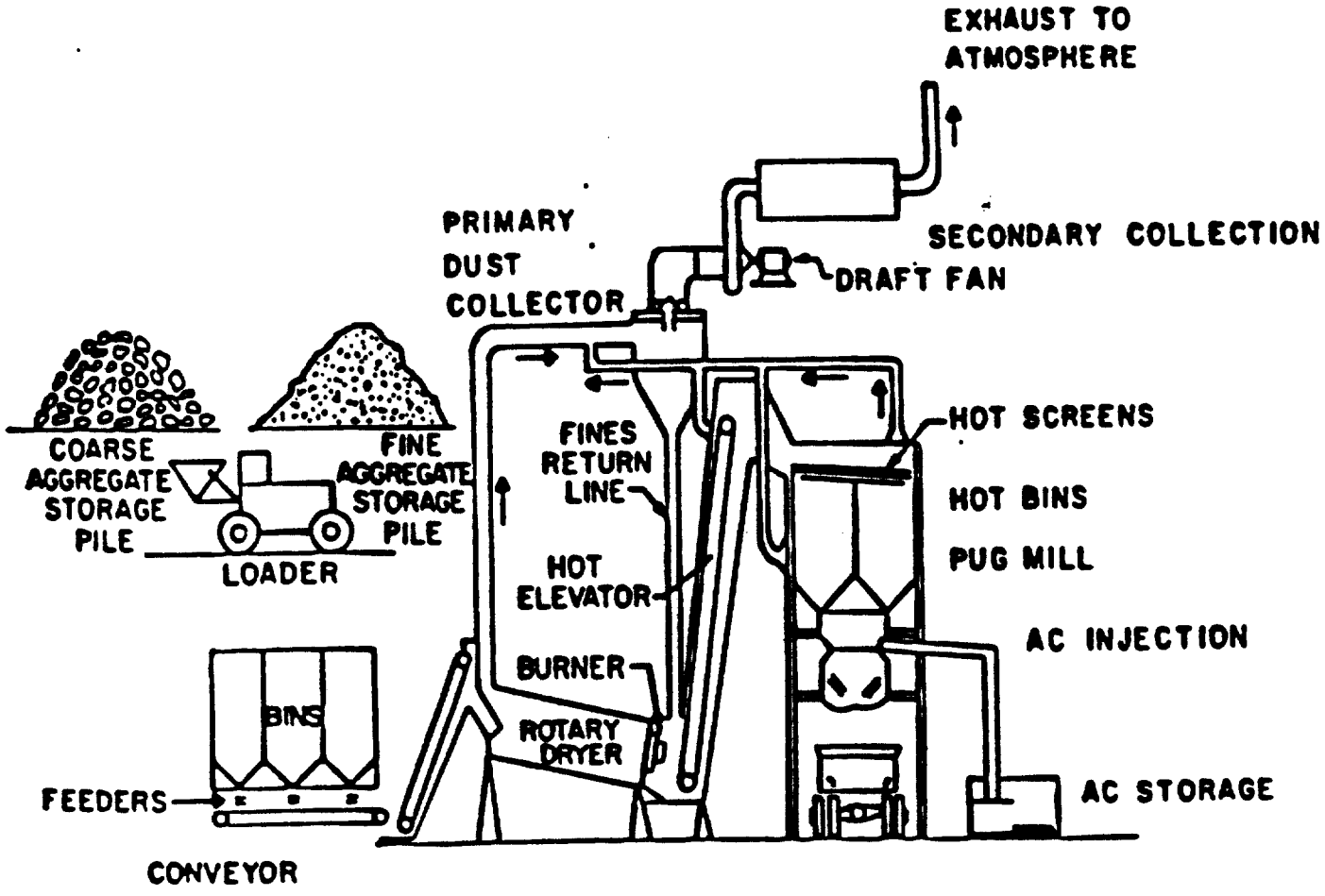
Burlington Asphalt Corporation operates a CMI Model ST 300 batch mix asphalt plant with a nominal rating of 180 tons per hour (TPH). The plant was first constructed in 1972. The unit was later modified to include a Standard Havens Batcher and four (4) - 200 tons stationary storage bins. The plant is equipped with an Alpha Mark baghouse for particulate control.

The plant fires natural gas as its primary fuel to the rotary dryer. The Genco Burner (Model AS-40) is a dual fuel (natural gas/fuel oil) burner rated at 70,000,000 BTU.

In 1989, the plant was modified to allow the use of Recycled Asphalt Pavement in the manufacturing process. The RAP system has a maximum rating of 100 TPH. This equipment consists of a ESSTEE Manufacturing Company recycled asphalt bin, screen and belt conveyor.

The following is a general schematic of a batch mix asphalt plant.

TYPICAL BATCH MIX ASPHALT CONCRETE PLANT



SECTION V

SAMPLING PROCEDURES

SAMPLING PROCEDURES

All samples were extracted from the centroid of the exhaust stack at a point 2.1 equivalent diameters downstream from the Fan Damper and 5.2 equivalent diameter upstream from the stack exit.

The sampling and analytical procedures utilized in this stack test program were as follows.

Total hydrocarbon (THC) emissions, as equivalent methane, were determined using the sampling and analytical procedures outlined in NJAC 7:27B Air Test Method Three (ATM3), "Sampling and Analytical Procedures for the Determination of Volatile Organic Substances from Source Operations".

Carbon monoxide (CO) emissions were determined using the sampling and analytical procedures outlined in 40 CFR - Part 60 - Appendix A - Referenced Method Ten - "Determination of Carbon Monoxide Emissions from Stationary Sources".

Nitrogen oxide (NO_x) emissions were determined using the sampling and analytical procedures outlined in 40 CFR - Part 60 - Appendix A - Reference Method 7E - "Determination of Nitrogen Oxide Emissions from Stationary Sources (Instrumental Analyzer Procedure)".

Fixed gases, oxygen (O_2) and carbon dioxide (CO_2), were determined using the procedures outlined in 40 CFR - Part 60 - Appendix A - Referenced Method 3A - "Determination of Oxygen and Carbon Dioxide Emissions from Stationary Sources (Instrumental Analyzer Procedure)".

The referenced sampling and analytical procedures may be found in Appendix G.

APPENDIX A

SOURCE OPERATING PARAMETERS

SOURCE OPERATING PARAMETER

The batch mix asphalt plant was operating within the following parameters during the emission test program.

VIRGIN MATERIAL
MAY 14, 1992

	RUN 1	RUN 2	RUN 3
Avg. Material Processed (TPH)	180	180	180
Avg. Mix Temp. (F)	310	310	310
Avg. Baghouse Pressure Drop (in H2O)	1.9	3.9	2.8
Avg. Burner Setting (%)	15.0	20.4	26
Avg. Burner Pressure (in H2O)	0.09	0.12	0.11

RAP MATERIAL
MAY 14 & 15, 1992

	RUN 1	RUN 2	RUN 3
Avg. Material Processed (TPH)	180	180	170-180
RAP %	20	20	20
Avg. Mix Temp. (F)	315	280	280
Avg. Baghouse Pressure Drop (in H2O)	3.0	4.3	3.3
Avg. Burner Setting (%)	36.5	27.4	21.3
Avg. Burner Pressure (in H2O)	0.11	0.12	0.13

APPENDIX B

TEST DATA CORRECTED FOR CALIBRATION DRIFT AND MOISTURE

New Jersey Department of Environmental Protection & Energy
Bureau of Technical Services
Data Correction Summary

RAW DATA CORRECTED FOR DRIFT AND MOISTURE

DATE THIS RUN WAS CONDUCTED : 05-14-1992

FACILITY : Burlington County Asphalt APC ID # : 45032 NJ STACK : 001

PROCESS : Batch plant VIRGIN P&CT # : 068976 LOG # : 90-1524

Run Number : 1

Percent Moisture for this Run = 20.46%

		O2 Pct	CO2 Pct	THC-OUT PPMV	CO PPMV	NOX PPMV	THC-IN PPMV
CALIBRATION GASES	ZERO	0.0	0.0	0.0	0.0	0.0	0.0
	LOW	N/A	N/A	27.50	91.30	N/A	
	MID	10.10	5.10	48.40	178.00	123.00	
	HIGH	17.10	9.35	88.90	376.00	217.00	
CALIBRATION ERROR RESPONSE	ZERO	0.00	0.00	0.00	0.00	0.00	
	LOW	N/A	N/A	25.60	87.10	N/A	
	MID	10.10	5.00	49.10	172.50	121.00	
	HIGH	17.10	9.40	90.60	380.90	217.10	
INITIAL CALIBRATION BIAS	ZERO	0.00	0.00	0.30	0.20	0.50	
	UPSCALE	10.00	9.30	25.70	86.00	119.50	
FINAL CALIBRATION BIAS	ZERO	0.00	0.10	0.30	0.20	1.30	
	UPSCALE	10.10	9.30	26.20	86.10	119.90	
AVERAGE CONCENTRATIONS UNCORRECTED FOR DRIFT		Dry 14.34	Dry 3.86	Wet(C3H8) 15.10	Dry 203.94	Dry 26.86	Wet
DRIFT CORRECTED AVERAGE CONCENTRATIONS		Dry 14.41	Dry 3.85	Wet(CH4) 47.60	Dry 216.67	Dry 26.88	Wet ????????
Final DRY CONCENTRATIONS		14.41	3.85	AS CH4 59.85	216.67	26.88	????????

Oxygen Corrections	TOTAL HYDRCARBONS	CARBON MONOXIDE	NITROGEN OXIDES
PPMVD @ 7% O2	128.20 AS CH4	464.16	57.58

New Jersey Department of Environmental Protection & Energy
Bureau of Technical Services
Data Correction Summary

RAW DATA CORRECTED FOR DRIFT AND MOISTURE

DATE THIS RUN WAS CONDUCTED : 05-14-1992

FACILITY : Burlington County Asphalt APC ID # : 45032 NJ STACK : 001

PROCESS : Batch plant VIRGIN P&CT # : 068976 LOG # : 90-1524

Run Number : 2

Percent Moisture for this Run = 21.80%

		O2 Pct	CO2 Pct	THC-OUT PPMV	CO PPMV	NOX PPMV	THC-IN PPMV
CALIBRATION GASES	ZERO	0.0	0.0	0.0	0.0	0.0	0.0
	LOW	N/A	N/A	27.50	91.30	N/A	
	MID	10.10	5.10	48.40	178.00	123.00	
	HIGH	17.10	9.35	88.90	376.00	217.00	
CALIBRATION ERROR RESPONSE	ZERO	0.00	0.00	0.00	0.00	0.00	
	LOW	N/A	N/A	25.60	87.10	N/A	
	MID	10.10	5.00	49.10	172.50	121.00	
	HIGH	17.10	9.40	90.60	380.90	217.10	
INITIAL CALIBRATION BIAS	ZERO	0.00	0.10	0.30	0.20	1.30	
	UPSCALE	10.10	9.30	26.20	86.10	119.90	
FINAL CALIBRATION BIAS	ZERO	0.00	0.10	0.50	0.20	1.20	
	UPSCALE	10.10	9.30	26.20	86.50	120.70	
AVERAGE CONCENTRATIONS UNCORRECTED FOR DRIFT		Dry 13.89	Dry 4.11	Wet(C3H8) 13.00	Dry 151.54	Dry 32.61	Wet
DRIFT CORRECTED AVERAGE CONCENTRATIONS		Dry 13.89	Dry 4.08	Wet(CH4) 40.29	Dry 160.48	Dry 32.40	Wet ????????
Final DRY CONCENTRATIONS		13.89	4.08	AS CH4 51.52	160.48	32.40	????????

Oxygen Corrections	TOTAL HYDRCARBONS	CARBON MONOXIDE	NITROGEN OXIDES
PPMVD @ 7% O2	102.16 AS CH4	318.21	64.25

New Jersey Department of Environmental Protection & Energy
Bureau of Technical Services
Data Correction Summary

RAW DATA CORRECTED FOR DRIFT AND MOISTURE

DATE THIS RUN WAS CONDUCTED : 05-14-1992

FACILITY : Burlington County Asphalt APC ID # : 45032 NJ STACK : 001

PROCESS : Batch plant VIRGIN P&CT # : 068976 LOG # : 90-1524

Run Number : 3

Percent Moisture for this Run = 23.10%

		O2 Pct	CO2 Pct	THC-OUT PPMV	CO PPMV	NOX PPMV	THC-IN PPMV
CALIBRATION GASES	ZERO	0.0	0.0	0.0	0.0	0.0	0.0
	LOW	N/A	N/A	27.50	91.30	N/A	
	MID	10.10	5.10	48.40	178.00	123.00	
	HIGH	17.10	9.35	88.90	376.00	217.00	
CALIBRATION ERROR RESPONSE	ZERO	0.00	0.00	0.00	0.00	0.00	
	LOW	N/A	N/A	25.60	87.10	N/A	
	MID	10.10	5.00	49.10	172.50	121.00	
	HIGH	17.10	9.40	90.60	380.90	217.10	
INITIAL CALIBRATION BIAS	ZERO	0.00	0.10	0.50	0.20	1.20	
	UPSCALE	10.10	9.30	26.20	86.50	120.70	
FINAL CALIBRATION BIAS	ZERO	0.00	0.10	0.60	0.20	1.30	
	UPSCALE	10.10	9.30	26.00	86.50	121.00	
AVERAGE CONCENTRATIONS UNCORRECTED FOR DRIFT		Dry 13.40	Dry 4.39	Wet(C3H8) 12.95	Dry 130.92	Dry 36.82	Wet
DRIFT CORRECTED AVERAGE CONCENTRATIONS		Dry 13.40	Dry 4.36	Wet(CH4) 40.04	Dry 138.29	Dry 36.58	Wet ????????
Final DRY CONCENTRATIONS		13.40	4.36	AS CH4 52.07	138.29	36.58	????????

Oxygen Corrections	TOTAL HYDRCARBONS	CARBON MONOXIDE	NITROGEN OXIDES
PPMVD @ 7% O2	96.50 AS CH4	256.30	67.80

New Jersey Department of Environmental Protection & Energy
Bureau of Technical Services
Data Correction Summary

RAW DATA CORRECTED FOR DRIFT AND MOISTURE

DATE THIS RUN WAS CONDUCTED : 05-14-1992

FACILITY : Burlington County Asphalt APC ID # : 45032 NJ STACK : 001

PROCESS : Batch plant RAP P&CT # : 068976 LOG # : 90-1524

Run Number : 4

Percent Moisture for this Run = 25.81%

		O2 Pct	CO2 Pct	THC-OUT PPMV	CO PPMV	NOX PPMV	THC-IN PPMV
CALIBRATION GASES	ZERO	0.0	0.0	0.0	0.0	0.0	0.0
	LOW	N/A	N/A	27.50	91.30	N/A	
	MID	10.10	5.10	48.40	178.00	123.00	
	HIGH	17.10	9.35	88.90	376.00	217.00	
CALIBRATION ERROR RESPONSE	ZERO	0.00	0.00	0.00	0.00	0.00	
	LOW	N/A	N/A	25.60	87.10	N/A	
	MID	10.10	5.00	49.10	172.50	121.00	
	HIGH	17.10	9.40	90.60	380.90	217.10	
INITIAL CALIBRATION BIAS	ZERO	0.00	0.10	0.60	0.20	1.30	
	UPSCALE	10.00	9.30	26.00	86.50	121.00	
FINAL CALIBRATION BIAS	ZERO	0.10	0.10	1.00	0.20	0.70	
	UPSCALE	10.10	9.30	26.20	86.50	119.70	
AVERAGE CONCENTRATIONS UNCORRECTED FOR DRIFT		Dry 12.16	Dry 5.10	Wet(C3H8) 21.82	Dry 78.07	Dry 45.57	Wet
DRIFT CORRECTED AVERAGE CONCENTRATIONS		Dry 12.23	Dry 5.08	Wet(CH4) 68.54	Dry 82.38	Dry 45.93	Wet ????????
Final DRY CONCENTRATIONS		12.23	5.08	AS CH4 92.39	82.38	45.93	????????

Oxygen Corrections	TOTAL HYDRCARBONS	CARBON MONOXIDE	NITROGEN OXIDES
PPMVD @ 7% O2	148.14 AS CH4	132.09	73.65

New Jersey Department of Environmental Protection & Energy
Bureau of Technical Services
Data Correction Summary

RAW DATA CORRECTED FOR DRIFT AND MOISTURE

DATE THIS RUN WAS CONDUCTED : 05-15-1992

FACILITY : Burlington County Asphalt APC ID # : 45032 NJ STACK : 001

PROCESS : Batch plant RAP P&CT # : 068976 LOG # : 90-1524

Run Number : 5

Percent Moisture for this Run = 21.92%

		O2 Pct	CO2 Pct	THC-OUT PPMV	CO PPMV	NOX PPMV	THC-IN PPMV
CALIBRATION GASES	ZERO	0.0	0.0	0.0	0.0	0.0	0.0
	LOW	N/A	N/A	27.50	91.30	N/A	
	MID	10.10	5.10	48.40	178.00	123.00	
	HIGH	17.10	9.35	88.90	376.00	217.00	
CALIBRATION ERROR RESPONSE	ZERO	0.00	0.00	0.00	0.20	0.00	
	LOW	N/A	N/A	25.50	86.50	N/A	
	MID	10.10	5.10	48.90	173.00	121.90	
	HIGH	17.10	9.40	90.80	381.40	217.30	
INITIAL CALIBRATION BIAS	ZERO	0.10	0.00	-0.20	0.20	0.00	
	UPSCALE	10.10	9.40	49.20	86.50	122.10	
FINAL CALIBRATION BIAS	ZERO	0.00	0.10	0.10	0.20	0.40	
	UPSCALE	10.00	9.30	48.60	86.50	120.40	
AVERAGE CONCENTRATIONS UNCORRECTED FOR DRIFT		Dry 13.21	Dry 4.46	Wet(C3H8) 22.89	Dry 89.34	Dry 40.62	Wet
DRIFT CORRECTED AVERAGE CONCENTRATIONS		Dry 13.29	Dry 4.43	Wet(CH4) 68.05	Dry 94.30	Dry 41.07	Wet ????????
Final DRY CONCENTRATIONS		13.29	4.43	AS CH4 87.15	94.30	41.07	????????

Oxygen Corrections	TOTAL HYDRCARBONS	CARBON MONOXIDE	NITROGEN OXIDES
PPMVD @ 7% O2	159.22 AS CH4	172.29	75.03

New Jersey Department of Environmental Protection & Energy
Bureau of Technical Services
Data Correction Summary

RAW DATA CORRECTED FOR DRIFT AND MOISTURE

DATE THIS RUN WAS CONDUCTED : 05-15-1992

FACILITY : Burlington County Asphalt APC ID # : 45032 NJ STACK : 001

PROCESS : Batch plant RAP P&CT # : 068976 LOG # : 90-1524

Run Number : 6

Percent Moisture for this Run = 19.24%

		O2 Pct	CO2 Pct	THC-OUT PPMV	CO PPMV	NOX PPMV	THC-IN PPMV
CALIBRATION GASES	ZERO	0.0	0.0	0.0	0.0	0.0	0.0
	LOW	N/A	N/A	27.50	91.30	N/A	
	MID	10.10	5.10	48.40	178.00	123.00	
	HIGH	17.10	9.35	88.90	376.00	217.00	
CALIBRATION ERROR RESPONSE	ZERO	0.00	0.00	0.00	0.20	0.00	
	LOW	N/A	N/A	25.50	86.50	N/A	
	MID	10.10	5.10	48.90	173.00	121.90	
	HIGH	17.10	9.40	90.80	381.40	217.30	
INITIAL CALIBRATION BIAS	ZERO	0.00	0.10	0.10	0.20	0.40	
	UPSCALE	10.00	9.30	48.60	86.50	120.40	
FINAL CALIBRATION BIAS	ZERO	0.00	0.10	0.30	0.20	0.20	
	UPSCALE	10.10	9.40	49.00	86.50	119.30	
AVERAGE CONCENTRATIONS UNCORRECTED FOR DRIFT		Dry 13.73	Dry 4.19	Wet(C3H8) 32.08	Dry 131.00	Dry 36.09	Wet
DRIFT CORRECTED AVERAGE CONCENTRATIONS		Dry 13.80	Dry 4.13	Wet(CH4) 95.25	Dry 138.38	Dry 36.82	Wet ????????
Final DRY CONCENTRATIONS		13.80	4.13	AS CH4 117.94	138.38	36.82	????????

Oxygen Corrections	TOTAL HYDRCARBONS	CARBON MONOXIDE	NITROGEN OXIDES
PPMVD @ 7% O2	230.84 AS CH4	270.84	72.07

APPENDIX C

TEST DATA - UNCORRECTED

. GRAPHICAL PRESENTATION
. RAW DATA

Instumental Method Raw Data Summary

Facility: Burlington County Asphalt APC ID. #: 45032 NJ Stack #: 001

Run Number: 6-RAP Date: 05/15/92

Reading Number	Time	O2 Pct	CO2 Pct	THC-OUT PPMVW	CO PPMVD	NOx PPMVD	THC-IN PPMVW
49	11:40:49	14.30	3.90	35.80	128.00	33.60	0.00
50	11:41:49	14.30	3.90	38.60	131.80	33.40	0.00
51	11:42:48	13.90	4.10	33.40	145.10	34.90	0.00
52	11:43:48	13.60	4.30	35.00	170.90	36.30	0.00
53	11:44:48	13.50	4.30	31.80	179.20	36.10	0.00
54	11:45:47	13.40	4.40	31.50	195.30	36.80	0.00
55	11:46:47	13.20	4.50	33.30	200.30	37.70	0.00
56	11:47:47	13.30	4.40	34.20	193.80	36.90	0.00
57	11:48:47	13.30	4.40	32.40	198.90	36.70	0.00
58	11:49:47	13.20	4.40	28.60	190.30	37.60	0.00
59	11:50:47	13.20	4.40	30.70	176.70	37.50	0.00
60	11:51:46	13.10	4.50	29.30	167.00	38.50	0.00
Run Average		13.73	4.19	32.00	131.00	36.09	0.00

APPENDIX D

MONITOR CALIBRATION DATA

- SUMMARY REPORTS
- RAW DATA SUMMARY FORMS

New Jersey Department of Environmental Protection & Energy
Bureau of Technical Services
Instrumental Method Calibration Summary Report

Facility : Burlington County Asphalt APC ID # : 45032 NJ Stack # : 001

Process : Batch plant VIRGIN P&CT # : 068976 Log # : 90-1524

Run Number : 1 Date : 05-14-1992		O2 Pct	CO2 Pct	THC-OUT PPMV	CO PPMV	NOx PPMV	THC-IN PPMV
Analyzer Span		25	10	100	500	250	1000
Upscale Bias Gas		10.10	9.35	27.50	91.30	123.00	
Calibration Gases	Low	N/A	N/A	27.50	91.30	N/A	
	Mid	10.10	5.10	48.40	178.00	123.00	
	High	17.10	9.35	88.90	376.00	217.00	
Calibration Error Response	Zero	0.00	0.00	0.00	0.00	0.00	
	Low	N/A	N/A	25.60	87.10	N/A	
	Mid	10.10	5.00	49.10	172.50	121.00	
	High	17.10	9.40	90.60	380.90	217.10	
Initial Bias Response	Zero	0.00	0.00	0.30	0.20	0.50	
	Upscale	10.00	9.30	25.70	86.00	119.50	
Final Bias Response	Zero	0.00	0.10	0.30	0.20	1.30	
	Upscale	10.10	9.30	26.20	86.10	119.90	
RESULTS							
Calibration Error Results (% of Span)	Zero	0.00	0.00	0.00	0.00	0.00	0.00
	Low	N/A	N/A	-1.90	-0.84	N/A	0.00
	Mid	0.00	-1.00	0.70	-1.10	-0.80	0.00
	High	0.00	0.50	1.70	0.98	0.04	0.00
Initial Bias Results (% of Span)	Zero	0.00	0.00	0.30	0.04	0.20	0.00
	Upscale	-0.40	-1.00	0.10	-0.22	-0.60	0.00
Final Bias Results (% of Span)	Zero	0.00	1.00	0.30	0.04	0.52	0.00
	Upscale	0.00	-1.00	0.60	-0.20	-0.44	0.00
Analyzer Drift (% of Span)	Zero	0.00	1.00	0.00	0.00	0.32	0.00
	Upscale	0.40	0.00	0.50	0.02	0.16	0.00

Calibration Error MUST be less than or equal to 2 percent of Span.

Calibration Bias MUST be less than or equal to 5 percent of Span.

Calibration Drift Must be less than or equal to 3 percent of Span.

New Jersey Department of Environmental Protection & Energy
Bureau of Technical Services
Instrumental Method Calibration Summary Report

Facility : Burlington County Asphalt APC ID # : 45032 NJ Stack # : 001

Process : Batch plant VIRGIN P&CT # : 068976 Log # : 90-1524

Run Number : 2 Date : 05-14-1992		O2 Pct	CO2 Pct	THC-OUT PPMV	CO PPMV	NOx PPMV	THC-IN PPMV
Analyzer Span		25	10	100	500	250	1000
Upscale Bias Gas		10.10	9.35	27.50	91.30	123.00	
Calibration Gases	Low	N/A	N/A	27.50	91.30	N/A	
	Mid	10.10	5.10	48.40	178.00	123.00	
	High	17.10	9.35	88.90	376.00	217.00	
Calibration Error Response	Zero	0.00	0.00	0.00	0.00	0.00	
	Low	N/A	N/A	25.60	87.10	N/A	
	Mid	10.10	5.00	49.10	172.50	121.00	
	High	17.10	9.40	90.60	380.90	217.10	
Initial Bias Response	Zero	0.00	0.10	0.30	0.20	1.30	
	Upscale	10.10	9.30	26.20	86.10	119.90	
Final Bias Response	Zero	0.00	0.10	0.50	0.20	1.20	
	Upscale	10.10	9.30	26.20	86.50	120.70	
RESULTS							
Calibration Error Results (% of Span)	Zero	0.00	0.00	0.00	0.00	0.00	0.00
	Low	N/A	N/A	-1.90	-0.84	N/A	0.00
	Mid	0.00	-1.00	0.70	-1.10	-0.80	0.00
	High	0.00	0.50	1.70	0.98	0.04	0.00
Initial Bias Results (% of Span)	Zero	0.00	1.00	0.30	0.04	0.52	0.00
	Upscale	0.00	-1.00	0.60	-0.20	-0.44	0.00
Final Bias Results (% of Span)	Zero	0.00	1.00	0.50	0.04	0.48	0.00
	Upscale	0.00	-1.00	0.60	-0.12	-0.12	0.00
Analyzer Drift (% of Span)	Zero	0.00	0.00	0.20	0.00	-0.04	0.00
	Upscale	0.00	0.00	0.00	0.08	0.32	0.00

Calibration Error MUST be less than or equal to 2 percent of Span.

Calibration Bias MUST be less than or equal to 5 percent of Span.

Calibration Drift Must be less than or equal to 3 percent of Span.

New Jersey Department of Environmental Protection & Energy
Bureau of Technical Services
Instrumental Method Calibration Summary Report

Facility : Burlington County Asphalt APC ID # : 45032 NJ Stack # : 001

Process : Batch plant VIRGIN P&CT # : 068976 Log # : 90-1524

Run Number : 3 Date : 05-14-1992		O2 Pct	CO2 Pct	THC-OUT PPMV	CO PPMV	NOx PPMV	THC-IN PPMV
Analyzer Span		25	10	100	500	250	1000
Upscale Bias Gas		10.10	9.35	27.50	91.30	123.00	
Calibration Gases	Low	N/A	N/A	27.50	91.30	N/A	
	Mid	10.10	5.10	48.40	178.00	123.00	
	High	17.10	9.35	88.90	376.00	217.00	
Calibration Error Response	Zero	0.00	0.00	0.00	0.00	0.00	
	Low	N/A	N/A	25.60	87.10	N/A	
	Mid	10.10	5.00	49.10	172.50	121.00	
	High	17.10	9.40	90.60	380.90	217.10	
Initial Bias Response	Zero	0.00	0.10	0.50	0.20	1.20	
	Upscale	10.10	9.30	26.20	86.50	120.70	
Final Bias Response	Zero	0.00	0.10	0.60	0.20	1.30	
	Upscale	10.10	9.30	26.00	86.50	121.00	
RESULTS							
Calibration Error Results (% of Span)	Zero	0.00	0.00	0.00	0.00	0.00	0.00
	Low	N/A	N/A	-1.90	-0.84	N/A	0.00
	Mid	0.00	-1.00	0.70	-1.10	-0.80	0.00
	High	0.00	0.50	1.70	0.98	0.04	0.00
Initial Bias Results (% of Span)	Zero	0.00	1.00	0.50	0.04	0.48	0.00
	Upscale	0.00	-1.00	0.60	-0.12	-0.12	0.00
Final Bias Results (% of Span)	Zero	0.00	1.00	0.60	0.04	0.52	0.00
	Upscale	0.00	-1.00	0.40	-0.12	0.00	0.00
Analyzer Drift (% of Span)	Zero	0.00	0.00	0.10	0.00	0.04	0.00
	Upscale	0.00	0.00	-0.20	0.00	0.12	0.00

Calibration Error MUST be less than or equal to 2 percent of Span.

Calibration Bias MUST be less than or equal to 5 percent of Span.

Calibration Drift Must be less than or equal to 3 percent of Span.

New Jersey Department of Environmental Protection & Energy
Bureau of Technical Services
Instrumental Method Calibration Summary Report

Facility : Burlington County Asphalt APC ID # : 45032 NJ Stack # : 001

Process : Batch plant RAP P&CT # : 068976 Log # : 90-1524

Run Number : 4 Date : 05-14-1992		O2 Pct	CO2 Pct	THC-OUT PPMV	CO PPMV	NOx PPMV	THC-IN PPMV
Analyzer Span		25	10	100	500	250	1000
Upscale Bias Gas		10.10	9.35	27.50	91.30	123.00	
Calibration Gases	Low	N/A	N/A	27.50	91.30	N/A	
	Mid	10.10	5.10	48.40	178.00	123.00	
	High	17.10	9.35	88.90	376.00	217.00	
Calibration Error Response	Zero	0.00	0.00	0.00	0.00	0.00	
	Low	N/A	N/A	25.60	87.10	N/A	
	Mid	10.10	5.00	49.10	172.50	121.00	
	High	17.10	9.40	90.60	380.90	217.10	
Initial Bias Response	Zero	0.00	0.10	0.60	0.20	1.30	
	Upscale	10.00	9.30	26.00	86.50	121.00	
Final Bias Response	Zero	0.10	0.10	1.00	0.20	0.70	
	Upscale	10.10	9.30	26.20	86.50	119.70	
RESULTS							
Calibration Error Results (% of Span)	Zero	0.00	0.00	0.00	0.00	0.00	0.00
	Low	N/A	N/A	-1.90	-0.84	N/A	0.00
	Mid	0.00	-1.00	0.70	-1.10	-0.80	0.00
	High	0.00	0.50	1.70	0.98	0.04	0.00
Initial Bias Results (% of Span)	Zero	0.00	1.00	0.60	0.04	0.52	0.00
	Upscale	-0.40	-1.00	0.40	-0.12	0.00	0.00
Final Bias Results (% of Span)	Zero	0.40	1.00	1.00	0.04	0.28	0.00
	Upscale	0.00	-1.00	0.60	-0.12	-0.52	0.00
Analyzer Drift (% of Span)	Zero	0.40	0.00	0.40	0.00	-0.24	0.00
	Upscale	0.40	0.00	0.20	0.00	-0.52	0.00

Calibration Error MUST be less than or equal to 2 percent of Span.

Calibration Bias MUST be less than or equal to 5 percent of Span.

Calibration Drift Must be less than or equal to 3 percent of Span.

New Jersey Department of Environmental Protection & Energy
Bureau of Technical Services
Instrumental Method Calibration Summary Report

Facility : Burlington County Asphalt APC ID # : 45032 NJ Stack # : 001

Process : Batch plant RAP P&CT # : 068976 Log # : 90-1524

Run Number : 5 Date : 05-15-1992		O2 Pct	CO2 Pct	THC-OUT PPMV	CO PPMV	NOx PPMV	THC-IN PPMV
Analyzer Span		25	10	100	500	250	1000
Upscale Bias Gas		10.10	9.35	48.40	91.30	123.00	
Calibration Gases	Low	N/A	N/A	27.50	91.30	N/A	
	Mid	10.10	5.10	48.40	178.00	123.00	
	High	17.10	9.35	88.90	376.00	217.00	
Calibration Error Response	Zero	0.00	0.00	0.00	0.20	0.00	
	Low	N/A	N/A	25.50	86.50	N/A	
	Mid	10.10	5.10	48.90	173.00	121.90	
	High	17.10	9.40	90.80	381.40	217.30	
Initial Bias Response	Zero	0.10	0.00	-0.20	0.20	0.00	
	Upscale	10.10	9.40	49.20	86.50	122.10	
Final Bias Response	Zero	0.00	0.10	0.10	0.20	0.40	
	Upscale	10.00	9.30	48.60	86.50	120.40	
RESULTS							
Calibration Error Results (% of Span)	Zero	0.00	0.00	0.00	0.04	0.00	0.00
	Low	N/A	N/A	-2.00	-0.96	N/A	0.00
	Mid	0.00	0.00	0.50	-1.00	-0.44	0.00
	High	0.00	0.50	1.90	1.08	0.12	0.00
Initial Bias Results (% of Span)	Zero	0.40	0.00	-0.20	0.00	0.00	0.00
	Upscale	0.00	0.00	0.30	0.00	0.08	0.00
Final Bias Results (% of Span)	Zero	0.00	1.00	0.10	0.00	0.16	0.00
	Upscale	-0.40	-1.00	-0.30	0.00	-0.60	0.00
Analyzer Drift (% of Span)	Zero	-0.40	1.00	0.30	0.00	0.16	0.00
	Upscale	-0.40	-1.00	-0.60	0.00	-0.68	0.00

Calibration Error MUST be less than or equal to 2 percent of Span.

Calibration Bias MUST be less than or equal to 5 percent of Span.

Calibration Drift Must be less than or equal to 3 percent of Span.

New Jersey Department of Environmental Protection & Energy
Bureau of Technical Services
Instrumental Method Calibration Summary Report

Facility : Burlington County Asphalt APC ID # : 45032 NJ Stack # : 001

Process : Batch plant RAP P&CT # : 068976 Log # : 90-1524

Run Number : 6 Date : 05-15-1992		O2 Pct	CO2 Pct	THC-OUT PPMV	CO PPMV	NOx PPMV	THC-IN PPMV
Analyzer Span		25	10	100	500	250	1000
Upscale Bias Gas		10.10	9.35	48.40	91.30	123.00	
Calibration Gases	Low	N/A	N/A	27.50	91.30	N/A	
	Mid	10.10	5.10	48.40	178.00	123.00	
	High	17.10	9.35	88.90	376.00	217.00	
Calibration Error Response	Zero	0.00	0.00	0.00	0.20	0.00	
	Low	N/A	N/A	25.50	86.50	N/A	
	Mid	10.10	5.10	48.90	173.00	121.90	
	High	17.10	9.40	90.80	381.40	217.30	
Initial Bias Response	Zero	0.00	0.10	0.10	0.20	0.40	
	Upscale	10.00	9.30	48.60	86.50	120.40	
Final Bias Response	Zero	0.00	0.10	0.30	0.20	0.20	
	Upscale	10.10	9.40	49.00	86.50	119.30	
RESULTS							
Calibration Error Results (% of Span)	Zero	0.00	0.00	0.00	0.04	0.00	0.00
	Low	N/A	N/A	-2.00	-0.96	N/A	0.00
	Mid	0.00	0.00	0.50	-1.00	-0.44	0.00
	High	0.00	0.50	1.90	1.08	0.12	0.00
Initial Bias Results (% of Span)	Zero	0.00	1.00	0.10	0.00	0.16	0.00
	Upscale	-0.40	-1.00	-0.30	0.00	-0.60	0.00
Final Bias Results (% of Span)	Zero	0.00	1.00	0.30	0.00	0.08	0.00
	Upscale	0.00	0.00	0.10	0.00	-1.04	0.00
Analyzer Drift (% of Span)	Zero	0.00	0.00	0.20	0.00	-0.08	0.00
	Upscale	0.40	1.00	0.40	0.00	-0.44	0.00

Calibration Error MUST be less than or equal to 2 percent of Span.

Calibration Bias MUST be less than or equal to 5 percent of Span.

Calibration Drift Must be less than or equal to 3 percent of Span.

Instrumental Method Data Summary Form

Facility: Burlington Asphalt Corp.
Purpose : COMPLIANCE - Diag.

APC ID NO. : 45032
NJ Stack NO.: 001
P&Ct/Log NO.: 068976
90-1524

Run Number: 1 Date: 5-14-92

Monitor	Cal Gases	Error <2%	I Bias <5%	F Bias <5%	Drift <3%	Run Average
Oxygen Span = 25 (%)	0	0.0	0.0	0.0		14.3 *
	10.1	10.1	10.0	10.1		
	17.1	17.1				
Tolerance (%)		.5	1.25	1.25	.75	
Carbon Dioxide Span = 10 (%)	0	0.0	0.0	0.1		3.9 *
	5.1	5.0				
	9.35	9.4	9.3	9.3		
Tolerance (%)		.2	.5	.5	.3	
Nitrogen Oxides Span = 250 (ppm)	0	0.0	0.5	1.3		~~23.4~~ 26.9 *
	123	121	119.5	119.9		
	217	217.1				
Tolerance (ppm)		5	12.5	12.5	7.5	
Carbon Monoxide Span = 500 (ppm)	0	0.0	0.2	0.2		201.6
	91.3	87.1	86.0	46.1		
	178	172.5				
	376	380.9				
Tolerance (ppm)		10	25	25	15	
Outlet Total Hydrocarbons Span = 100 "Propane" (ppm)	0	0.0	0.3	0.3		~~17.6~~ 14.3 *
	27.5	25.6	25.7	26.2		
	48.4	49.1				
	88.9	90.6				
Tolerance (ppm)		2	5	5	3	
Inlet Total Hydrocarbons Span = 1000 "Propane" (ppm)						
Tolerance (ppm)		20	50	50	30	

* - Invalid Data

Instrumental Method Data Summary Form

Facility: Burlington Asphalt Corp.
Purpose : COMPLIANCE - VIRGIN

APC ID NO. : 45032
NJ Stack NO.: 001
P&Ct/Log NO.: 068976
90-1524

Run Number: 2 Date: 5-14-92

Monitor	Cal Gases	Error <2%	I Bias <5%	F Bias <5%	Drift <3%	Run Average
Oxygen Span = 25 (%)	0		0.0	0.0		13.9 *
	10.1		10.1	10.1		
	17.1					
Tolerance (%)		.5	1.25	1.25	.75	
Carbon Dioxide Span = 10 (%)	0		0.1	0.1		4.1 *
	5.1					
	9.35		9.3	9.3		
Tolerance (%)		.2	.5	.5	.3	
Nitrogen Oxides Span = 250 (ppm)	0		1.3	1.2		32.6 *
	123		119.9	120.7		
	217					
Tolerance (ppm)		5	12.5	12.5	7.5	
Carbon Monoxide Span = 500 (ppm)	0		0.2	0.2		151.5 *
	91.3		86.1	86.5		
	178					
	376					
Tolerance (ppm)		10	25	25	15	
Outlet Total Hydrocarbons Span = 100 (ppm) "Propane"	0		0.3	~~-2~~ 0.5		13.0 *
	27.5		26.2	26.2		
	48.4					
	88.9					
Tolerance (ppm)		2	5	5	3	
Inlet Total Hydrocarbons Span = 1000 (ppm) "Propane"						
Tolerance (ppm)		20	50	50	30	

* corrected data

Instrumental Method Data Summary Form

Facility: Burlington Asphalt Corp.
Purpose : COMPLIANCE - VIRGIN

APC ID NO. : 45032
NJ Stack NO.: 001
P&Ct/Log NO.: 068976
90-1524

Run Number: 3 Date: 5/14/92

Monitor	Cal Gases	Error <2%	I Bias <5%	F Bias <5%	Drift <3%	Run Average
Oxygen Span = 25 (%)	0		0.0	0.0		13.4
	10.1		10.1	10.0		
	17.1					
Tolerance (%)		.5	1.25	1.25	.75	
Carbon Dioxide Span = 10 (%)	0		0.1	0.1		4.4
	5.1					
	9.35		9.3	9.3		
Tolerance (%)		.2	.5	.5	.3	
Nitrogen Oxides Span = 250 (ppm)	0		1.2	1.3		36.8
	123		120.7	121.0		
	217					
Tolerance (ppm)		5	12.5	12.5	7.5	
Carbon Monoxide Span = 500 (ppm)	0		0.2	0.2		130.9
	91.3		86.5	86.5		
	178					
	376					
Tolerance (ppm)		10	25	25	15	
Outlet Total Hydrocarbons Span = 100 (ppm) "Propane"	0		0.5	0.6		12.9
	27.5		26.2	26.0		
	48.4					
	88.9					
Tolerance (ppm)		2	5	5	3	
Inlet Total Hydrocarbons Span = 1000 (ppm) "Propane"						
Tolerance (ppm)		20	50	50	30	

Instrumental Method Data Summary Form

Facility: Burlington Asphalt Corp.
Purpose : compliance - RAP

APC ID NO. : 45032
NJ Stack NO.: 001
P&Ct/Log NO.: 068976
90-1524

Run Number: 4 Date: 5/14/92

Monitor	Cal Gases	Error <2%	I Bias <5%	F Bias <5%	Drift <3%	Run Average
Oxygen Span = 25 (%)	0		0.0	0.1		12.2
	10.1		10.0	10.0		
	17.1					
Tolerance (%)		.5	1.25	1.25	.75	
Carbon Dioxide Span = 10 (%)	0		0.1	0.1		5.1
	5.1					
	9.35		9.3	9.3		
Tolerance (%)		.2	.5	.5	.3	
Nitrogen Oxides Span = 250 (ppm)	0		1.3	0.7		45.6
	123		121.0	119.7		
	217					
Tolerance (ppm)		5	12.5	12.5	7.5	
Carbon Monoxide Span = 500 (ppm)	0		0.2	0.2		78.1
	91.3		86.5	86.5		
	178					
	376					
Tolerance (ppm)		10	25	25	15	
Outlet Total Hydrocarbons Span = 100 (ppm) "Propane"	0		0.6	1.0		21.8
	27.5		26.0	26.2		
	48.4					
	88.9					
Tolerance (ppm)		2	5	5	3	
Inlet Total Hydrocarbons Span = 1000 (ppm) "Propane"						
Tolerance (ppm)		20	50	50	30	

Instrumental Method Data Summary Form

Facility: Burlington Asphalt Corp.
Purpose : COMPLIANCE - RAP

APC ID NO. : 45032
NJ Stack NO.: 001
P&Ct/Log NO.: 068976
90-1524

Run Number: 5 Date: 5-15-92

Monitor	Cal Gases	Error <2%	I Bias <5%	F Bias <5%	Drift <3%	Run Average
Oxygen Span = 25 (%)	0	0.0	0.1	0.0		13.2 Ø
	10.1	10.1	10.1	10.0		
	17.1	17.1				
Tolerance (%)		.5	1.25	1.25	.75	
Carbon Dioxide Span = 10 (%)	0	0.0	0.0	0.1		4.5 ✗
	5.1	5.1				
	9.35	9.4	9.4	9.3		
Tolerance (%)		.2	.5	.5	.3	
Nitrogen Oxides Span = 250 (ppm)	0	0.0	0.0	0.4		40.6 ✗
	123	121.9	122.1	120.4		
	217	217.3				
Tolerance (ppm)		5	12.5	12.5	7.5	
Carbon Monoxide Span = 500 (ppm)	0	0.2	0.2	0.2		89.3 ✗
	91.3	86.5	86.5	86.5		
	178	173.0				
	376	380.4				
Tolerance (ppm)		10	25	25	15	
Outlet Total Hydrocarbons Span = 100 (ppm) "Propane"	0	0.0	-.2	0.1		22.9 ✗
	27.5	25.5				
	48.4	48.9	49.2	48.6		
	88.9	90.8				
Tolerance (ppm)		2	5	5	3	
Inlet Total Hydrocarbons Span = 1000 (ppm) "Propane"						
Tolerance (ppm)		20	50	50	30	

→ Corrected Data

Instrumental Method Data Summary Form

Facility: Burlington Asphalt Corp.
Purpose : COMPLIANCE - RAP

APC ID NO. : 45032
NJ Stack NO.: 001
P&Ct/Log NO.: 068976
90-1524

Run Number: 6 Date: 5-15-92

Monitor	Cal Gases	Error <2%	I Bias <5%	F Bias <5%	Drift <3%	Run Average
Oxygen Span = 25 (%)	0		0.0	0.0		
	10.1		10.0	10.1		
	17.1					
Tolerance (%)		.5	1.25	1.25	.75	
Carbon Dioxide Span = 10 (%)	0		0.1	0.1		
	5.1					
	9.35		9.3	9.4		
Tolerance (%)		.2	.5	.5	.3	
Nitrogen Oxides Span = 250 (ppm)	0		0.4	0.2		
	123		120.4	119.3		
	217					
Tolerance (ppm)		5	12.5	12.5	7.5	
Carbon Monoxide Span = 500 (ppm)	0		0.2	0.2		
	91.3		86.5	86.5		
	178					
	376					
Tolerance (ppm)		10	25	25	15	
Outlet Total Hydrocarbons Span = 100 (ppm) "Propane"	0		0.1	0.3		
	27.5					
	48.4		48.6	49.0		
	88.9					
Tolerance (ppm)		2	5	5	3	
Inlet Total Hydrocarbons Span = 1000 (ppm) "Propane"						
Tolerance (ppm)		20	50	50	30	

APPENDIX E

MOISTURE DATA AND CALCULATIONS

- SUMMARY REPORT
- FIELD DATA AND CALCULATIONS

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION AND ENERGY
BUREAU OF TECHNICAL SERVICES
COMPLIANCE TEST MOISTURE DETERMINATION

FACILITY: BURLINGTON ASPHALT CO.
APC ID NO: 45032
NJ STACK NO: 001

DATE	RUN	MATERIAL TYPE	BAROMETRIC PRESSURE ("Hg)	STANDARD METER VOL. (DSCF)	IMPINGER COLLECT (mls.)	SILICA COLLECT (gms.)	PERCENT MOISTURE
05-14-92	1	VIRGIN	29.95	41.527	214.0	11.8	20.46 %
05-14-92	2	VIRGIN	29.95	40.935	228.0	13.3	21.80 %
05-14-92	3	VIRGIN	30.01	41.071	251.0	9.9	23.10 %
05-14-92	4	RAP	30.06	41.452	291.0	13.9	25.81 %
05-15-92	5	RAP	30.18	42.141	239.0	11.1	21.92 %
05-15-92	6	RAP	30.27	41.375	196.0	12.4	19.24 %

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF TECHNICAL SERVICES
TRAVERSE-CONDENSATE SHEET

COMPANY: BURLINGTON ASPHALT CO.			ID #: 45032
STACK: HOT MIX	INLET or OUTLET		N.J. #: 001
ADDITIONAL TEST: THC, CO, O_2, CO_2, NOx	RUN #: 1		DATE: 5/14/92
DESICCANT #: 3	MET MAIN: 11.8	Pst ("H2O): .-1.2	Pb ("Hg): 29.95

IMPINGERS
1 100 mls DI H_2O
2 EMPTY
3 SILICA GEL IMPINGER
4 ←

H_2O COLLECTED: 214

TEST TIMES
START: 7:51 (AM) PM
STOP: 8:51 (AM) PM
SAMPLING TIME (MIN): 60

FYRITE
% CO2
% O2
Op: ——— ID #: ———

TRAVERSES						Pt	CONDENSATE					
PORT	POINT	ΔP1	Ts1	ΔP2	Ts2		TRIN	TROUT	TRAVG	ΔH	Hg	REMARKS
					187	1	62	62	62	1.5	5"	0
					187	2	64	62	63	1.5	5"	300
					187	3	66	62	64	1.5	6"	600
					188	4	68	64	66	1.5	6"	900
					187	5	70	64	67	1.5	6"	1200
					187	6	70	66	68	1.5	6"	1500
					187	7	70	66	68	1.5	6"	1800
					186	8	70	66	68	1.5	6"	2100
					186	9	70	66	68	1.5	6"	2400
					190	10	70	66	68	1.5	6"	2700
					189	11	70	66	68	1.5	6"	3000
					190	12	70	66	68	1.5	6"	3300 → 3600
				AVG	187.6		AVG.		66.5	1.5		
AVG.												

AVG. Ts = _____
AVG √ΔP = _____

METER DATA
ID#: 11 Y = 1.005
ORIFICE ID#: D-9 ΔH@ = 1.70
FINAL VOL.: 160.400
INIT. VOL.: 119.544
Vm : 40.856 * Y = 41.060

LEAK RATE
PRE.: 0 @ 15" CFM @ "Hg
POST: 0 @ 6" CFM @ "Hg

TESTED BY: KETTIG, PAPP

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF TECHNICAL SERVICES
TRAVERSE-CONDENSATE SHEET

COMPANY: BURLINGTON ASPHALT CO.			ID #: 45032
STACK: HOT MIX		INLET or (OUTLET)	B.J. #: 001
ADDITIONAL TEST: THC, CO, O_2, CO_2, NOx		RUN #: 2	DATE: 5/14/92
DESICCANT #: 9	DRY GAS: 13.3	Pst (H_2O): . -1.2	Pb (Hg): 29.95

IMPINGERS
1 100 ml H_2O
2 Empty
3 Silica Gel
4 —

H_2O COLLECTED: 228

TEST TIMES
START: 9:46 (AM) PM
STOP: 10:46 (AM) PM
SAMPLING TIME (MIN): 60

FYRITE

% CO_2	—			
% O_2	—			

Cp: — ID # —

TRAVERSES						Pt	CONDENSATE					
PORT	POINT	ΔP_1	T_{S1}	ΔP_2	T_{S2}		T_{MIN}	T_{MOUT}	T_{MAVG}	ΔH	Hg	REMARKS
					190	1	70	72	71	1.5	5"	0
					190	2	70	74	72	1.5	6'	300
					189	3	74	74	74	1.5	6"	600
					191	4	76	74	75	1.5	6"	900
					191	5	76	76	76	1.5	6"	1200
					194	6	76	76	76	1.5	6"	1500
					195	7	78	78	78	1.5	6"	1800
					198	8	82	80	81	1.5	6"	2100
					199	9	82	80	81	1.5	7"	2400
					202	10	82	80	81	1.5	7"	2700
					203	11	82	80	81	1.5	7"	3000
				AVG Ts →	202	12	82	80	81	1.5	7⅛"	3300-3600
					195.3		AVG.		77.3	1.5		
AVG.												

AVG. Ts = _____

AVG $\sqrt{\Delta P}$ = _____

METER DATA
ID#: 11 Y = 1.005
ORIFICE ID#: O-9 $\Delta H@$ = 1.70
FINAL VOL.: 202.002 R.K
INIT. VOL.: 160902 Vm = 41.1
Vm : [redacted]* Y = 41.30

LEAK RATE
PRE.: .002 @ 15" CFM @ "Hg
POST: .001 @ 8" CFM @ "Hg

TESTED BY: FRANK PAPP, FRED BAILAY
BOB KETTIG

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF TECHNICAL SERVICES
TRAVERSE-CONDENSATE SHEET

COMPANY: BURLINGTON ASPHALT CO.		ID #: 45032
STACK: BATCH PLANT	~~INLET~~ or OUTLET	N.J. #: 001
ADDITIONAL TEST: THC, CO, NOx	RUN #: 3	DATE: 5/14/92
DESICCANT #: 10	WET GAIN: 9.9	Pst (H_2O): . -1.20	Pb (Hg): 30.01

IMPINGERS
1 100 mls DI H_2O
2 EMPTY
3 SILICA GEL
X ——

TEST TIMES
START: 12:18 AM (PM)
STOP: 1:18 AM (PM)
SAMPLING TIME (MIN): 60 min.

FYRITE
% CO2
% O2
Cp: —— ID #: ——

H2O COLLECTED: 251

TRAVERSES						Pt	CONDENSATE					
PORT	POINT	ΔP_1	T_{S1}	ΔP_2	T_{S2}		T_{RIN}	T_{ROUT}	T_{RAVG}	ΔH	Hg	REMARKS
					193	1	80	86	83	1.5	5"	0
					191	2	80	86	83	1.5	5"	300
					195	3	84	86	85	1.5	6"	600
					197	4	86	86	86	1.5	6"	900
					199	5	86	86	86	1.5	6"	1200
					203	6	88	86	87	1.5	6"	1500
					206	7	90	88	89	1.5	6"	1800
					205	8	90	88	89	1.5	7"	2100
					208	9	90	90	90	1.5	7"	2400
					210	10	90	90	90	1.5	7"	2700
					212	11	90	90	90	1.5	7"	3000
					212	12	90	90	90	1.5	7"	3300-3600
				$T_{S\,AVG.}$	202		AVG.		87.3	1.5		
AVG.												

AVG. Ts = ——
AVG $\sqrt{\Delta P}$ = ——

METER DATA
ID#: 11 Y = 1.005
ORIFICE ID#: O-9 $\Delta H@$ = 1.70
FINAL VOL.: 244.320
INIT. VOL.: 202.400
Vm: 41.92 * Y = 42.13

LEAK RATE
PRE.: .002 @ 15" CFM @ "Hg
POST: .000 @ 8" CFM @ "Hg

TESTED BY: Kettig, PAPP
BALLAY

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF TECHNICAL SERVICES
TRAVERSE-CONDENSATE SHEET

COMPANY: BURLINGTON ASPHALT CO.			ID #: 45032
STACK: BATCH PLANT		~~INLET~~ or (OUTLET)	N.J. #: 001
ADDITIONAL TEST: THC, CO, NOX		RUN #: 4 RAP	DATE: 5/14/92
DESICCANT #: 7	WET GAIN: 13.9	Pst (H_2O): .-1.20	Pb (Hg): 30.06

IMPINGERS
1 100 mls DI H_2O
2 EMPTY
3 SILICA GEL
4 ———

H2O COLLECTED: 291

TEST TIMES
START: 2:10 ~~AM~~ (PM)
STOP: 3:10 ~~AM~~ (PM)
SAMPLING TIME (MIN): 60

FYRITE
% CO2
% O2
Op: —— ID # ——

TRAVERSES						Pt	CONDENSATE					
PORT	POINT	ΔP1	Ts1	ΔP2	Ts2		TmIN	TmOUT	TmAVG	ΔH	Hg	REMARKS
					198	1	86	86	86	1.5	5"	0
					208	2	86	86	86	1.5	6"	300
					213	3	86	86	86	1.5	6"	600
					216	4	88	86	87	1.5	6"	900
					221	5	88	86	87	1.5	6"	1200
					224	6	88	86	87	1.5	7"	1500
					228	7	88	88	88	1.5	7"	1800
					229	8	90	88	89	1.5	7"	2106
					229	9	90	88	89	1.5	7"	2400
					229	10	90	88	89	1.5	7"	2700
					228	11	90	88	89	1.5	7"	3000
					228	12	90	88	89	1.5	7"	3300 3600
				AVG.TS	221.1		AVG.		87.7	1.5		
AVG.												

AVG. Ts = ———
AVG $\sqrt{\Delta P}$ = ———

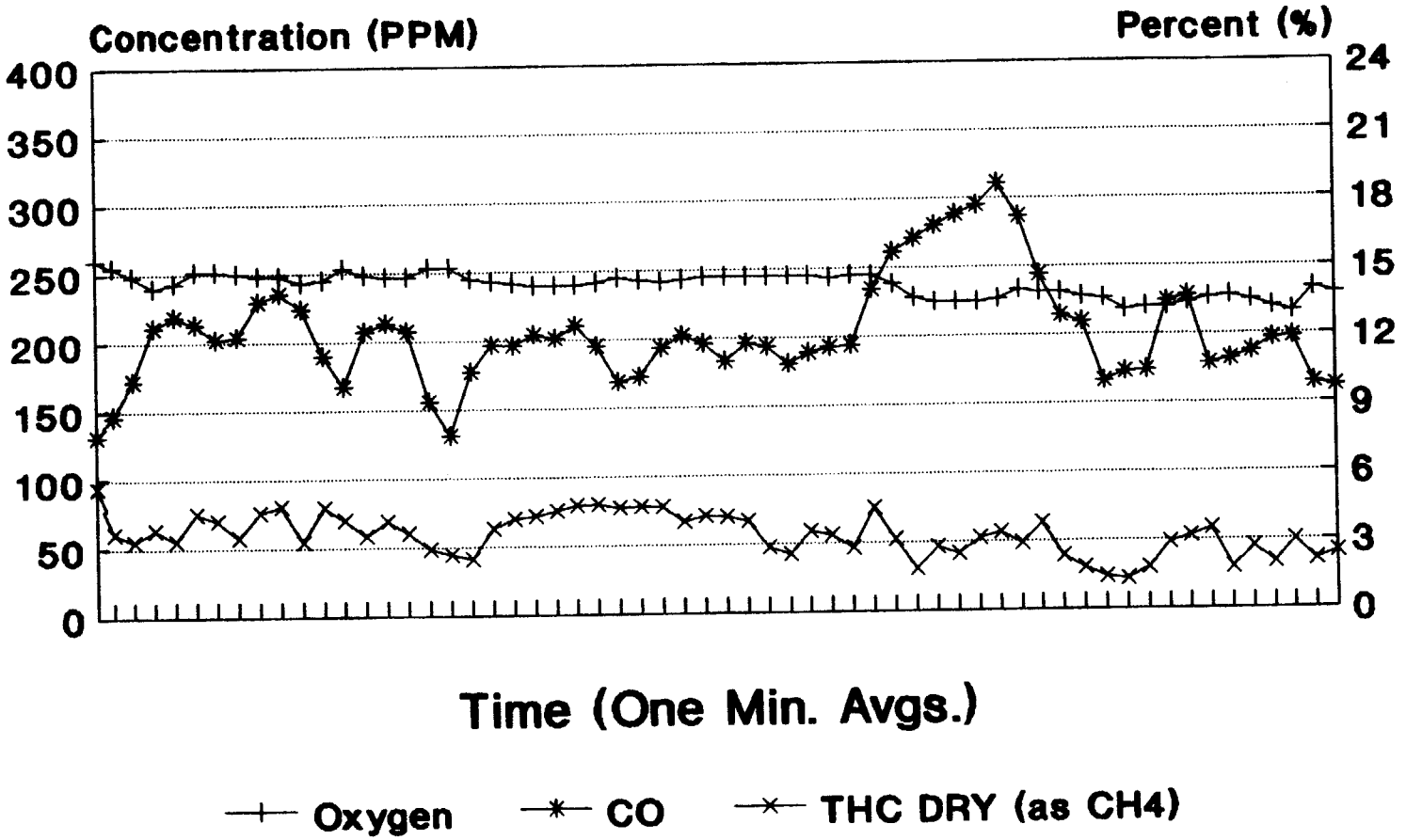
METER DATA
ID#: 11 Y = 1.005
ORIFICE ID#: O-9 ΔH@ = 1.70
FINAL VOL.: 286.872 Vm = 42.270
INIT. VOL.: 244.602
Vm: [illegible] * Y = 42.48

LEAK RATE
PRE.: .001 @ 15" CFM @ "Hg
POST: .000 @ 7" CFM @ "Hg

TESTED BY: Kelly, PAPC, BALLA/

Burlington Asphalt Corporation

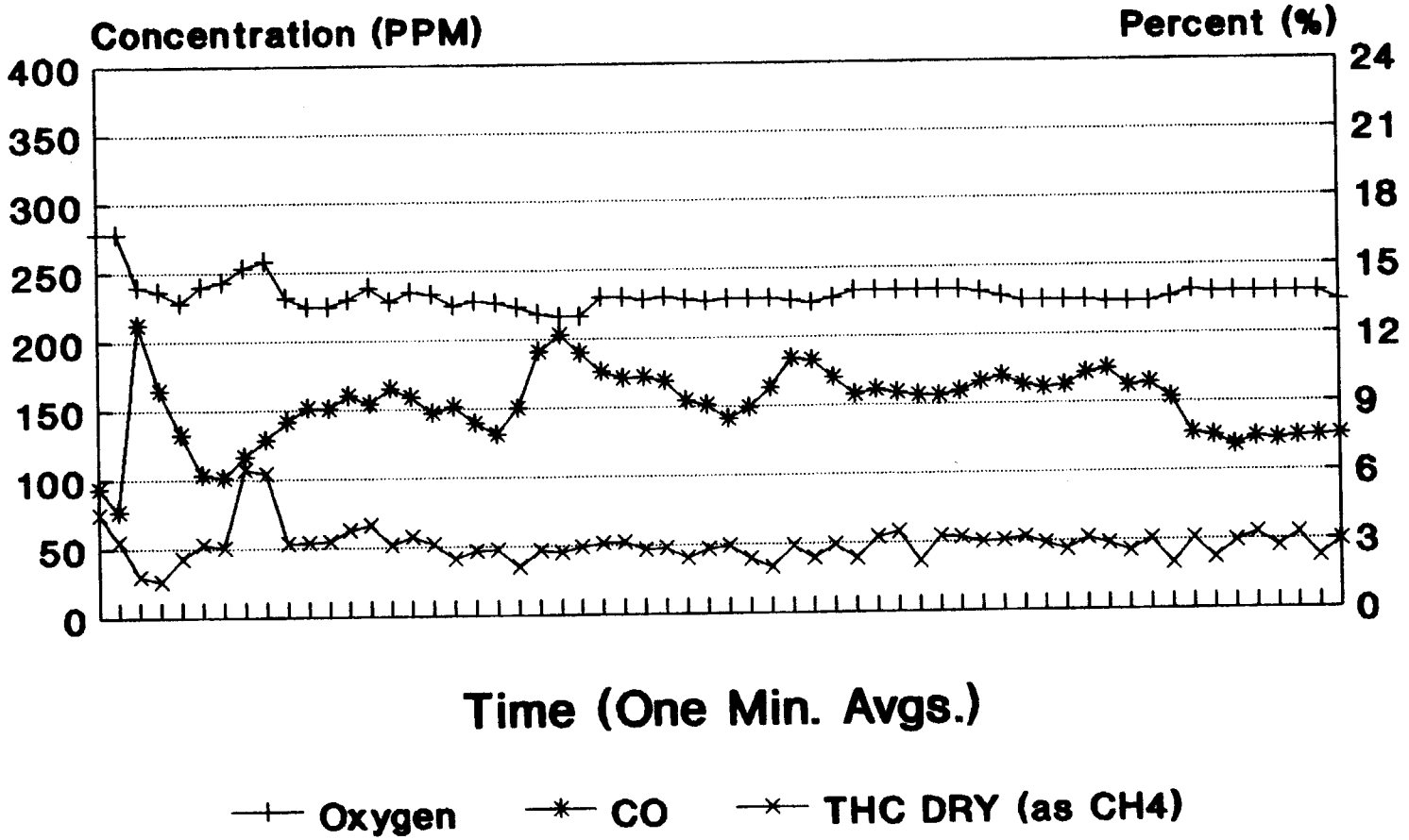
Compliance Stack Test - Run No. 1



Virgin Material (7:50am to 8:50am)

Burlington Asphalt Corporation

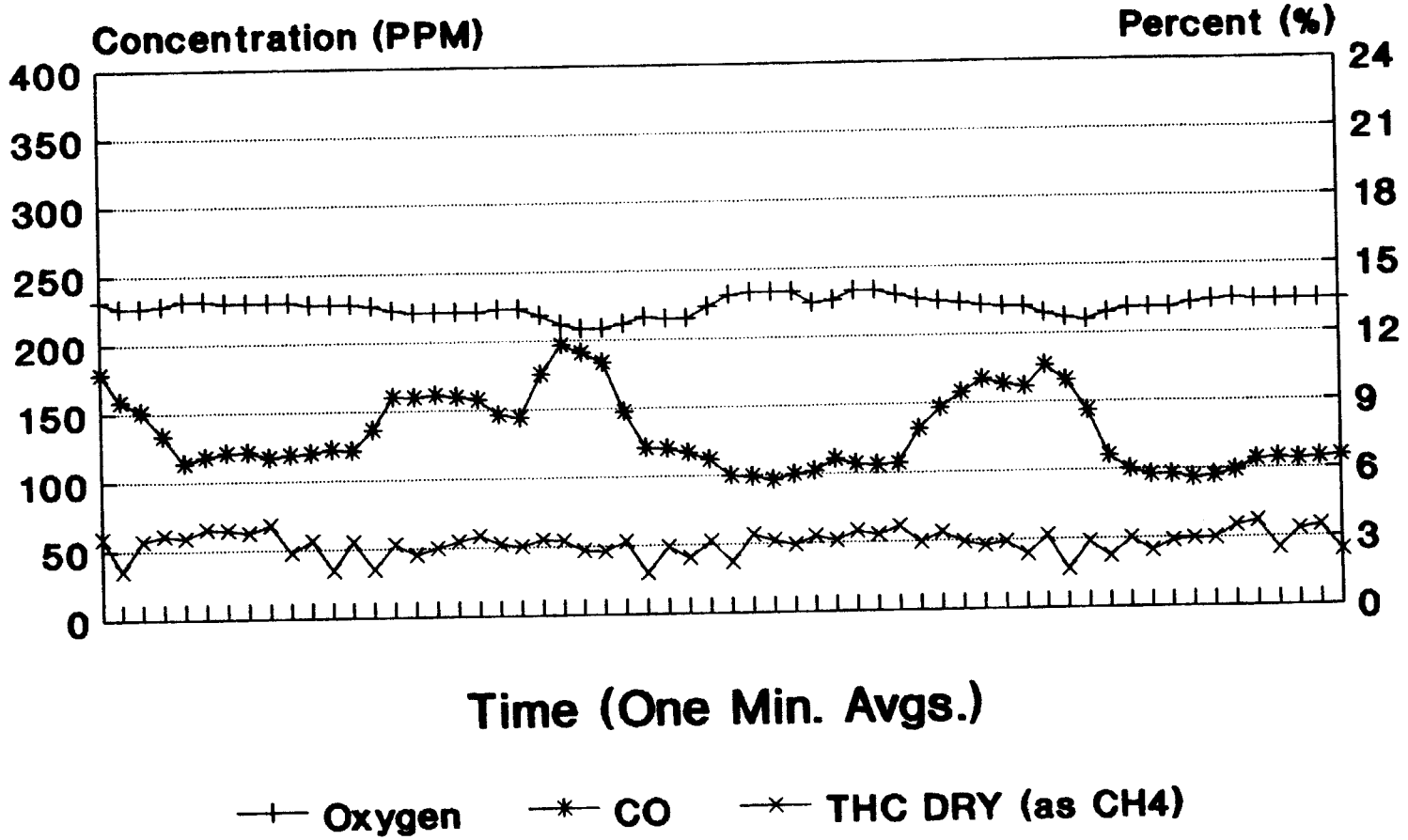
Compliance Stack Test - Run No. 2



Virgin Material (9:45am to 10:45am)

Burlington Asphalt Corporation

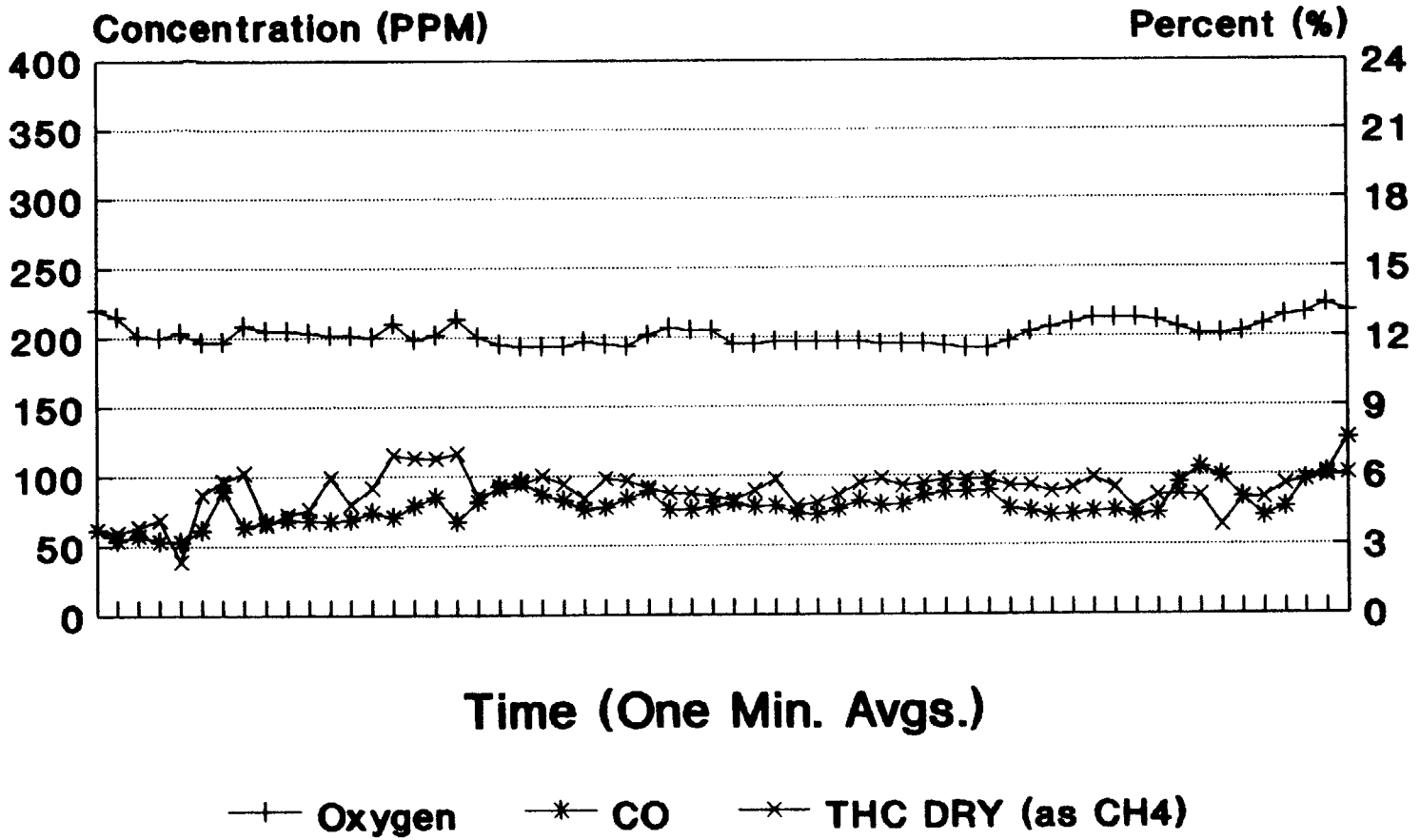
Compliance Stack Test - Run No. 3



Virgin Material (12:18pm to 13:18pm)

Burlington Asphalt Corporation

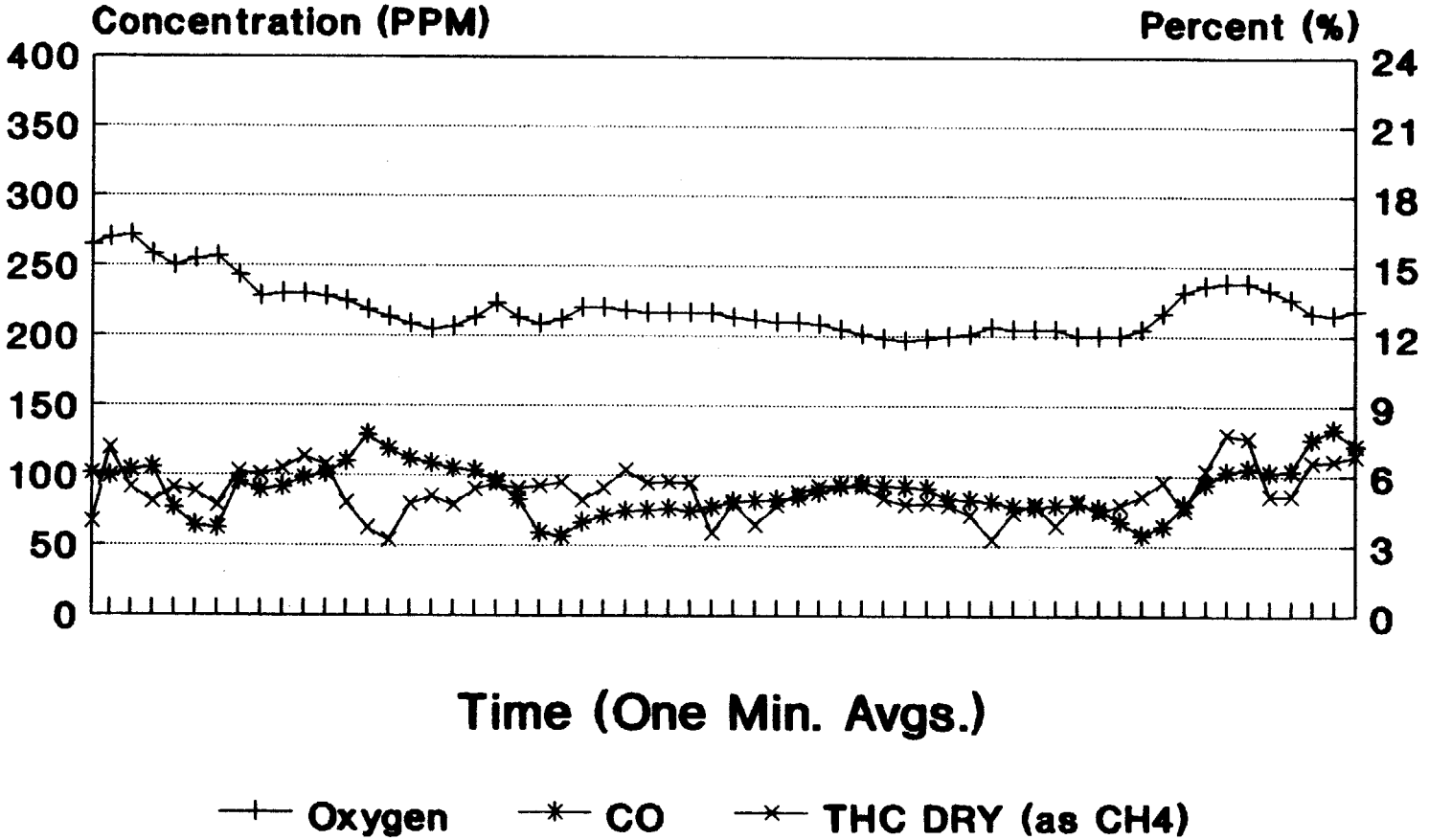
Compliance Stack Test - Run No. 4



RAP Material (14:10pm to 15:10pm)

Burlington Asphalt Corporation

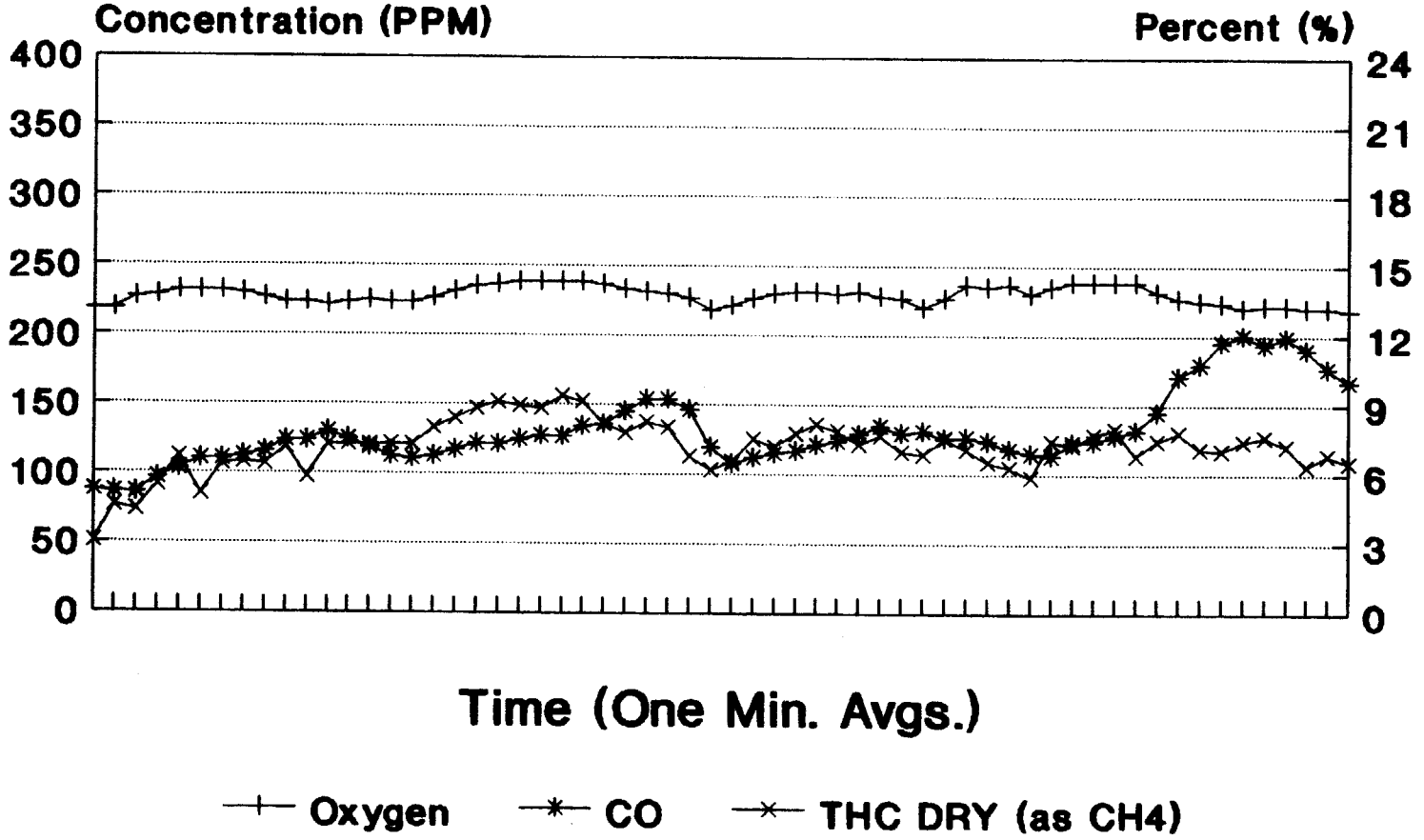
Compliance Stack Test - Run No. 5



RAP Material (09:02am to 10:02am)

Burlington Asphalt Corporation

Compliance Stack Test - Run No. 6



RAP Material (10:52am to 11:52am)

Instuental Method Raw Data Summary

Facility: Burlington County Asphalt APC ID. #: 45032 NJ Stack #: 001

Run Number: 1-Virgin Date: 05/14/92

Reading Number	Time	O2 Pct	CO2 Pct	THC-OUT PPMVW	CO PPMVD	NOx PPMVD	THC-IN PPMVW
1	07:51:35	15.60	3.20	25.00	131.70	21.80	0.00
2	07:52:34	15.30	3.40	16.20	146.20	23.20	0.00
3	07:53:34	14.90	3.50	14.60	171.90	23.40	0.00
4	07:54:33	14.40	3.90	16.80	210.90	25.70	0.00
5	07:55:33	14.60	3.70	14.70	218.90	23.90	0.00
6	07:56:32	15.10	3.50	19.90	213.40	22.80	0.00
7	07:57:32	15.10	3.50	18.60	202.20	22.90	0.00
8	07:58:31	15.00	3.50	15.30	203.80	23.40	0.00
9	07:59:30	14.90	3.60	20.10	229.70	23.60	0.00
10	08:00:30	14.90	3.60	21.30	235.40	23.80	0.00
11	08:01:29	14.60	3.70	14.40	224.30	24.80	0.00
12	08:02:29	14.70	3.60	21.00	189.80	24.70	0.00
13	08:03:28	15.20	3.40	18.60	167.10	24.10	0.00
14	08:04:28	14.90	3.60	15.50	207.60	24.50	0.00
15	08:05:27	14.80	3.60	18.30	213.20	24.40	0.00
16	08:06:27	14.80	3.60	16.00	207.60	24.40	0.00
17	08:07:26	15.20	3.40	12.90	156.00	24.70	0.00
18	08:08:25	15.20	3.40	11.80	138.90	24.20	0.00
19	08:09:25	14.70	3.70	10.90	177.60	24.60	0.00
20	08:10:24	14.60	3.70	16.70	196.80	25.10	0.00
21	08:11:24	14.50	3.80	18.60	196.60	25.60	0.00
22	08:12:23	14.40	3.80	19.10	204.20	25.70	0.00
23	08:13:23	14.40	3.80	20.00	201.10	25.50	0.00
24	08:14:22	14.40	3.80	21.00	210.40	25.60	0.00
25	08:15:21	14.50	3.80	21.20	195.20	25.80	0.00
26	08:16:21	14.70	3.70	20.50	168.90	25.70	0.00
27	08:17:20	14.60	3.70	20.70	172.80	25.40	0.00
28	08:18:20	14.50	3.80	20.60	193.70	25.70	0.00
29	08:19:20	14.60	3.70	17.70	202.20	25.00	0.00
30	08:20:20	14.70	3.70	18.80	196.40	25.10	0.00
31	08:21:19	14.70	3.70	18.60	183.50	25.30	0.00
32	08:22:19	14.70	3.70	17.70	196.40	25.20	0.00
33	08:23:19	14.70	3.70	12.60	193.70	25.20	0.00
34	08:24:18	14.70	3.70	11.20	188.60	25.50	0.00
35	08:25:18	14.70	3.70	15.60	188.60	25.40	0.00
36	08:26:18	14.60	3.70	14.80	192.90	25.20	0.00
37	08:27:17	14.70	3.70	12.30	194.00	25.10	0.00
38	08:28:17	14.70	3.70	19.90	234.40	24.40	0.00
39	08:29:17	14.30	3.90	13.80	261.60	25.70	0.00
40	08:30:17	13.70	4.20	8.10	271.30	27.40	0.00
41	08:31:16	13.50	4.30	12.30	288.50	27.60	0.00
42	08:32:16	13.50	4.30	10.90	288.50	27.80	0.00
43	08:33:15	13.50	4.30	13.90	295.00	28.00	0.00
44	08:34:15	13.60	4.20	15.00	310.80	27.30	0.00
45	08:35:15	14.00	4.00	12.90	286.70	28.70	0.00
46	08:36:15	13.90	4.10	16.70	244.20	30.40	0.00
47	08:37:14	13.90	4.10	10.40	214.40	30.90	0.00
48	08:38:14	13.70	4.10	8.00	209.70	31.60	0.00

Instumental Method Raw Data Summary

Facility: Burlington County Asphalt APC ID. #: 45032 NJ Stack #: 001

Run Number: 1-Virgin Date: 05/14/92

Reading Number	Time	O2 Pct	CO2 Pct	THC-OUT PPMVW	CO PPMVD	NOx PPMVD	THC-IN PPMVW
49	08:39:14	13.60	4.30	6.30	166.10	32.60	0.00
50	08:40:13	13.10	4.40	5.80	172.90	33.90	0.00
51	08:41:13	13.20	4.50	7.90	173.70	33.60	0.00
52	08:42:13	13.20	4.40	12.80	224.10	31.80	0.00
53	08:43:12	13.40	4.40	14.00	228.10	31.30	0.00
54	08:44:12	13.60	4.10	15.50	178.50	29.90	0.00
55	08:45:12	13.70	4.20	7.90	181.70	31.40	0.00
56	08:46:11	13.50	4.30	11.90	187.40	32.80	0.00
57	08:47:11	13.20	4.50	8.90	196.80	34.00	0.00
58	08:48:11	13.00	4.50	13.20	197.90	34.80	0.00
59	08:49:10	14.00	4.00	9.40	164.30	31.20	0.00
60	08:50:11	13.80	4.20	10.80	161.70	32.40	0.00
Run Average		14.34	3.86	15.10	203.94	26.86	0.00

Instumental Method Raw Data Summary

Facility: Burlington County Asphalt APC ID. #: 45032 NJ Stack #: 001

Run Number: 2-Virgin Date: 05/14/92

Reading Number	Time	O2 Pct	CO2 Pct	THC-OUT PPMVW	CO PPMVD	NOx PPMVD	THC-IN PPMVW
1	09:46:03	16.70	2.50	19.50	93.50	17.10	0.00
2	09:47:02	16.70	2.60	14.40	76.90	16.40	0.00
3	09:48:02	14.40	3.90	7.80	212.60	26.50	0.00
4	09:49:01	14.20	3.90	6.80	164.70	29.60	0.00
5	09:50:00	13.70	4.20	11.10	132.70	32.80	0.00
6	09:51:00	14.40	3.80	13.80	103.30	31.80	0.00
7	09:51:59	14.60	3.80	13.10	101.00	30.70	0.00
8	09:52:59	15.20	3.40	27.90	116.50	26.20	0.00
9	09:53:58	15.50	3.30	27.10	128.70	25.00	0.00
10	09:54:58	13.90	4.20	13.90	141.80	31.80	0.00
11	09:55:57	13.50	4.30	14.00	151.60	33.90	0.00
12	09:56:56	13.50	4.30	14.20	150.70	33.60	0.00
13	09:57:56	13.80	4.10	16.30	160.30	31.90	0.00
14	09:58:55	14.30	3.90	17.20	154.00	30.70	0.00
15	09:59:55	13.70	4.30	13.40	165.10	33.50	0.00
16	10:00:54	14.10	4.00	14.90	159.00	31.40	0.00
17	10:01:54	14.00	4.10	13.50	147.10	32.20	0.00
18	10:02:53	13.50	4.30	10.70	151.70	33.70	0.00
19	10:03:53	13.70	4.30	12.20	139.30	33.80	0.00
20	10:04:52	13.60	4.20	12.40	131.10	34.20	0.00
21	10:05:52	13.40	4.40	9.10	149.90	35.10	0.00
22	10:06:51	13.10	4.50	12.20	191.00	35.10	0.00
23	10:07:51	13.00	4.60	11.80	202.90	35.40	0.00
24	10:08:50	13.00	4.50	12.70	190.00	35.40	0.00
25	10:09:49	13.80	4.10	13.40	176.00	32.80	0.00
26	10:10:49	13.80	4.20	13.60	171.20	33.00	0.00
27	10:11:48	13.70	4.20	12.20	171.90	33.00	0.00
28	10:12:48	13.80	4.20	12.50	168.60	33.40	0.00
29	10:13:48	13.70	4.20	10.60	154.40	34.20	0.00
30	10:14:48	13.60	4.30	12.20	151.20	34.90	0.00
31	10:15:47	13.70	4.20	12.70	140.80	34.20	0.00
32	10:16:47	13.70	4.20	10.30	149.10	33.30	0.00
33	10:17:47	13.70	4.20	8.70	163.40	33.60	0.00
34	10:18:46	13.60	4.20	12.60	184.30	32.80	0.00
35	10:19:46	13.50	4.30	10.30	182.90	33.80	0.00
36	10:20:46	13.70	4.20	12.70	170.10	33.60	0.00
37	10:21:45	14.00	4.10	10.20	157.80	32.70	0.00
38	10:22:45	14.00	4.10	14.10	161.10	32.60	0.00
39	10:23:45	14.00	4.10	15.00	158.70	32.80	0.00
40	10:24:44	14.00	4.00	9.50	156.70	32.30	0.00
41	10:25:44	14.00	4.10	14.10	156.20	32.30	0.00
42	10:26:44	14.00	4.10	13.90	159.10	32.00	0.00
43	10:27:43	13.90	4.10	13.00	166.10	32.60	0.00
44	10:28:43	13.70	4.20	13.20	169.70	34.20	0.00
45	10:29:43	13.50	4.30	13.80	163.60	35.10	0.00
46	10:30:42	13.50	4.30	12.60	161.40	35.40	0.00
47	10:31:42	13.50	4.30	11.40	163.00	35.70	0.00
48	10:32:42	13.50	4.30	13.50	171.60	35.40	0.00

Instumental Method Raw Data Summary

Facility: Burlington County Asphalt APC ID. #: 45032 NJ Stack #: 001

Run Number: 2-Virgin Date: 05/14/92

Reading Number	Time	O2 Pct	CO2 Pct	THC-OUT PPMVW	CO PPMVD	NOx PPMVD	THC-IN PPMVW
49	10:33:41	13.40	4.40	12.50	174.60	35.00	0.00
50	10:34:41	13.40	4.30	11.00	162.30	35.30	0.00
51	10:35:41	13.40	4.30	13.20	164.20	34.70	0.00
52	10:36:40	13.60	4.20	8.70	153.30	35.10	0.00
53	10:37:40	13.90	4.20	13.30	127.60	34.40	0.00
54	10:38:40	13.80	4.20	9.60	125.20	34.30	0.00
55	10:39:39	13.80	4.10	12.70	118.30	34.60	0.00
56	10:40:39	13.80	4.10	14.30	124.10	33.70	0.00
57	10:41:39	13.80	4.20	11.70	122.70	33.20	0.00
58	10:42:38	13.80	4.20	14.20	124.40	33.20	0.00
59	10:43:38	13.80	4.20	9.80	125.20	34.00	0.00
60	10:44:38	13.40	4.40	12.80	126.00	36.60	0.00
Run Average		13.89	4.11	13.00	151.54	32.61	0.00

Instumental Method Raw Data Summary

Facility: Burlington County Asphalt APC ID. #: 45032 NJ Stack #: 001

Run Number: 3-Virgin Date: 05/14/92

Reading Number	Time	O2 Pct	CO2 Pct	THC-OUT PPMVW	CO PPMVD	NOx PPMVD	THC-IN PPMVW
1	12:19:21	13.90	4.20	15.20	178.90	33.30	0.00
2	12:20:20	13.60	4.30	9.10	158.90	35.30	0.00
3	12:21:20	13.60	4.30	14.60	151.00	35.30	0.00
4	12:22:19	13.70	4.20	15.60	133.70	36.00	0.00
5	12:23:19	13.90	4.10	15.20	113.50	35.40	0.00
6	12:24:18	13.90	4.10	16.70	117.80	35.50	0.00
7	12:25:18	13.80	4.20	16.60	121.00	35.20	0.00
8	12:26:17	13.80	4.20	16.00	121.30	35.90	0.00
9	12:27:17	13.80	4.20	17.40	117.30	35.30	0.00
10	12:28:16	13.80	4.20	12.30	118.90	35.00	0.00
11	12:29:15	13.70	4.20	14.40	120.00	35.20	0.00
12	12:30:15	13.70	4.20	8.90	122.70	35.20	0.00
13	12:31:14	13.70	4.20	14.10	121.70	36.30	0.00
14	12:32:14	13.60	4.30	9.00	136.40	35.80	0.00
15	12:33:13	13.40	4.40	13.60	160.30	36.20	0.00
16	12:34:13	13.30	4.40	11.60	159.90	36.60	0.00
17	12:35:12	13.30	4.40	12.80	161.20	35.80	0.00
18	12:36:11	13.30	4.40	13.90	159.90	36.10	0.00
19	12:37:11	13.30	4.40	15.00	157.60	35.80	0.00
20	12:38:10	13.40	4.40	13.40	146.30	35.60	0.00
21	12:39:10	13.40	4.40	12.90	144.20	35.90	0.00
22	12:40:09	13.10	4.50	14.10	175.50	36.90	0.00
23	12:41:09	12.70	4.80	13.80	196.90	37.40	0.00
24	12:42:08	12.50	4.90	12.00	191.10	38.40	0.00
25	12:43:08	12.50	4.90	11.80	183.60	37.90	0.00
26	12:44:08	12.70	4.80	13.60	147.50	37.80	0.00
27	12:45:08	13.00	4.60	7.70	120.70	37.50	0.00
28	12:46:07	12.90	4.60	12.40	120.10	37.70	0.00
29	12:47:07	12.90	4.60	10.40	116.70	38.30	0.00
30	12:48:07	13.40	4.30	13.40	111.70	36.90	0.00
31	12:49:06	13.90	4.10	9.40	99.50	35.60	0.00
32	12:50:06	14.00	4.10	14.50	98.90	35.90	0.00
33	12:51:06	14.00	4.10	13.40	96.40	36.30	0.00
34	12:52:05	14.00	4.10	12.50	99.90	35.70	0.00
35	12:53:05	13.50	4.40	14.00	102.10	37.10	0.00
36	12:54:05	13.60	4.20	13.20	110.00	36.30	0.00
37	12:55:04	14.00	4.10	14.90	107.10	34.70	0.00
38	12:56:04	14.00	4.10	14.10	106.00	35.70	0.00
39	12:57:04	13.80	4.20	15.60	107.00	36.80	0.00
40	12:58:03	13.60	4.30	12.60	131.80	36.90	0.00
41	12:59:03	13.50	4.40	14.40	146.80	37.40	0.00
42	13:00:03	13.40	4.40	12.50	157.70	36.60	0.00
43	13:01:02	13.30	4.40	11.00	167.10	36.60	0.00
44	13:02:02	13.20	4.50	12.40	163.70	37.60	0.00
45	13:03:02	13.20	4.50	10.10	161.50	38.00	0.00
46	13:04:01	12.90	4.60	13.50	176.70	38.50	0.00
47	13:05:01	12.70	4.80	7.20	165.90	39.30	0.00
48	13:06:01	12.60	4.80	12.30	143.30	39.70	0.00

Instumental Method Raw Data Summary

Facility: Burlington County Asphalt APC ID. #: 45032 NJ Stack #: 001

Run Number: 3-Virgin Date: 05/14/92

Reading Number	Time	O2 Pct	CO2 Pct	THC-OUT PPMVW	CO PPMVD	NOx PPMVD	THC-IN PPMVW
49	13:07:00	12.90	4.60	9.50	110.10	39.60	0.00
50	13:08:00	13.10	4.50	12.80	100.20	38.50	0.00
51	13:09:00	13.10	4.50	10.50	95.90	37.90	0.00
52	13:09:59	13.10	4.50	12.30	96.00	38.60	0.00
53	13:10:59	13.30	4.40	12.60	93.60	38.40	0.00
54	13:11:59	13.40	4.40	12.70	94.90	38.00	0.00
55	13:12:58	13.50	4.40	15.00	98.70	38.30	0.00
56	13:13:58	13.40	4.40	15.80	106.70	38.10	0.00
57	13:14:58	13.40	4.40	10.70	107.60	37.70	0.00
58	13:15:58	13.40	4.40	14.20	106.60	37.90	0.00
59	13:16:58	13.40	4.40	14.90	107.70	38.20	0.00
60	13:17:57	13.40	4.40	10.20	108.70	37.60	0.00
Run Average		13.40	4.39	12.95	130.92	36.82	0.00

Instuaental Method Raw Data Summary

Facility: Burlington County Asphalt APC ID. #: 45032 NJ Stack #: 001

Run Number: 4-RAP Date: 05/14/92

Reading Number	Time	O2 Pct	CO2 Pct	THC-OUT PPMVW	CO PPMVD	NOx PPMVD	THC-IN PPMVW
1	14:11:06	13.20	4.50	15.30	61.60	41.90	0.00
2	14:12:06	12.90	4.70	14.60	54.10	43.80	0.00
3	14:13:05	12.10	5.20	15.70	57.40	45.60	0.00
4	14:14:05	12.00	5.20	17.00	53.40	45.50	0.00
5	14:15:04	12.20	5.10	9.60	52.80	46.40	0.00
6	14:16:03	11.80	5.40	21.40	61.30	47.30	0.00
7	14:17:03	11.80	5.30	23.80	89.40	45.50	0.00
8	14:18:02	12.50	4.90	25.30	63.60	46.10	0.00
9	14:19:02	12.30	5.00	16.10	66.90	46.20	0.00
10	14:20:01	12.30	5.00	17.00	68.70	45.30	0.00
11	14:21:01	12.20	5.10	18.80	67.70	46.80	0.00
12	14:22:00	12.10	5.10	24.50	67.40	47.30	0.00
13	14:23:00	12.10	5.10	19.70	68.60	46.10	0.00
14	14:23:59	12.00	5.20	22.60	73.60	45.40	0.00
15	14:24:58	12.60	4.80	28.40	70.30	44.70	0.00
16	14:25:58	11.90	5.30	27.90	78.30	45.40	0.00
17	14:26:57	12.10	5.10	27.80	84.80	44.60	0.00
18	14:27:57	12.80	4.70	28.70	67.10	45.00	0.00
19	14:28:56	12.00	5.20	21.10	81.50	45.40	0.00
20	14:29:56	11.70	5.40	22.30	92.60	46.00	0.00
21	14:30:55	11.60	5.40	23.10	96.30	45.60	0.00
22	14:31:54	11.60	5.40	24.70	86.40	46.90	0.00
23	14:32:54	11.60	5.40	23.30	82.30	46.20	0.00
24	14:33:53	11.80	5.30	20.70	75.60	46.50	0.00
25	14:34:53	11.70	5.40	24.20	77.50	47.10	0.00
26	14:35:52	11.60	5.40	23.80	83.40	44.80	0.00
27	14:36:52	12.10	5.10	22.60	88.90	44.70	0.00
28	14:37:51	12.40	4.90	21.70	75.50	45.20	0.00
29	14:38:51	12.30	5.00	21.50	75.70	46.10	0.00
30	14:39:51	12.30	5.00	21.10	77.70	46.40	0.00
31	14:40:51	11.70	5.40	20.40	80.00	46.70	0.00
32	14:41:50	11.70	5.40	22.00	77.90	46.70	0.00
33	14:42:50	11.80	5.40	24.00	78.10	46.40	0.00
34	14:43:50	11.80	5.30	19.30	72.80	47.00	0.00
35	14:44:49	11.80	5.30	19.90	71.80	47.00	0.00
36	14:45:49	11.80	5.30	21.20	76.00	47.10	0.00
37	14:46:49	11.80	5.40	23.30	81.70	46.30	0.00
38	14:47:48	11.70	5.40	24.10	78.40	46.20	0.00
39	14:48:48	11.70	5.40	22.80	79.20	45.70	0.00
40	14:49:48	11.70	5.40	23.30	85.40	45.40	0.00
41	14:50:47	11.60	5.40	24.00	88.00	46.00	0.00
42	14:51:47	11.50	5.50	23.90	87.90	45.80	0.00
43	14:52:47	11.50	5.50	24.10	88.90	46.90	0.00
44	14:53:46	11.80	5.30	22.80	76.10	47.00	0.00
45	14:54:46	12.20	5.10	22.80	74.10	47.20	0.00
46	14:55:46	12.40	4.90	21.80	71.10	46.10	0.00
47	14:56:45	12.60	4.80	22.40	71.80	44.30	0.00
48	14:57:45	12.80	4.70	24.30	73.70	44.70	0.00

Instumental Method Raw Data Summary

Facility: Burlington County Asphalt APC ID. #: 45032 NJ Stack #: 001

Run Number: 4-RAP Date: 05/14/92

Reading Number	Time	O2 Pct	CO2 Pct	THC-OUT PPMVW	CO PPMVD	NOx PPMVD	THC-IN PPMVW
49	14:58:45	12.80	4.70	22.50	74.50	44.70	0.00
50	14:59:44	12.80	4.70	18.60	70.30	44.80	0.00
51	15:00:44	12.70	4.80	21.00	72.70	45.00	0.00
52	15:01:44	12.40	5.00	21.20	94.70	46.20	0.00
53	15:02:43	12.10	5.20	21.00	105.10	46.90	0.00
54	15:03:43	12.10	5.10	15.80	99.10	46.80	0.00
55	15:04:43	12.20	5.10	20.50	84.00	46.70	0.00
56	15:05:42	12.50	4.90	20.70	70.50	46.20	0.00
57	15:06:42	12.90	4.60	23.00	76.50	43.80	0.00
58	15:07:42	13.00	4.60	23.80	96.20	42.40	0.00
59	15:08:41	13.40	4.40	24.50	101.10	40.00	0.00
60	15:09:42	13.10	4.50	25.00	126.30	38.50	0.00
Run Average		12.16	5.10	21.82	78.07	45.57	0.00

Instumental Method Raw Data Summary

Facility: Burlington County Asphalt APC ID. #: 45032 NJ Stack #: 001

Run Number: 5-RAP Date: 05/15/92

Reading Number	Time	O2 Pct	CO2 Pct	THC-OUT PPMVW	CO PPMVD	NOx PPMVD	THC-IN PPMVW
1	09:03:08	15.90	3.00	17.40	101.50	26.00	0.00
2	09:04:08	16.20	2.80	31.10	99.30	24.50	0.00
3	09:05:08	16.30	2.80	23.80	103.80	23.90	0.00
4	09:06:07	15.50	3.30	21.10	105.40	28.70	0.00
5	09:07:07	15.00	3.50	23.70	76.60	31.20	0.00
6	09:08:06	15.30	3.30	23.00	63.70	29.70	0.00
7	09:09:05	15.40	3.30	20.40	62.50	29.80	0.00
8	09:10:05	14.60	3.80	26.70	95.30	33.90	0.00
9	09:11:04	13.70	4.20	26.10	89.40	39.10	0.00
10	09:12:04	13.80	4.20	27.30	91.50	38.50	0.00
11	09:13:03	13.80	4.10	29.50	98.20	38.10	0.00
12	09:14:03	13.70	4.20	28.00	101.20	38.20	0.00
13	09:15:02	13.50	4.30	20.90	109.80	38.00	0.00
14	09:16:02	13.10	4.50	16.20	129.00	40.20	0.00
15	09:17:01	12.80	4.60	14.00	118.70	42.20	0.00
16	09:18:00	12.50	4.80	20.70	111.60	42.90	0.00
17	09:19:00	12.30	4.90	22.10	108.30	42.60	0.00
18	09:19:59	12.40	4.90	20.50	104.70	42.80	0.00
19	09:20:59	12.80	4.60	23.50	103.30	42.30	0.00
20	09:21:58	13.40	4.40	24.40	96.10	40.70	0.00
21	09:22:58	12.80	4.70	23.60	82.70	43.20	0.00
22	09:23:57	12.50	4.90	24.00	59.20	46.30	0.00
23	09:24:56	12.70	4.60	24.70	56.50	44.90	0.00
24	09:25:56	13.20	4.40	21.40	66.60	42.20	0.00
25	09:26:55	13.20	4.40	23.70	71.20	42.10	0.00
26	09:27:55	13.10	4.50	27.00	74.40	42.30	0.00
27	09:28:54	13.00	4.50	24.60	75.00	42.30	0.00
28	09:29:54	13.00	4.50	24.80	76.20	42.60	0.00
29	09:30:54	13.00	4.60	24.60	74.60	43.50	0.00
30	09:31:53	13.00	4.60	15.40	77.50	42.90	0.00
31	09:32:53	12.80	4.70	20.80	81.50	44.00	0.00
32	09:33:53	12.70	4.70	16.80	82.20	44.30	0.00
33	09:34:52	12.60	4.80	20.40	82.90	44.70	0.00
34	09:35:52	12.60	4.80	22.80	84.30	44.50	0.00
35	09:36:52	12.50	4.90	23.90	88.00	43.80	0.00
36	09:37:51	12.30	5.00	24.20	91.90	43.80	0.00
37	09:38:51	12.10	5.10	23.90	94.20	45.10	0.00
38	09:39:51	11.90	5.20	21.80	92.30	46.30	0.00
39	09:40:50	11.80	5.30	20.60	92.00	46.20	0.00
40	09:41:50	11.90	5.20	20.90	91.00	46.60	0.00
41	09:42:50	12.00	5.10	20.50	83.30	46.00	0.00
42	09:43:49	12.10	5.10	18.70	82.80	45.50	0.00
43	09:44:49	12.40	4.90	14.20	81.40	43.80	0.00
44	09:45:49	12.30	5.00	19.10	78.10	45.30	0.00
45	09:46:48	12.30	5.00	20.80	76.90	44.20	0.00
46	09:47:48	12.30	5.00	16.70	79.00	44.60	0.00
47	09:48:48	12.00	5.20	21.30	79.60	44.90	0.00
48	09:49:47	12.00	5.20	19.20	76.80	45.20	0.00

Instumental Method Raw Data Summary

Facility: Burlington County Asphalt APC ID. #: 45032 NJ Stack #: 001

Run Number: 5-RAP Date: 05/15/92

Reading Number	Time	O2 Pct	CO2 Pct	THC-OUT PPMVW	CO PPMVD	NOx PPMVD	THC-IN PPMVW
49	09:50:47	12.00	5.10	20.50	67.00	46.10	0.00
50	09:51:47	12.30	4.90	22.10	57.80	45.20	0.00
51	09:52:46	13.00	4.50	24.80	63.70	43.20	0.00
52	09:53:46	13.90	4.10	19.70	79.40	39.20	0.00
53	09:54:46	14.20	4.00	26.90	94.10	36.80	0.00
54	09:55:45	14.30	3.90	33.70	103.00	36.00	0.00
55	09:56:45	14.30	3.90	33.10	105.60	35.80	0.00
56	09:57:45	14.00	4.10	22.30	102.50	37.40	0.00
57	09:58:44	13.60	4.30	22.30	103.80	39.20	0.00
58	09:59:44	13.00	4.50	28.50	126.40	41.10	0.00
59	10:00:43	12.90	4.60	28.80	133.40	41.70	0.00
60	10:01:44	13.10	4.50	29.70	121.50	41.10	0.00
Run Average		13.21	4.46	22.89	89.34	40.62	0.00

Instumental Method Raw Data Summary

Facility: Burlington County Asphalt APC ID. #: 45032 NJ Stack #: 001

Run Number: 6-RAP Date: 05/15/92

Reading Number	Time	O2 Pct	CO2 Pct	THC-OUT PPMVW	CO PPMVD	NOx PPMVD	THC-IN PPMVW
1	10:53:10	13.10	4.50	13.70	87.50	40.00	0.00
2	10:54:09	13.10	4.50	20.50	86.30	39.60	0.00
3	10:55:09	13.60	4.20	19.70	85.80	37.50	0.00
4	10:56:08	13.70	4.20	24.60	96.50	37.10	0.00
5	10:57:08	13.90	4.10	30.10	103.00	35.70	0.00
6	10:58:07	13.90	4.10	22.90	110.10	35.40	0.00
7	10:59:07	13.90	4.10	28.70	110.10	36.30	0.00
8	11:00:06	13.80	4.20	29.10	112.40	36.50	0.00
9	11:01:05	13.60	4.30	28.70	115.70	37.00	0.00
10	11:02:05	13.40	4.40	31.90	123.90	38.10	0.00
11	11:03:04	13.40	4.30	26.20	123.60	37.50	0.00
12	11:04:04	13.30	4.40	32.40	130.00	38.20	0.00
13	11:05:03	13.40	4.40	32.60	124.80	38.40	0.00
14	11:06:03	13.50	4.30	32.40	118.50	38.40	0.00
15	11:07:02	13.40	4.30	32.60	112.60	38.40	0.00
16	11:08:01	13.40	4.30	32.50	110.60	37.90	0.00
17	11:09:01	13.60	4.20	35.80	112.80	37.60	0.00
18	11:10:00	13.90	4.10	37.60	117.10	35.50	0.00
19	11:11:00	14.10	4.00	39.50	121.70	34.50	0.00
20	11:11:59	14.20	4.00	40.80	121.30	33.70	0.00
21	11:12:59	14.30	3.90	40.10	124.80	33.20	0.00
22	11:13:58	14.30	3.90	39.60	127.30	33.40	0.00
23	11:14:58	14.30	3.90	42.00	127.00	33.30	0.00
24	11:15:57	14.30	3.90	41.00	134.30	33.50	0.00
25	11:16:57	14.20	3.90	36.70	135.80	33.60	0.00
26	11:17:57	14.00	4.10	34.90	145.10	34.40	0.00
27	11:18:57	13.90	4.10	37.00	153.70	34.80	0.00
28	11:19:56	13.80	4.10	36.00	153.70	34.70	0.00
29	11:20:56	13.60	4.30	30.40	146.30	35.80	0.00
30	11:21:56	13.10	4.50	27.70	119.30	39.20	0.00
31	11:22:55	13.30	4.40	29.40	107.70	38.20	0.00
32	11:23:55	13.60	4.20	33.70	112.00	37.00	0.00
33	11:24:55	13.80	4.20	32.20	115.10	35.10	0.00
34	11:25:54	13.90	4.10	34.80	116.90	35.50	0.00
35	11:26:54	13.90	4.10	36.60	121.20	35.40	0.00
36	11:27:54	13.80	4.20	35.30	123.60	35.40	0.00
37	11:28:53	13.90	4.10	32.70	129.30	35.50	0.00
38	11:29:53	13.70	4.20	34.40	134.70	36.10	0.00
39	11:30:53	13.60	4.30	31.20	129.50	36.40	0.00
40	11:31:52	13.20	4.40	30.80	131.10	37.80	0.00
41	11:32:52	13.60	4.20	33.80	126.00	36.90	0.00
42	11:33:51	14.20	4.00	31.70	126.60	34.80	0.00
43	11:34:51	14.10	4.00	29.30	123.80	34.40	0.00
44	11:35:51	14.20	4.00	28.20	118.10	34.70	0.00
45	11:36:50	13.80	4.20	26.30	114.90	36.80	0.00
46	11:37:50	14.10	4.00	33.30	113.60	34.60	0.00
47	11:38:50	14.30	3.90	32.50	123.20	33.10	0.00
48	11:39:49	14.30	3.90	34.60	123.70	33.50	0.00

BUREAU OF TECHNICAL SERVICES
TRAVERSE-CONDENSATE SHEET

COMPANY: BURLINGTON ASPHALT CO.			ID #: 45032
STACK: BATCH PLANT	INLET or OUTLET		E.J. #: 001
ADDITIONAL TEST: THC, CO, NOx	DGM #: 5 RAP		DATE: 5/15/92
DESICCANT #: 9	WET GAIN: 11.1 gms	Pst (H2O): -1.20	Pb (Hg): 30.18

IMPINGERS
1 100 mls $DI H_2O$
2 EMPTY
3 SILICA GEL
4 ———

H2O COLLECTED: 239 mls

TEST TIMES
START: 9:02 AM PM
STOP: 10:02 AM PM
SAMPLING TIME (MIN): 60

FYRITE

% CO2	—			
% O2	—			

Cp: —— ID #: ——

TRAVERSES						Pt	CONDENSATE					
PORT	POINT	ΔP1	Ts1	ΔP2	Ts2		TMIN	TMOUT	TMAVG	ΔH	Hg	REMARKS
					186	1	64	64	64	1.5	5.5	0
					187	2	66	64	65	1.5	5.5	300
					184	3	69	65	67	1.5	6	600
					189	4	72	66	69	1.5	6	900
					186	5	74	66	70	1.5	6	1200
					187	6	74	67	70.5	1.5	6	1500
					187	7	75	67	71	1.5	6	1800
					188	8	76	68	72	1.5	6	2100
					184	9	76	68	72	1.5	6	2400
					189	10	78	69	73.5	1.5	6	2700
					189	11	78	70	74	1.5	6	3000
					185	12	78	70	74	1.5	6	45st -> 3600
					187		AVG.		70.2	1.5		
AVG.												

AVG. Ts = _____
AVG √ΔP = _____

METER DATA
ID#: 11 Y = 1.005
ORIFICE ID#: 0-9 ΔH@ = 1.70
FINAL VOL.: 328.868
INIT. VOL.: 287.434
Vm : 41.434 * Y = 41.641

LEAK RATE
PRE.: 0.0 @ 15 CFM @ "Hg
POST: 0 @ 6 CFM @ "Hg

TESTED BY: PAPP, KETTIG

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF TECHNICAL SERVICES
TRAVERSE-CONDENSATE SHEET

COMPANY: BURLINGTON ASPHALT CO.			ID #: 45032
STACK: HOT MIX		INLET or (OUTLET)	N.J. #: 001
ADDITIONAL TEST: THC. CO. CO_2 NOx, O_2		RUN #: 6 RAP	DATE: 5 / 15 / 92
DESICCANT #: 11	MET GAIN: 12.4 gms	Pst (H_2O): -1.20	Pb (Hg): 30.27

IMPINGERS
1 H_2O 100 mls
2 Empty
3
4 Silica Gel

H2O COLLECTED: 196 mls

TEST TIMES
START: 10:50 (AM) PM
STOP: 11:50 (AM) PM
SAMPLING TIME (MIN): 60

FYRITE
% CO2
% O2
Op: ID #

TRAVERSES						Pt	CONDENSATE					
PORT	POINT	ΔP_1	T_{s1}	ΔP_2	T_{s2}		T_{MIN}	T_{MOUT}	T_{MAVG}	ΔH	Hg	REMARKS
					177	1	70	68	69	1.5	6"	0
					181	2	72	70	71	1.5	6"	300
					182	3	74	70	72	1.5	6"	600
					185	4	76	70	73	1.5	6"	900
					186	5	78	72	75	1.5	6"	1200
					186	6	80	72	76	1.5	6"	1500
					186	7	80	72	76	1.5	6"	1800
					187	8	80	72	76	1.5	7"	2100
					188	9	80	72	76	1.5	7"	2400
					191	10	80	72	76	1.5	7"	2700
					191	11	80	72	76	1.5	7"	3000
					191	12	80	72	76	1.5	7"	3300-3600
				Ts AVG.	186		AVG.		74	1.5		
AVG.												

AVG. Ts = _____
AVG $\sqrt{\Delta P}$ = _____

Pm = 30.38 Tm = 534

METER DATA
ID#: 11 Y = 1.005
ORIFICE ID#: O-9 $\Delta H@$ = 1.70
FINAL VOL.: 370.356
INIT. VOL.: 329.505
Vm : 40.851 * Y = 41.055

LEAK RATE
PRE.: .000 @ 15" CFM @ "Hg
POST: .000 @ 7" CFM @ "Hg

TESTED BY: KETTIG, PAPP

APPENDIX F

EQUIPMENT CALIBRATION AND QUALITY ASSURANCE

- CALIBRATION GAS CERTIFICATES OF ANALYSIS
- METER CALIBRATION
- ORIFICE CALIBRATION

MG Industries
Gas Products

1399 NEW FORD MILL RD.
MORRISVILLE, PA 19067
(800)638-8360

ANALYTICAL REPORT – PRODUCT CERTIFICATION

TO:

M.G.Industries
Intracompany Transfer Account
2300 E Church St.
Philadelphia , PA 19124

DATE: 05/08/91
P.O. NO.
ORDER NO. 816079-002
REF. # WCP-182

CYLINDER NO.	CONSTITUENTS CONCENTRATION:	NOMINAL	ACTUAL
	CERTIFIED MIXTURE		
3X-2132	Carbon Dioxide	5 %	5.10 %
	Oxygen	17 %	17.1 %
	Nitrogen	Balance	Balance

Recd 5/21/91

ANALYST

Walter C. Preller

MG Industries
Gas Products

1399 NEW FORD MILL RD.
MORRISVILLE, PA 19067
(800)638-6360

ANALYTICAL REPORT – PRODUCT CERTIFICATION

TO:

M.G.Industries
Intracompany Transfer Account
2300 E Church St.
Philadelphia , PA 18124

DATE: 05/08/91

P.O. NO.

ORDER NO. 816078-003

REF. # WCP-183

CYLINDER NO.	CONSTITUENTS CONCENTRATION:	NOMINAL	ACTUAL
	CERTIFIED MIXTURE		
250-023696	Carbon Dioxide	9 %	9.35 %
	Oxygen	10 %	10.1 %
	Nitrogen	Balance	Balance

Rec'd 5/21/91

Walter C. Preller
ANALYST

Walter C. Preller

MG 23301/A 3/89

MG Industries
Gas Products

1399 NEW FORD MILL RD.
MORRISVILLE, PA 19067
(800)638-6360

ANALYTICAL REPORT – PRODUCT CERTIFICATION

TO:

M.G.Industries
Intracompany Transfer Account
2300 E Church St.
Philadelphia , PA 19124

DATE: 07/10/91

P.O. NO.

ORDER NO. 880101-001

REF. # PMF-035

CYLINDER NO.	CONSTITUENTS CONCENTRATION:	NOMINAL	ACTUAL
	CERTIFIED MIXTURE		
CC55186	CARBON MONOXIDE	90 ppm	91.3 ppm
	Nitrogen	Balance	Balance

Peter Michael Fazio ANALYST

MG Industries
Gas Products

1399 NEW FORD MILL RD.
MORRISVILLE, PA 19067
(800)638-8360

ANALYTICAL REPORT – PRODUCT CERTIFICATION

TO:

M.G.Industries
Intracompany Transfer Account
2300 E Chufoh St.
Philadelphia , PA 19124

DATE: 05/07/91

P.O. NO.

ORDER NO. 816113-001

REF. # EM-690-4

CYLINDER NO.	CONSTITUENTS-CONCENTRATION:	NOMINAL	ACTUAL
	CERTIFIED MIXTURE		
CC89736	Carbon Monoxide	180 ppm	178 ppm
	Nitrogen	Balance	Balance

Rec'd 5/21/91

E Maxwell

Eben Maxwell ANALYST

MG Industries
Gas Products

1399 NEW FORD MILL RD.
MORRISVILLE, PA 19067
(800)638-6360

ANALYTICAL REPORT – PRODUCT CERTIFICATION

TO:

M.G.Industries
Intracompany Transfer Account
2300 E Church St.
Philadelphia , PA 19124

DATE: 05/07/91

P.O. NO.

ORDER NO. 616113-001

REF. # EM-890-5

CYLINDER NO.	CONSTITUENTS CONCENTRATION:	NOMINAL	ACTUAL
	CERTIFIED MIXTURE		
CC99920	Carbon Monoxide	400 ppm	376 ppm
	Nitrogen	Balance	Balance

Recd 5/21/91

El Maxwell

Eben Maxwell ANALYST

MG Industries
Gas Products

1399 NEW FORD MILL RD.
MORRISVILLE, PA 19067
(800)638-6360

ANALYTICAL REPORT – PRODUCT CERTIFICATION

TO:

M.G.Industries
Intracompany Transfer Account
2300 E Church St.
Philadelphia , PA 19124

DATE: 05/13/91

P.O. NO.

ORDER NO. 623998-001

REF. # WCP-221

CYLINDER NO.	CONSTITUENTS CONCENTRATION:	NOMINAL	ACTUAL
	CERTIFIED MIXTURE		
44-3966	Hydrogen	40 %	39.6 %
	Total Hydrocarbons	<0.5 ppm	<0.5 ppm
	Helium	Balance	Balance

ANALYST

Walter C. Preller

MG Industries
Gas Products

1399 NEW FORD MILL RD.
MORRISVILLE, PA 19067
(800)638-6360

ANALYTICAL REPORT – PRODUCT CERTIFICATION

TO:

M.G.Industries
Intracompany Transfer Account
2300 E Church St.
Philadelphia , PA 19124

DATE: 05/07/91
P.O. NO.
ORDER NO. 616134-001
REF. # WCP-175

CYLINDER NO.	CONSTITUENTS CONCENTRATION:	NOMINAL	ACTUAL
	CERTIFIED MIXTURE		
35523	Propane	25 ppm	27.5 ppm
	Nitrogen	Balance	Balance

Rec'd 5/21/91

Walter C. Preller
ANALYST

MG 23301/A 3/89

MG Industries
Gas Products

1399 NEW FORD MILL RD.
MORRISVILLE, PA 19067
(800)638-6360

ANALYTICAL REPORT – PRODUCT CERTIFICATION

TO:

M.G.Industries
Intracompany Transfer Account
2300 E Church St.
Philadelphia , PA 19124

DATE: 05/03/91

P.O. NO.

ORDER NO. 616134-002

REF. # WCP-176

CYLINDER NO.	CONSTITUENTS CONCENTRATION:	NOMINAL	ACTUAL
	CERTIFIED MIXTURE		
250-042432	Propane	50 ppm	48.4 ppm
	Nitrogen	Balance	Balance

Rec'd 5/21/91

Walter C. Preller ANALYST

Walter C. Preller

MG Industries
Gas Products

1399 NEW FORD MILL RD.
MORRISVILLE, PA 19067
(800)638-8360

ANALYTICAL REPORT – PRODUCT CERTIFICATION

TO:

M.G.Industries
Intracompany Transfer Account
2300 E Church St.
Philadelphia , PA 19124

DATE: 05/07/91
P.O. NO.
ORDER NO. 616134-003
REF. # WCP-177

CYLINDER NO.	CONSTITUENTS CONCENTRATION:	NOMINAL	ACTUAL
	CERTIFIED MIXTURE		
ZA-0645	Propane	90 ppm	88.9 ppm
	Nitrogen	Balance	Balance

Walter C. Preller ANALYST

MG 23301/A 3/89

MG Industries
Gas Products

1399 NEW FORD MILL RD.
MORRISVILLE, PA 19067
(800)638-6360

ANALYTICAL REPORT – PRODUCT CERTIFICATION

TO:

M.G.Industries
Intracompany Transfer Account
2300 E Church St.
Philadelphia , PA 19124

DATE: 05/10/91
P.O. NO.
ORDER NO. 618079-001
REF. # EM-900-5

CYLINDER NO.	CONSTITUENTS CONCENTRATION:	NOMINAL	ACTUAL
	CERTIFIED MIXTURE		
CC38748	Nitric Oxide	125 ppm	123 ppm
	Nitrogen	Balance	Balance

Rec'd 5/21/91

E. Maxwell

ANALYST

Eben Maxwell

MG 23301/A 3/89

MG Industries
Gas Products

1300 NEW FORD MILL RD.
MORRISVILLE, PA 19067
(800)638-6360

ANALYTICAL REPORT – PRODUCT CERTIFICATION

TO:

M.G.Industries
Intracompany Transfer Account
2300 E Church St.
Philadelphia , PA 19124

DATE: 05/13/91

P.O. NO.

ORDER NO. 616079-001

REF. # EM-900-6

CYLINDER NO.	CONSTITUENTS CONCENTRATION:	NOMINAL	ACTUAL
	CERTIFIED MIXTURE		
CC88255	Nitric Oxide	220 ppm	217 ppm
	Nitrogen	Balance	Balance

Rec'd 5/21/91

Eben Maxwell
ANALYST

Eben Maxwell

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF TECHNICAL SERVICES
DRY GAS METER CALIBRATION SHEET

DRY GAS METER #: 11	Pb (" Hg): 30.02	DATE: 4/29/92
ORIFICE #: C-9	CALIBRATED BY: J. Papp	

▲ H	DRY GAS METER	BELL PROVER	Y FACTOR
.29	FINAL VOL: 105.833 INIT. VOL: 103.829 Vm: 2.004 Tm_I: 70 Tm_O: 70 Tm_A: 70.0 Pm: 30.04	VOL. = 2 CU.FT. Tspir = 71.8 Pgage = 2.05 Pspir = 30.17	1.00 t = 389
.76	FINAL VOL: 107.914 INIT. VOL: 105.924 Vm: 1.990 Tm_I: 70 Tm_O: 70 Tm_A: 70 Pm: 30.08	VOL. = 2 CU.FT. Tspir = 72.0 Pgage = 4.5 Pspir = 30.35	1.01 t = 239
.81	FINAL VOL: 109.920 INIT. VOL: 107.925 Vm: 1.995 Tm_I: 70 Tm_O: 70 Tm_A: 70 Pm: 30.05	VOL. = 2 CU.FT. Tspir = 72.0 Pgage = 4.7 Pspir = 30.37	1.01 t = 235
.65	FINAL VOL: 111.961 INIT. VOL: 109.943 Vm: 2.018 Tm_I: 70 Tm_O: 70 Tm_A: 70 Pm: 30.07	VOL. = 2 CU.FT. Tspir = 71.5 Pgage = 4.0 Pspir = 30.31	1.00 t = 257
		AVG. Y FACTOR	1.005

$$Pm = \frac{\blacktriangle H}{13.6} + Pb \qquad Pspir = \frac{Pgage}{13.6} + Pb$$

$$Y\ FACTOR = \frac{2 * (Tm + 460) * Pspir}{Vm * Pm * (Tspir + 460)}$$

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF TECHNICAL SERVICES
ORIFICE METER CALIBRATION SHEET

ORIFICE METER #: C-9	DRY GAS METER #:	D.G.M. Y-FACTOR:
CALIBRATED BY: J Papp	DATE: 4/29/92	Pb: 30.02

ΔH	METER	Tm (F)	t (SEC.)			ΔH@
.29	FINAL= INIT.= Vm = 2.004	IN OUT AVG. 530 R	FINAL INIT. ACT. = 389	Pm: 30.04 Qm: .3107	t(min): 6.483 Km = .7391	1.68
.68	FINAL= INIT.= Vm = 2.018	IN OUT AVG. 530 R	FINAL INIT. TOT. 257	Pm: 30.07 Qm: .4735	t(min): 4.283 Km = .7359	1.70
.76	FINAL= INIT.= Vm = 1.996	IN OUT AVG. 530 R	FINAL INIT. TOT. 239	Pm: 30.08 Qm: .5021	t(min): 3.983 Km = .7383	1.69
.81	FINAL= INIT.= Vm = 1.995	IN OUT AVG. 530 R	FINAL INIT. TOT. 235	Pm: 30.08 Qm: .5119	t(min): 3.917 Km = .7291	1.73
	FINAL= INIT.= Vm =	IN OUT AVG.	FINAL INIT. TOT.	Pm: Qm:	t(min): Km =	
	FINAL= INIT.= Vm =	IN OUT AVG.	FINAL INIT. TOT.	Pm: Qm:	t(min): Km =	
	FINAL= INIT.= Vm =	IN OUT AVG.	FINAL INIT. TOT.	Pm: Qm:	t(min): Km =	
				AVERAGES	Km = .7356	ΔH@ =

$$Pm = \frac{\Delta H}{13.6} + Pb$$

$$Tm = {}^{o}F + 460$$

$$Qm = \frac{Vm}{Minutes} * Y\text{-FACTOR}$$

$$Km = \left[\frac{Pm * Md}{Tm * \Delta H}\right]^{1/2} * Qm$$

$$\Delta H@ = \frac{.9193}{Km^2}$$

$$\overline{\Delta H@} = \frac{.9193}{\overline{Km}^{2}}$$

$$\overline{\Delta H@} = 1.70$$

APPENDIX G

REFERENCE METHODS

NEW JERSEY STATE DEPARTMENT OF ENVIRONMENTAL PROTECTION

NEW JERSEY ADMINISTRATIVE CODE

TITLE 7, CHAPTER 27B

AIR TEST METHOD 3

Sampling and Analytical Procedures for the Determination of Volatile Organic Substances From Source Operations

Promulgated: 9/25/86

TABLE OF CONTENTS

(a) The method in this section is applicable for the determination of the concentration and the mass emission rate of a known VOS or a mixture of known VOS in known proportions in systems with constant emissions and flow rates. For the same circumstances as described above, the procedures specified in N.J.A.C. 7:27B-3.8 or 3.9 may be used in place of this method. Any other alternative test method shall be submitted to the Department for review, pursuant to N.J.A.C. 7:27B-3.2(c),(d) and (e).

(b) This method is based upon the following principles:

1. The flame ionization method is based upon ionization produced when the organic vapor in the sample is combusted in a hydrogen flame. The ions and electrons formed in the flame enter an electrode gap, decrease the gap resistance, and thus permit a current flow in an external circuit. The resulting current is proportional to the instantaneous concentration of the organic vapor.

2. The photoionization method is based upon ionization produced when an organic vapor in the sample is exposed to a high intensity ultraviolet source. The ions and electrons formed enter an electrode gap, decrease the gap resistance, and thus permit a current flow in an external circuit. The resulting current is proportional to the instantaneous concentration of the organic vapor.

3. The non-dispersive infrared method is based upon absorption of infrared energy when a band of infrared energy containing the proper frequencies is alternately passed through an absorption cell containing the organic vapor and a reference cell. The difference in absorption between the reference cell and the absorption cell containing the organic vapor is proportional to the instantaneous concentration of the organic vapor.

(c) The following is a summary of this method:

1. The instrument is calibrated with standard gas mixtures to establish the instrument response to the VOS being analyzed. A representative sample of the source gas is drawn into the instrument under conditions which prevent any condensation of the source gas and which remove particulate matter. The response is recorded at specified intervals during the test period, and the true concentration of the VOS is calculated from previously determined response factors. The total gas flow rate, moisture content, and the average molecular weight of the gas are determined during the sampling period, and the mass emission rate of the VOS is calculated and reported as pounds per hour.

2. For the purposes of this procedure, three separate test runs will be conducted, each of which shall extend for one hour or a batch cycle whichever is longer. Any alternative test period shall be submitted to the Department for review, pursuant to N.J.A.C. 7:27B-3.2(c),(d) and (e).

(d) The following is a list of equipment used in this method:

1. Probe;
2. Sample line;
3. Temperature sensor;
4. Pump;
5. Detector: a total hydrocarbon analysis instrument having a flame ionization, a photoionization or a non-dispersive infrared detector and a sampling system capable of preventing any condensation of the sample gas. The detector must be capable of meeting or exceeding the manufacturer's specifications by demonstration, preferably by the manufacturer, and the other specifications listed below:

i. Linearity: the instrument response to the VOS being measured shall not deviate from linearity by more than five percent of the full scale value of the range being used.

ii. Zero drift: less than three percent of full scale per test period or one hour, whichever is shorter.

iii. Span drift: less than three percent of full scale per test period or one hour, whichever is shorter.

iv. Response time: equal to or less than 30 seconds for 95 percent full scale.

6. Recorder/Integrator:

7. Gas cylinder supplies as follows:

i. Laboratory standard calibration gases;

ii. Field standard: a known concentration of methane used to check instrument response in the field;

iii. Fuel gas;

iv. Combustion gas; and

v. Zero gas;

8. Velocity meter;

9. Condensor; and

10. Dilution system (if necessary): a system supplied by the instrument manufacturer or one similar to that specified in N.J.A.C. 7:27B-3.9(e)4, capable of producing dilution ratios which will prevent any condensation of the sample gas and capable of bringing the sample concentration within the linear range of the detector.

(e) The procedure for this section shall be as follows:

1. A presampling survey of the source operation shall be conducted to establish certain basic information including but not limited to: sampling location; stack temperature and pressure; stack gas moisture content; approximate particulate concentrations; composition of the gases and the identification and approximate concentrations of the VOS to be analyzed. It may be necessary to take samples for analysis to acquire any information that is not readily available.

2. The instrument shall be calibrated as follows:

i. The instrument shall be operated according to the manufacturer's instructions;

ii. Adjust the analyzer to the zero reading by using zero gas; and

iii. Introduce three laboratory standard calibration gases separately recording the response for each. Plot the response versus the concentration. No response should deviate from the best fit line through the three points by more than five percent. If linearity cannot be obtained over the concentration range expected, the sample should be diluted to a concentration level where linearity can be obtained.

iv. Introduce a sample of the field standard and record the response.

3. The sampling and analysis shall be conducted as follows:

i. Assemble and connect any sampling probe, filter, and heating or dilution system to the instrument. All connections shall be tight and leakfree;

ii. Adjust the heating or dilution system to prevent any condensation of the sample gas;

iii. Analyze a sample of the field standard and adjust the instrument to the reading determined during calibration. If a dilution system must be used, record the response of the field standard with the dilution system in place and determine a new calibration curve at the same conditions used in the field.

iv. The probe should be positioned at least two feet into the stack or at the centroid of the stack. The sample port location should be in accordance with N.J.A.C. 7:27B-1, Air Test Method 1, (N.J.A.C. 7:27B-3.18, Reference 1);

v. Activate the system and adjust as necessary to achieve the manufacturer's recommended operating conditions. Record the instrument response using a continuous recording device if available; if a continuous reading device is not available, take a reading at intervals of no less than one minute. Note any non-representative operations or occurrences during the testing and omit those corresponding analyzer readings from the calculations;

vi. For the purposes of this procedure, three separate and valid test runs will be conducted, each of which shall extend for one hour or a batch cycle whichever is longer. Any alternative test period shall be submitted to the Department for review pursuant to N.J.A.C. 7:27B-3.2(c),(d) and (e);

vii. During the test period, determine the stack gas velocity, temperature, moisture content, average gas molecular weight, and volumetric flow rates in accordance with the methods prescribed in N.J.A.C. 7:27B-1 AIR TEST METHOD 1 (N.J.A.C. 7:27B-3.18, Reference 1) or other flow determining method which shall be submitted to the Department for review, pursuant to N.J.A.C. 7:27B-3.2(c),(d) and (e). See Appendix A for the required reporting form. (Any alternative reporting form shall be submitted to the Department for review pursuant to N.J.A.C. 7:27B-3.2(c) and (e).)

viii. At the conclusion of each test run, note the time and introduce the field standard gas and determine and record its response. The net response must agree within five percent of the pretest response for the test to be valid.

(f) The calculations shall be preformed as follows:

1. Establish the molecular weight of each VOS and calculate a weighted average molecular weight if more than one VOS is present.

2. Calculate the total gas flow rate from the source in SCFM (70°F and 1 atm) including the contribution of the VOS and any moisture present.

3. Determine the response factor (RF) of the lab standard from the following equation.

$$RF = \frac{\text{C ppm (std)}}{\text{Response (Meter Reading)}}$$

4. Calculate the concentration of VOS as the standard as follows:

C (VOS as std.) = Instrument Response x RF

5. Calculate the emission rate in lbs/hr. expressed as the laboratory standard calibration gas.

$$\frac{\text{lbs. VOS}}{\text{hr}} = \frac{\text{Avg. C ppm (VOS as std.) x SCFM x MW(std.) x 60(min/hr)}}{387 \times 10^{6}}$$

Where:

C ppm (std) = the concentration in ppm of the standard mixture.

Avg. C ppm (VOS as std.) = average parts per million of VOS over the test period as laboratory standard calibration gas.

MW (std) = molecular weight of laboratory calibration standard (pounds per pound-mol).

SCFM = cubic feet per minute at 70^{o}F and 1 atm emitted from the source operation.

387 = molar volume at standard conditions in cubic feet per pound-mol.

RF = response factor for VOS.

NOTE: This formula is based upon the assumption that both the standards and the sample have been passed through the same sampling system and are diluted by the same amount.

(g) The test report shall include the following information submitted on the required reporting forms in Appendix B (any alternative reporting form shall be submitted to the Department for review prior to use pursuant to N.J.A.C. 7:27B-3.2(c) and (e)):

1. A dimensioned sketch of the sampling location;

2. All data used to determine the volume flow rate;

3. The composition of the gas and its average molecular weight;

4. A sketch and/or description of the sampling system used;

5. The identity, concentration and means of verification for each standard used;

6. A description of the analysis instrument and the conditions of operation;

7. Sufficient details of the calculations to allow the results to be reproduced independently;

8. The emission rate measured in lbs/hr of each VOS for each test;

9. Operating conditions of the source operation; and

10. An explanation for any unusual procedures or results.

7:27B-3.8 <u>Procedures for the direct measurement of volatile organic substances using a gas chromatograph (GC) with a flame ionization detector (FID) or other suitable detector</u>

Method 7E—Determination of Nitrogen Oxides Emissions From Stationary Sources (Instrumental Analyzer Procedure)

1. *Applicability and Principle*

1.1 Applicability. This method is applicable to the determination of nitrogen oxides (NO_x) concentrations in emissions from stationary sources only when specified within the regulations.

1.2 Principle. A gas simple is continuously extracted from a stack, and a portion of the sample is conveyed to an instrumental chemiluminescent analyzer for determination of NO_x concentration. Performance specifications and test procedures are provided to ensure reliable data.

2. *Range and Sensitivity*

Same as Method 6C, Sections 2.1 and 2.2.

3. *Definitions*

3.1 Measurement System. The total equipment required for the determination of NO_x concentration. The measurement system consists of the following major subsystems:

3.1.1 Sample Interface, Gas Analyzer, and Data Recorder. Same as Method 6C, Sections 3.1.1, 3.1.2, and 3.1.3.

3.1.2 NO_2 to NO Converter. A device that converts the nitrogen dioxide (NO_2) in the sample gas to nitrogen oxide (NO).

3.2 Span, Calibration Gas, Analyzer Calibration Error, Sampling System Bias, Zero Drift, Calibration Drift, and Response Time. Same as Method 6C, Sections 3.2 through 3.8.

3.3 Interference Response. The output response of the measurement system to a component in the sample gas, other than the gas component being measured.

4. *Measurement System Performance Specifications*

Same as Method 6C, Sections 4.1 through 4.4.

5. *Apparatus and Reagents*

5.1 Measurement System. Any measurement system for NO_x that meets the specifications of this method. A schematic of an acceptable measurement system is shown in Figure 6C-1 of Method 6C. The essential components of the measurement system are described below:

5.1.1 Sample Probe, Sample Line, Calibration Valve Assembly, Moisture Removal System, Particulate Filter, Sample Pump, Sample Flow Rate Control, Sample Gas Manifold, and Data Recorder. Same as Method 6C, Sections 5.1.1 through 5.1.8, and 5.1.11.

5.1.2 NO_2 to NO Converter. That portion of the system that converts the nitrogen dioxide (NO_2) in the sample gas to nitrogen oxide (NO). An NO_2 to NO converter is not necessary if data are presented to demonstrate that the NO_2 portion of the exhaust gas is less than 5 percent of the total NO_x concentration.

5.1.3 NO_x Analyzer. An analyzer based on the principles of chemiluminescence, to determine continuously the NO_x concentration in the sample gas stream. The analyzer shall meet the applicable performance specifications of Section 4. A means of controlling the analyzer flow rate and a device for determining proper sample flow rate (e.g., precision rotameter, pressure gauge downstream of all flow controls, etc.) shall be provided at the analyzer.

5.2 NO_x Calibration Gases. The calibration gases for the NO_x analyzer shall be NO in N_2. Three calibration gases, as specified in Sections 5.3.1 through 5.3.3, of Method 6C, shall be used. Ambient air may be used for the zero gas.

6. *Measurement System Performance Test Procedures*

Perform the following procedures before measurement of emissions (Section 7).

6.1 Calibration Gas Concentration Verification. Follow Section 6.1 of Method 6C, except if calibration gas analysis is required, use Method 7, and change all 5 percent performance values to 10 percent (or 10 ppm, whichever is greater).

6.2 Interference Response. Conduct an interference response test of the analyzer prior to its initial use in the field. Thereafter, recheck the measurement system if changes are made in the instrumentation that could alter the interference response (e.g., changes in the gas detector). Conduct the interference response in accordance with Section 5.4 of Method 20.

6.3 Measurement System Preparation, Analyzer Calibration Error, and Sample System Bias Check. Follow Sections 6.2 through 6.4 of Method 6C.

6.4 NO_2 to NO Conversion Efficiency. Unless data are presented to demonstrate that the NO_2 concentration within the sample stream is not greater than 5 percent of the NO_x concentration, conduct an NO_2 to NO conversion efficiency test in accordance with Section 5.6 of Method 20.

7. *Emission Test Procedure*

7.1 Selection of Sampling Site and Sampling Points. Select a measurement site and sampling points using the same criteria that are applicable to tests performed using Method 7.

7.2 Sample Collection. Position the sampling probe at the first measurement point, and begin sampling at the same rate as used during the system calibration drift test. Maintain constant rate sampling (i.e., ±10 percent) during the entire run. The sampling time per run shall be the same as the total time required to perform a run using Method 7, plus twice the system response time. For each run, use only those measurements obtained after twice the response time of the measurement system has elapsed, to determine the average effluent concentration.

7.3 Zero and Calibration Drift Test. Follow Section 7.4 of Method 6C.

8. *Emission Calculation*

Follow Section 8 of Method 6C.

9. *Bibliography*

Same as bibliography of Method 6C.

METHOD 10—DETERMINATION OF CARBON MONOXIDE EMISSIONS FROM STATIONARY SOURCES

1. *Principle and Applicability.*

1.1 *Principle.* An integrated or continuous gas sample is extracted from a sampling point and analyzed for carbon monoxide (CO) content using a Luft-type nondispersive infrared analyzer (NDIR) or equivalent.

1.2 *Applicability.* This method is applicable for the determination of carbon monoxide emissions from stationary sources only when specified by the test procedures for determining compliance with new source performance standards. The test procedure will indicate whether a continuous or an integrated sample is to be used.

2. *Range and sensitivity.*

2.1 *Range.* 0 to 1,000 ppm.

2.2 *Sensitivity.* Minimum detectable concentration is 20 ppm for a 0 to 1,000 ppm span.

3. *Interferences.* Any substance having a strong absorption of infrared energy will interfere to some extent. For example, discrimination ratios for water (H_2O) and carbon dioxide (CO_2) are 3.5 percent H_2O per 7 ppm CO and 10 percent CO_2 per 10 ppm CO, respectively, for devices measuring in the 1,500 to 3,000 ppm range. For devices measuring in the 0 to 100 ppm range, interference ratios can be as high as 3.5 percent H_2O per 25 ppm CO and 10 percent CO_2 per 50 ppm CO. The use of silica gel and ascarite traps will alleviate the major interference problems. The measured gas volume must be corrected if these traps are used.

4. *Precision and accuracy.*

4.1 *Precision.* The precision of most NDIR analyzers is approximately ±2 percent of span.

4.2 *Accuracy.* The accuracy of most NDIR analyzers is approximately ±5 percent of span after calibration.

5. *Apparatus.*

5.1 *Continuous sample* (Figure 10-1).

5.1.1 *Probe.* Stainless steel or sheathed Pyrex[1] glass, equipped with a filter to remove particulate matter.

5.1.2 *Air-cooled condenser or equivalent.* To remove any excess moisture.

5.2 *Integrated sample* (Figure 10-2).

5.2.1 *Probe.* Stainless steel or sheathed Pyrex glass, equipped with a filter to remove particulate matter.

5.2.2 *Air-cooled condenser or equivalent.* To remove any excess moisture.

5.2.3 *Valve.* Needle valve, or equivalent, to to adjust flow rate.

5.2.4 *Pump.* Leak-free diaphragm type, or equivalent, to transport gas.

5.2.5 *Rate meter.* Rotameter, or equivalent, to measure a flow range from 0 to 1.0 liter per min. (0.035 cfm).

5.2.6 *Flexible bag.* Tedlar, or equivalent, with a capacity of 60 to 90 liters (2 to 3 ft³). Leak-test the bag in the laboratory before using by evacuating bag with a pump followed by a dry gas meter. When evacuation is complete, there should be no flow through the meter.

5.2.7 *Pitot tube.* Type S, or equivalent, attached to the probe so that the sampling rate can be regulated proportional to the stack gas velocity when velocity is varying with the time or a sample traverse is conducted.

[1] Mention of trade names or specific products does not constitute endorsement by the Environmental Protection Agency.

5.3 *Analysis* (Figure 10-3).

5.3.1 *Carbon monoxide analyzer.* Nondispersive infrared spectrometer, or equivalent. This instrument should be demonstrated, preferably by the manufacturer, to meet or exceed manufacturer's specifications and those described in this method.

5.3.2 *Drying tube.* To contain approximately 200 g of silica gel.

5.3.3 *Calibration gas.* Refer to section 6.1.

5.3.4 *Filter.* As recommended by NDIR manufacturer.

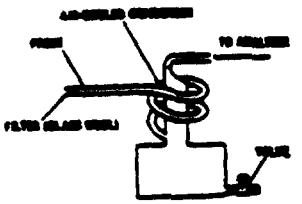


Figure 10-1. [illegible]

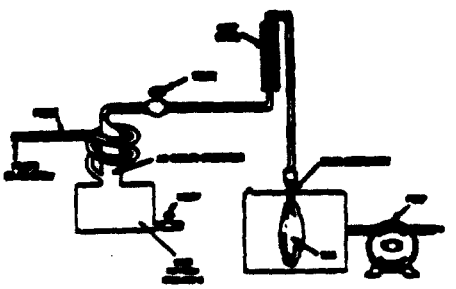


Figure 10-2. [illegible]

5.3.5 CO_2 removal tube. To contain approximately 500 g of ascarite.

5.3.6 *Ice water bath.* For ascarite and silica gel tubes.

5.3.7 *Valve.* Needle valve, or equivalent, to adjust flow rate.

5.3.8 *Rate meter.* Rotameter or equivalent to measure gas flow rate of 0 to 1.0 liter per min. (0.035 cfm) through NDIR.

5.3.9 *Recorder* (optional). To provide permanent record of NDIR readings.

6. *Reagents.*

6.1 *Calibration gases.* Known concentration of CO in nitrogen (N_2) for instrument span, prepurified grade of N_2 for zero, and two additional concentrations corresponding approximately to 60 percent and 30 percent span. The span concentration shall not exceed 1.5 times the applicable source performance standard. The calibration gases shall be certified by the manufacturer to be within ±2 percent of the specified concentration.

6.2 *Silica gel.* Indicating type, 6 to 16 mesh, dried at 175° C (347° F) for 2 hours.

6.3 *Ascarite.* Commercially available.

7. *Procedure.*

7.1 *Sampling.*

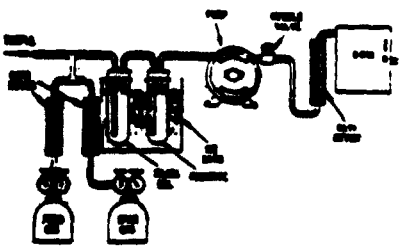


Figure 10-3. [illegible]

7.1.1 *Continuous sampling.* Set up the equipment as shown in Figure 10-1 making sure all connections are leak free. Place the probe in the stack at a sampling point and purge the sampling line. Connect the analyzer and begin drawing sample into the analyzer. Allow 5 minutes for the system to stabilize, then record the analyzer reading as required by the test procedure. (See section 7.3 and 8). CO_2 content of the gas may be determined by using the Method 3 integrated sample procedure or by weighing the ascarite CO_2 removal tube and computing CO_2 concentration from the gas volume sampled and the weight gain of the tube.

7.1.2 *Integrated sampling.* Evacuate the flexible bag. Set up the equipment as shown in Figure 10-2 with the bag disconnected. Place the probe in the stack and purge the sampling line. Connect the bag, making sure that all connections are leak free. Sample at a rate proportional to the stack velocity. CO_2 content of the gas may be determined by using the Method 3 integrated sample procedures or by weighing the ascarite CO_2 removal tube and computing CO_2 concentration from the gas volume sampled and the weight gain of the tube.

7.2 *CO Analysis.* Assemble the apparatus as shown in Figure 10-3, calibrate the instrument, and perform other required operations as described in section 8. Purge analyzer with N_2 prior to introduction of each sample. Direct the sample stream through the instrument for the test period, recording the readings. Check the zero and span again after the test to assure that any drift or malfunction is detected. Record the sample data on Table 10-1.

8. *Calibration.* Assemble the apparatus according to Figure 10-3. Generally an instrument requires a warm-up period before stability is obtained. Follow the manufacturer's instructions for specific procedure. Allow a minimum time of 1 hour for warm-up. During this time check the sample conditioning apparatus, i.e., filter, condenser, drying tube, and CO_2 removal tube, to ensure that each component is in good operating condition. Zero and calibrate the instrument according to the manufacturer's procedures using, respectively, nitrogen and the calibration gases.

TABLE 10-1—FIELD DATA

	Comments
Location	
Test	
Date	
Operator	
Clock time	Pump or meter reading, liters per minute (cubic feet per minute)

3. Calculation—

Calculate the concentration of carbon monoxide in the stack using equation 10-1.

$$C_{CO,\,stack} = C_{CO,\,NDIR}(1 - F_{CO_2})$$

Where:

$C_{CO,\,stack}$ = concentration of CO in stack, ppm by volume (dry basis).

$C_{CO,\,NDIR}$ = concentration of CO measured by NDIR analyzer, ppm by volume (dry basis).

F_{CO_2} = volume fraction of CO_2 in sample, i.e., percent CO_2 from Orsat analysis divided by 100.

4. *Alternative Procedures*

4.0.1 Interference Trap. The sample conditioning system described in Method 6 sections 2.1.2 and 4.2 may be used as an alternative to the silica gel and ascarite traps.

5. *Bibliography.*

1. McElroy, Frank. The Intertech NDIR-CO Analyzer. Presented at 11th Methods Conference on Air Pollution. University of California, Berkeley, Calif., April 1, 1970.
2. Jeanes, M. B., et al. Continuous Determination of Carbon Monoxide and Hydrocarbons in Air by a Modified Infrared Analyzer. J. Air Pollution Control Association. 9(2): 110-114. August 1959.
3. MSA LIRA Infrared Gas and Liquid Analyzer Instruction Book. Mine Safety Appliances Co., Technical Products Division, Pittsburgh, Pa.
4. Models 215A, 315A, and 415A Infrared Analyzers. Beckman Instruments, Inc., Beckman Instructions 1635-B. Fullerton, Calif., October 1967.
   Continuous CO Monitoring System, Model AS611. Intertech Corp., Princeton, N.J.
5. UNOR Infrared Gas Analyzers. Bendix Corp., Ronceverte, West Virginia.

ADDENDA—A. PERFORMANCE SPECIFICATIONS FOR NDIR CARBON MONOXIDE ANALYZERS.

Range	0-1000 ppm.
Output	0-10mV.
Minimum detectable sensitivity	20 ppm.
Rise time, 90 percent (max.)	30 seconds.
Fall time, 90 percent (max.)	30 seconds.
Zero drift (maximum)	10% in 8 hours.
Span drift (maximum)	10% in 8 hours.
Precision	±2% of full scale.
Noise	±1% of full scale.
Linearity (maximum deviation)	2% of full scale.
Maintenance reaction rate	CO_2—1000 to 1, H_2O—600 to 1.

B. *Definitions of Performance Specifications.*

Range—The minimum and maximum measurement limits.

Output—Electrical signal which is proportional to the measurement; intended for connection to readout or data processing devices. Usually expressed as millivolts or milliamps full scale at a given impedance.

Full scale—The maximum measuring limit for a given range.

Minimum detectable sensitivity—The smallest amount of input concentration that can be detected as the concentration approaches zero.

Accuracy—The degree of agreement between a measured value and the true value; usually expressed as ± percent of full scale.

Time to 90 percent response—The time interval from a step change in the input concentration at the instrument inlet to a reading of 90 percent of the ultimate recorded concentration.

Rise Time (90 percent)—The interval between initial response time and time to 90 percent response after a step increase in the inlet concentration.

Fall Time (90 percent)—The interval between initial response time and time to 90 percent response after a step decrease in the inlet concentration.

Zero Drift—The change in instrument output over a stated time period, usually 24 hours, of unadjusted continuous operation when the input concentration is zero; usually expressed as percent full scale.

Span Drift—The change in instrument output over a stated time period, usually 24 hours, of unadjusted continuous operation when the input concentration is a stated upscale value; usually expressed as percent full scale.

Precision—The degree of agreement between repeated measurements of the same concentration, expressed as the average deviation of the single results from the mean.

Noise—Spontaneous deviations from a mean output not caused by input concentration changes.

Linearity—The maximum deviation between an actual instrument reading and the reading predicted by a straight line drawn between upper and lower calibration points.

Method 6C—Determination of Sulfur Dioxide Emissions From Stationary Sources (Instrumental Analyzer Procedure)

1. *Applicability and Principle.*

1.1 *Applicability.* This method is applicable to the determination of sulfur dioxide (SO_2) concentrations in controlled and uncontrolled emissions from stationary sources only when specified within the regulations.

1.2 Principle. A gas sample is continuously extracted from a stack, and a portion of the sample is conveyed to an instrumental analyzer for determination of SO_2 gas concentration using an ultraviolet (UV), nondispersive infrared (NDIR), or fluorescence analyzer. Performance specifications and test procedures are provided to ensure reliable data.

2. *Range and Sensitivity.*

2.1 Analytical Range. The analytical range is determined by the instrumental design. For this method, a portion of the analytical range is selected by choosing the span of the monitoring system. The span of the monitoring system shall be selected such that the pollutant gas concentration equivalent to the emission standard is not less than 30 percent of the span. If at any time during a run the measured gas concentration exceeds the span, the run shall be considered invalid.

2.2 Sensitivity. The minimum detectable limit depends on the analytical range, span, and signal-to-noise ratio of the measurement system. For a well designed system, the minimum detectable limit should be less than 2 percent of the span.

3. *Definitions.*

3.1 Measurement System. The total equipment required for the determination of gas concentration. The measurement system consists of the following major subsystems:

3.1.1 Sample Interface. That portion of a system used for one or more of the following: sample acquisition, sample transport, sample conditioning, or protection of the analyzers from the effects of the stack effluent.

3.1.2 Gas Analyzer. That portion of the system that senses the gas to be measured and generates an output proportional to its concentration.

3.1.3 Data Recorder. A strip chart recorder, analog computer, or digital recorder for recording measurement data from the analyzer output.

3.2 Span. The upper limit of the gas concentration measurement range displayed on the data recorder.

3.3 Calibration Gas. A known concentration of a gas in an appropriate diluent gas.

3.4 Analyzer Calibration Error. The difference between the gas concentration exhibited by the gas analyzer and the known concentration of the calibration gas when the calibration gas is introduced directly to the analyzer.

3.5 Sampling System Bias. The difference between the gas concentrations exhibited by the measurement system when a known concentration gas is introduced at the outlet of the sampling probe and when the same gas is introduced directly to the analyzer.

3.6 Zero Drift. The difference in the measurement system output reading from the initial calibration response at the zero concentration level after a stated period of operation during which no unscheduled maintenance, repair, or adjustment took place.

3.7 Calibration Drift. The difference in the measurement system output reading from the initial calibration response at a mid-range calibration value after a stated period of operation during which no unscheduled maintenance, repair, or adjustment took place.

3.8 Response Time. The amount of time required for the measurement system to display 95 percent of a step change in gas concentration on the data recorder.

3.9 Interference Check. A method for detecting analytical interferences and excessive biases through direct comparison of gas concentrations provided by the measurement system and by a modified Method 6 procedure. For this check, the modified Method 6 samples are acquired at the sample by-pass discharge vent.

3.10 Calibration Curve. A graph or other systematic method of establishing the relationship between the analyzer response and the actual gas concentration introduced to the analyzer.

4. *Measurement System Performance Specifications.*

4.1 Analyzer Calibration Error. Less than ±2 percent of the span for the zero, mid-range, and high-range calibration gases.

4.2 Sampling System Bias. Less than ±5 percent of the span for the zero, and mid- or high-range calibration gases.

4.3 Zero Drift. Less than ±3 percent of the span over the period of each run.

4.4 Calibration Drift. Less than ±3 percent of the span over the period of each run.

4.5 Interference Check. Less than ±7 percent of the modified Method 6 result for each run.

5. *Apparatus and Reagents.*

5.1 Measurement System. Any measurement system for SO_2 that meets the specifications of this method. A schematic of an acceptable measurement system is shown in Figure 6C-1. The essential components of the measurement system are described below:

5.1.1 Sample Probe. Glass, stainless steel, or equivalent, of sufficient length to traverse the sample points. The sampling probe shall be heated to prevent condensation.

5.1.2 Sample Line. Heated (sufficient to prevent condensation) stainless steel or Teflon tubing, to transport the sample gas to the moisture removal system.

5.1.3 Sample Transport Lines. Stainless steel or Teflon tubing, to transport the sample from the moisture removal system to the sample pump, sample flow rate control, and sample gas manifold.

5.1.4 Calibration Valve Assembly. A three-way valve assembly, or equivalent, for blocking the sample gas flow and introducing calibration gases to the measurement system at the outlet of the sampling probe when in the calibration mode.

5.1.5 Moisture Removal System. A refrigerator-type condenser or similar device (e.g., permeation dryer), to remove condensate continuously from the sample gas while maintaining minimal contact between the condensate and the sample gas. The moisture removal system is not necessary for analyzers that can measure gas concentrations on a wet basis; for these analyzers, (1) heat the sample line and all interface components up to the inlet of the analyzer sufficiently to prevent condensation, and (2) determine the moisture content and correct the measured gas concentrations to a dry basis using appropriate methods, subject to the approval of the Administrator. The determination of sample moisture content is not necessary for pollutant analyzers that measure concentrations on a wet basis when (1) a wet basis CO_2 analyzer operated according to Method 3A is used to obtain simultaneous measurements, and (2) the pollutant/CO_2 measurements are used to determine emissions in units of the standard.

5.1.6 Particulate Filter. An in-stack or heated (sufficient to prevent water condensation) out-of-stack filter. The filter is glass fiber mat. Additional filters at the inlet or outlet of the moisture removal system and inlet of the analyzer may be used to prevent accumulation of particulate material in the measurement system and extend the useful life of the components. All filters shall be fabricated of materials that are nonreactive to the gas being sampled.

5.1.7 Sample Pump. A leak-free pump, to pull the sample gas through the system at a flow rate sufficient to minimize the response time of the measurement system. The pump may be constructed of any material that is nonreactive to the gas being sampled.

5.1.8 Sample Flow Rate Control. A sample flow rate control valve and rotameter, or equivalent, to maintain a constant sampling rate within 10 percent.

(Note.—The tester may elect to install a back-pressure regulator to maintain the sample gas manifold at a constant pressure order to protect the analyzer(s) from overpressurization, and to minimize the need for flow rate adjustments.)

5.1.9 Sample Gas Manifold. A sample gas manifold, to divert a portion of the sample gas stream to the analyzer, and the remainder to the by-pass discharge vent. The sample gas manifold should also include provisions for introducing calibration gases directly to the analyzer. The manifold may be constructed of any material that is nonreactive to the gas being sampled.

5.1.10 Gas Analyzer. A UV or NDIR absorption or fluorescence analyzer, to determine continuously the SO_2 concentration in the sample gas stream. The analyzer shall meet the applicable performance specifications of Section 4. A means of controlling the analyzer flow rate and a device for determining proper sample flow rate (e.g., precision rotameter, pressure gauge downstream of all flow controls, etc.) shall be provided at the analyzer.

(Note.—Housing the analyzer(s) in a clean, thermally-stable, vibration-free environment will minimize drift in the analyzer calibration.)

5.1.11 Data Recorder. A strip chart recorder, analog computer, or digital recorder, for recording measurement data. The data recorder resolution (i.e., readability) shall be 0.5 percent of span. Alternatively, a digital or analog meter having a resolution of 0.5 percent of span may be used to obtain the analyzer responses and the readings may be recorded manually. If this alternative is used, the readings shall be obtained at equally spaced intervals over the duration of the sampling run. For sampling run durations of less than 1 hour, measurements at 1-minute intervals or a minimum of 30 measurements, whichever is less restrictive, shall be obtained. For sampling run durations greater than 1 hour, measurements at 2-minute intervals or a minimum of 96 measurements, whichever is less restrictive, shall be obtained.

5.2 Method 6 Apparatus and Reagents. The apparatus and reagents described in Method 6, and shown by the schematic of the sampling train in Figure 6C-2, to conduct the interference check.

5.3 SO_2 Calibration Gases. The calibration gases for the gas analyzer shall be SO_2 in N_2 or SO_2 in air. Alternatively, SO_2/CO_2, SO_2/O_2, or $SO_2/CO_2/O_2$ gas mixtures in N_2 may be used. For fluorescence-based analyzers, the O_2 and CO_2 concentrations of the calibration gases as introduced to the analyzer shall be within 1 percent (absolute) O_2 and 1 percent (absolute) CO_2 of the O_2 and CO_2 concentrations of the effluent samples as introduced to the analyzer. Alternatively, for fluorescence-based analyzers, use calibration blends of SO_2 in air and the nomographs provided by the vendor to determine the quenching correction factor (the effluent O_2 and CO_2 concentrations must be known). Use three calibration gases as specified below:

5.3.1 High-Range Gas. Concentration equivalent to 80 to 100 percent of the span.

5.3.2 Mid-Range Gas. Concentration equivalent to 50 to 60 percent of the span.

5.3.3 Zero Gas. Concentration of less than 0.25 percent of the span. Purified ambient air may be used for the zero gas by passing air through a charcoal filter, or through one or more impingers containing a solution of 3 percent H_2O_2.

6. *Measurement System Performance Test Procedures.*

Perform the following procedures before measurement of emissions (Section 7).

6.1 Calibration Gas Concentration Verification. There are two alternatives for establishing the concentrations of calibration gases. Alternative Number 1 is preferred.

6.1.1 Alternative Number 1—Use of calibration gases that are analyzed following the Environmental Protection Agency Traceability Protocol Number 1 (see Citation 1 in the Bibliography). Obtain a certification from the gas manufacturer that Protocol Number 1 was followed.

6.1.2 Alternative Number 2—Use of calibration gases not prepared according to Protocol Number 1. If this alternative is chosen, obtain gas mixtures with a manufacturer's tolerance not to exceed ±2 percent of the tag value. Within 6 months before the emission test, analyze each of the calibration gases in triplicate using Method 6. Citation 2 in the Bibliography describes procedures and techniques that may be used for this analysis. Record the results on a data sheet (example is shown in Figure 6C-3). Each of the individual SO_2 analytical results for each calibration gas shall be within 5 percent (or 5 ppm, whichever is greater) of the triplicate set average; otherwise, discard the entire set, and repeat the triplicate analyses. If the average of the triplicate analyses is within 5 percent of the calibration gas manufacturer's cylinder tag value, use the tag value; otherwise, conduct at least three additional analyses until the results of six consecutive runs agree with 5 percent (or 5 ppm, whichever is greater) of their average. Then use this average for the cylinder value.

6.2 Measurement System Preparation. Assemble the measurement system by following the manufacturer's written instructions for preparing and preconditioning the gas analyzer and, as applicable, the other system components. Introduce the calibration gases in any sequence, and make all necessary adjustments to calibrate the analyzer and the data recorder. Adjust system components to achieve correct sampling rates.

6.3 Analyzer Calibration Error. Conduct the analyzer calibration error check by introducing calibration gases to the measurement system at any point upstream of the gas analyzer as follows:

6.3.1 After the measurement system has been prepared for use, introduce the zero, mid-range, and high-range gases to the analyzer. During this check, make no adjustments to the system except those necessary to achieve the correct calibration gas flow rate at the analyzer. Record the analyzer responses to each calibration gas on a form similar to Figure 6C-4.

Note.—A calibration curve established prior to the analyzer calibration error check may be used to convert the analyzer response to the equivalent gas concentration introduced to the analyzer. However, the same correction procedure shall be used for all effluent and calibration measurements obtained during the test.

6.3.2 The analyzer calibration error check shall be considered invalid if the gas concentration displayed by the analyzer exceeds ±2 percent of the span for any of the calibration gases. If an invalid calibration is exhibited, take corrective action, and repeat the analyzer calibration error check until acceptable performance is achieved.

6.4 Sampling System Bias Check. Perform the sampling system bias check by introducing calibration gases at the calibration valve installed at the outlet of the sampling probe. A zero gas and either the mid-range or high-range gas, whichever most closely approximates the effluent concentrations, shall be used for this check as follows:

6.4.1 Introduce the upscale calibration gas, and record the gas concentration displayed by the analyzer on a form similar to Figure 6C-5. Then introduce zero gas, and record the gas concentration displayed by the analyzer. During the sampling system bias check, operate the system at the normal sampling rate, and make no adjustments to the measurement system other than those necessary to achieve proper calibration gas flow rates at the analyzer. Alternately introduce the zero and upscale gases until a stable response is achieved. The tester shall determine the measurement system response time by observing the times required to achieve a stable response for both the zero and upscale gases. Note the longer of the two times as the response time.

6.4.2 The sampling system bias check shall be considered invalid if the difference between the gas concentrations displayed by the measurement system for the analyzer calibration error check and for the sampling system bias check exceeds ±5 percent of the span for either the zero or upscale calibration gas. If an invalid calibration is exhibited, take corrective action, and repeat the sampling system bias check until acceptable performance is achieved. If adjustment to the analyzer is required, first repeat the analyzer calibration error check, then repeat the sampling system bias check.

7. *Emission Test Procedure.*

7.1 Selection of Sampling Site and Sampling Points. Select a measurement site and sampling points using the same criteria that are applicable to Method 6.

7.2 Interference Check Preparation. For each individual analyzer, conduct an interference check for at least three runs during the initial field test on a particular source category. Retain the results, and report them with each test performed on that source category.

If an interference check is being performed, assemble the modified Method 6 train, flow control valve, two midget impingers containing 3 percent H_2O_2, and dry gas meter, as shown in Figure 6C-2. Install the sampling train to obtain a sample at the measurement system sample by-pass discharge vent. Record the initial dry gas meter reading.

7.3 Sample Collection. Position the sampling probe at the first measurement point, and begin sampling at the same rate as used during the sampling system bias check. Maintain constant rate sampling (i.e., ±10 percent) during the entire run. The sampling time per run shall be the same as for Method 6 plus twice the system response time. For each run, use only those measurements obtained after twice response time of the measurement system has elapsed, to determine the average effluent concentration. If an interference check is being performed, open the flow control valve on the modified Method 6 train concurrent with the initiation of the sampling period, and adjust the flow to 1 liter per minute (±10 percent).

(Note.—If a pump is not used in the modified Method 6 train, caution should be exercised in adjusting the flow rate since overpressurization of the impingers may cause leakage in the impinger train, resulting in positively biased results).

7.4 Zero and Calibration Drift Tests. Immediately preceding and following each run, or if adjustments are necessary to the measurement system during the run, repeat the sampling system bias check procedure described in Section 6.4 (Make no adjustments to the measurement system after the drift checks are completed.) and analyzer's responses on a form similar to Figure 6C-5.

7.4.1 If either the zero or upscale calibration value exceeds the sampling system bias specification, then the run is considered invalid. Repeat both the analyzer calibration error check procedure (Section 6.3) and the sampling system bias check procedure (Section 6.4) before repeating the run.

7.4.2 If both the zero and upscale calibration values are within the sampling system bias specification, then use the average of the initial and final bias check values to calculate the gas concentration for the run. If the zero or upscale calibration drift value exceeds the drift limits, based on the difference between the sampling system bias check responses immediately before and after the run, repeat both the analyzer calibration error check procedure (Section 6.3) and the sampling system bias check procedure (Section 6.4) before conducting additional runs.

7.5 Interference Check (if performed). After completing the run, record the final dry gas meter reading, meter temperature, and barometric pressure. Recover and analyze the contents of the midget impingers, and determine the SO_2 gas concentration using the procedures of Method 6. (It is not necessary to analyze EPA performance audit samples for Method 6.) Determine the average gas concentration exhibited by the analyzer for the run. If the gas concentrations provided by the analyzer and the modified Method 6 differ by more than 7 percent of the modified Method 6 result, the run is invalidated.

8. *Emission Calculation.*

The average gas effluent concentration is determined from the average gas concentration displayed by the gas analyzer, and is adjusted for the zero and upscale sampling system bias checks, as determined in accordance with Section 7.4. The average gas concentration displayed by the analyzer may be determined by integration of the area under the curve for chart recorders, or by averaging all of the effluent measurements. Alternatively, the average may be calculated from measurements recorded at equally spaced intervals over the entire duration of the run. For sampling run durations of less than 1 hour, measurements at 1-minute intervals or a minimum of 30 measurements, whichever is less restrictive, shall be used. For sampling run durations greater than 1 hour, measurements at 2-minute intervals or a minimum of 66 measurements, whichever is less restrictive, shall be used. Calculate the effluent gas concentration using Equation 6C-1.

$$C_{ma} = (\bar{C} - C_o)\frac{C_{ma}}{C_m - C_o}$$

Eq. 6C-1

where:

C_{ma} = Effluent gas concentration, dry basis, ppm.

$\bar{C}$ = Average gas concentration indicated by gas analyzer, dry basis, ppm.

C_o = Average of initial and final system calibration bias check responses for the zero gas, ppm.

C_m = Average of initial and final system calibration bias check responses for the upscale calibration gas, ppm.

C_{ma} = Actual concentration of the upscale calibration gas, ppm.

9. *Bibliography.*

1. Traceability Protocol for Establishing True Concentrations of Gases Used for Calibrations and Audits of Continuous Source Emission Monitors: Protocol Number 1. U.S. Environmental Protection Agency, Quality Assurance Division, Research Triangle Park, NC. June 1978.

2. Westlin, Peter R. and J. W. Brown. Methods for Collecting and Analyzing Gas Cylinder Samples. Source Evaluation Society Newsletter, 3(3):5–15. September 1978.

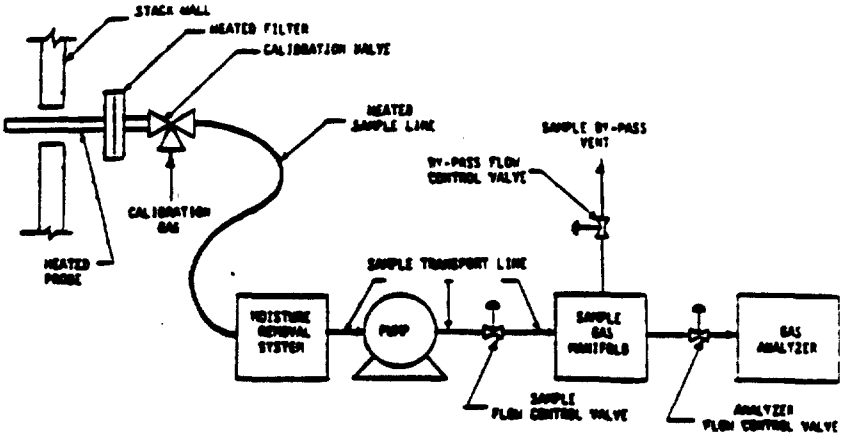


Figure 6C-1. Measurement System Schematic

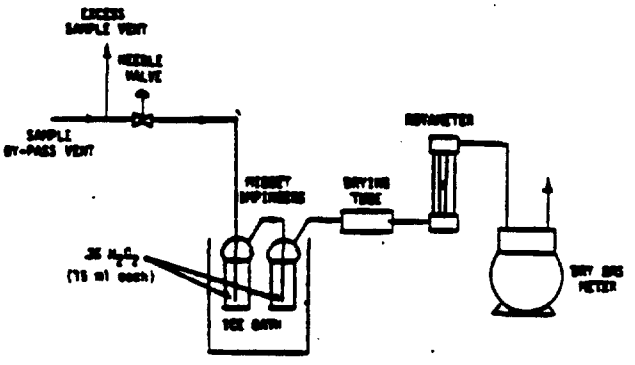


Figure 6C-2. Interference Check Sampling Train

Date _____
Analytic method used _____

FIGURE 6C-3.—ANALYSIS OF CALIBRATION GASES

	Gas concentration (indicate units)		
	Zero [1]	Mid-range [2]	High-range [3]
Sample run:			
1			
2			
3			
Average			
Maximum percent deviation			

[1] Average must be less than 0.25 percent of span.
[2] Average must be 50 to 60 percent of span.
[3] Average must be 80 to 90 percent of span.

Source identification: _____
Test personnel: _____

Date: _____
Analyzer calibration data for sampling runs: _____
Span: _____

FIGURE 6C-4.—ANALYZER CALIBRATION DATA

	Cylinder value	Analyzer calibration response (indicate units)	Absolute difference	Difference (percent of span)
Zero gas				
Mid-range gas				
High-range gas				

Source identification: _____
Test personnel: _____
Date: _____
Run number: _____
Span: _____

		Analyzer calibration response	Initial values		Final values	
			System calibration response	System cal. bias (percent of span)	(percent of span)	
					System cal. bias	Drift
Zero gas						
Upscale gas						

$$\text{System Calibration Bias} = \frac{\text{System Cal. Response} - \text{Analyzer Cal. Response}}{\text{Span}} \times 100$$

$$\text{Drift} = \frac{\text{Final System Cal. Response} - \text{Initial System Cal. Response}}{\text{Span}} \times 100$$

Figure 6C-5. System calibration bias and drift data.

Method 3A—Determination of Oxygen and Carbon Dioxide Concentrations in Emissions From Stationary Sources (Instrumental Analyzer Procedure)

1. *Applicability and Principle.*

1.1 Applicability. This method is applicable to the determination of oxygen (O_2) and carbon dioxide (CO_2) concentrations in emissions from stationary sources only when specified within the regulations.

1.2 Principle. A sample is continuously extracted from the effluent stream; a portion of the sample stream is conveyed to an instrumental analyzer(s) for determination of O_2 and CO_2 concentration(s). Performance specifications and test procedures are provided to ensure reliable data.

2. *Range and Sensitivity.*

Same as Method 6C, Sections 2.1 and 2.2, except that the span of the monitoring system shall be selected such that the average O_2 or CO_2 concentration is not less than 20 percent of the span.

3. *Definitions.*

3.1 Measurement System. The total equipment required for the determination of the O_2 or CO_2 concentration. The measurement system consists of the same major subsystems as defined in Method 6C, Sections 3.1.1, 3.1.2, and 3.1.3.

3.2 Span, Calibration Gas, Analyzer Calibration Error, Sampling System Bias, Zero Drift, Calibration Drift, Response Time, and Calibration Curve. Same as Method 6C, Sections 3.2 through 3.8, and 3.10.

3.3 Interference Response. The output response of the measurement system to a component in the sample gas, other than the gas component being measured.

4. *Measurement System Performance Specifications.*

Same as Method 6C, Sections 4.1 through 4.4.

5. *Apparatus and Reagents.*

5.1 Measurement System. Any measurement system for O_2 or CO_2 that meets the specifications of this method. A schematic of an acceptable measurement system is shown in Figure 6C-1 of Method 6C. The essential components of the measurement system are described below:

5.1.1 Sample Probe. A leak-free probe, of sufficient length to traverse the sample points.

5.1.2 Sample Line. Tubing, to transport the sample gas from the probe to the moisture removal system. A heated sample line is not required for systems that measure the O_2 or CO_2 concentration on a dry basis, or transport dry gases.

5.1.3 Sample Transport Line, Calibration Value Assembly, Moisture Removal System, Particulate Filter, Sample Pump, Sample Flow Rate Control, Sample Gas Manifold, and Data Recorder. Same as Method 6C, Sections 5.1.3 through 5.1.9, and 5.1.11, except that the requirements to use stainless steel, Teflon, and nonreactive glass filters do not apply.

5.1.4 Gas Analyzer. An analyzer to determine continuously the O_2 or CO_2 concentration in the sample gas stream. The analyzer shall meet the applicable performance specifications of Section 4. A means of controlling the analyzer flow rate and a device for determining proper sample flow rate (e.g., precision rotameter, pressure gauge downstream of all flow controls, etc.) shall be provided at the analyzer. The requirements for measuring and controlling the analyzer flow rate are not applicable if data are presented that demonstrate the analyzer is insensitive to flow variations over the range encountered during the test.

5.2 Calibration Gases. The calibration gases for CO_2 analyzers shall be CO_2 in N_2 or CO_2 in air. Alternatively, CO_2/SO_2, O_2/SO_2, or $O_2/CO_2/SO_2$ gas mixtures in N_2 may be used. Three calibration gases, as specified Section 5.3.1 through 5.3.3 of Method 6C, shall be used. For O_2 monitors that cannot analyze zero gas, a calibration gas concentration equivalent to less than 10 percent of the span may be used in place of zero gas.

6. *Measurement System Performance Test Procedures.*

Perform the following procedures before measurement of emissions (Section 7).

6.1 Calibration Concentration Verification. Follow Section 6.1 of Method 6C, except if calibration gas analysis is required, use Method 3 and change the acceptance criteria for agreement among Method 3 results to 5 percent (or 0.2 percent by volume, whichever is greater).

6.2 Interference Response. Conduct an interference response test of the analyzer prior to its initial use in the field. Thereafter, recheck the measurement system if changes are made in the instrumentation that could alter the interference response (e.g., changes in the type of gas detector). Conduct the interference response in accordance with Section 5.4 of Method 20.

6.3 Measurement System Preparation, Analyzer Calibration Error, and Sampling System Bias Check. Follow Sections 6.2 through 6.4 of Method 6C.

7. *Emission Test Procedure.*

7.1 Selection of Sampling Site and Sampling Points. Select a measurement site and sampling points using the same criteria that are applicable to tests performed using Method 3.

7.2 Sample Collection. Position the sampling probe at the first measurement point, and begin sampling at the same rate as used during the sampling system bias check. Maintain constant rate sampling (i.e., ±10 percent) during the entire run. The sampling time per run shall be the same as for tests conducted using Method 3 plus twice the system response time. For each run, use only those measurements obtained after twice the response time of the measurement system has elapsed to determine the average effluent concentration.

7.3 Zero and Calibration Drift Test. Follow Section 7.4 of Method 6C.

8. *Quality Control Procedures.*

The following quality control procedures are recommended when the results of this method are used for an emission rate correction factor, or excess air determination. The tester should select one of the following options for validating measurement results:

8.1 If both O_2 and CO_2 are measured using Method 3A, the procedures described in Section 4.4 of Method 3 should be followed to validate the O_2 and CO_2 measurement results.

8.2 If only O_2 is measured using Method 3A, measurements of the sample stream CO_2 concentration should be obtained at the sample by-pass vent discharge using an Orsat or Fyrite analyzer, or equivalent. Duplicate samples should be obtained concurrent with at least one run. Average the duplicate Orsat or Fyrite analyses results for each run. Use the average CO_2 values for comparison with the O_2 measurements in accordance with the procedures described in Section 4.4 of Method 3.

8.3 If only CO_2 is measured using Method 3A, concurrent measurements of the sample stream CO_2 concentration should be obtained using an Orsat or Fyrite analyzer as described in Section 8.2. For each run, differences greater than 0.5 percent between the Method 3A results and the average of the duplicate Fyrite analysis should be investigated.

9. *Emission Calculation.*

For all CO_2 analyzers, and for O_2 analyzers that can be calibrated with zero gas, follow Section 8 of Method 6C, except express all concentrations as percent, rather than ppm.

For O_2 analyzers that use a low-level calibration gas in place of a zero gas, calculate the effluent gas concentration using Equation 3A-1.

$$C_{ma} = \frac{C_{ma} - C_{mo}}{C_{ma} - C_{mo}} (\bar{C} - C_{mo}) + C_{mo}$$

Eq. 3A-1

where:

C_{ma} = Effluent gas concentration, dry basis, percent.

C_{ma} = Actual concentration of the upscale calibration gas, percent.

C_{mo} = Actual concentration of the low-level calibration gas, percent.

C_{mo} = Average of initial and final system calibration bias check responses for the upscale calibration gas, percent.

C_{o} = Average of initial and final system calibration bias check responses for the low-level gas, percent.

$\bar{C}$ = Average gas concentration indicated by the gas analyzer, dry basis, percent.

10. *Bibliography.*

Same as bibliography of Method 6C.