Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources.* AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

AP-42 Section 12.2
Reference
Report Sect. 4
Reference 53

reviewed
BS

PARTICULATE EVALUATION

OF

COKE OVEN BATTERY NO. 1 COMBUSTION STACK

AT

SHENANGO INCORPORATED
NEVILLE ISLAND PLANT
PITTSBURGH, PENNSYLVANIA 15225

BCM NO. 00-4810-30

DECEMBER 18, 1989

PREPARED BY:

Paul A. Jadlowiec
PAUL A. JADLOWIEC
SECTION MANAGER

BCM ENGINEERS INC.
5777 BAUM BOULEVARD
PITTSBURGH, PENNSYLVANIA 15206

BCM

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BCM

1.0 EXECUTIVE SUMMARY

Shenango Incorporated retained BCM Engineers Inc. (BCM) to perform a particulate emission test on the Coke Oven Battery No. 1 Combustion Stack. Testing and analyses were conducted according to EPA Methods 1 through 5 and 9. The test results are to be used to demonstrate compliance with limitations set forth by the Allegheny County Health Department. The compliance limits and measured particulate emissions were as follows:

NO. 1 BATTERY

Run No.	Compliance Limit	Measured Concentration
1	0.015 gr/dscf	0.0040 gr/dscf
2	0.015 gr/dscf	0.0060 gr/dscf
3	0.015 gr/dscf	0.0031 gr/dscf
Avg.	0.015 gr/dscf	0.0044 gr/dscf

2.0 SCOPE AND OBJECTIVES

The scope of this project included the determination of the following parameters for each test run:

- Gas Flow — ACFM and DSCFM
- Gas Temperature — ^{o}F
- Gas Moisture — % by Volume
- Particulate Concentration — gr/dscf
- Opacity — %

BCM

3.0 PROCEDURES

The field sampling program was performed on December 5 and 6, 1989. The BCM test personnel consisted of Messrs. Paul Jadlowiec, James Phillippi, and Daniel Petrovay. Mr. Bruce Earhardt served as plant coordinator.

3.1 FIELD WORK

All test and analytical procedures and field data sheets, including visual emissions data, are contained in Appendix A.

An exception to EPA Method 5 was the use of rubber tubing to connect the heated sample box with the glass impinger train.

3.2 ANALYSIS

All analytical data sheets and calculations are contained in Appendix B.

3.3 CALIBRATIONS

Field equipment calibrations are contained in Appendix C.

4.0 SUMMARY OF RESULTS

4.1 NO. 1 BATTERY COMBUSTION STACK

Table 1 presents a summary of the results of the particulate testing for No. 1 Battery Combustion Stack. The particulate grain loading ranged from 0.0031 gr/dscf to 0.0060 gr/dscf. The average of the three test runs was 0.0044 gr/dscf. The compliance limit was 0.015 gr/dscf. The average opacity during the three test runs was less than two percent.

BCM

TABLE 1

SUMMARY OF RESULTS

COKE OVEN BATTERY NO. 1 COMBUSTION STACK

Parameter	Run No. 1	Run No. 2	Run No. 3	Average
Gas Flow (ACFM)	93,390	92,288	97,551	94,410
Gas Flow (DSCFM)	40,805	40,774	42,835	41,471
Gas Temp. (^{o}F)	551	535	535	540
Gas Moisture (%)	13.7	14.0	14.5	14.1
Isokinetic (%)	108.0	103.0	100.9	104.0
Part. Emission (gr/dscf)	0.0040	0.0060	0.0031	0.0044
Average Opacity (%)	1.8	0.9	0.9	1.2
Number of Readings >20% for 120 min. observation	6	4	0	3.3
Number of Readings >60% for 120 min. observation	0	0	0	0

1.564 #/hr

APPENDIX A

FIELD DATA

EPA MI [illegible]

FIELD DATA

Shenango
12-5-89
IG LOCATION No 1 Battery Stk
TYPE EPA-5
IBER 1
R Paul Jadlowiec
TEMPERATURE ~35°F
RIC PRESSURE ~~29.06~~ 29.07
RESSURE, (P_s) ~~28.93~~ 29.00
MBER (s) 145
BE No. & Cp. 7-1 0.84

O_2 [illegible]
8.5
8.5
CO_2 5.5
4.5
4.0

PROBE LENGTH AND TYPE 7 Ft 7-1 glass
NOZZLE I.D. .525
ASSUMED MOISTURE, % 14
SAMPLE BOX NUMBER —
METER BOX NUMBER 582-1[illegible] [illegible] 1.[illegible]15
METER ΔH@ 1.993
K FACTOR .93
PRE-TEST LEAK CHECK RATE .017 CFM @ 15 "Hg
POST TEST LEAK CHECK RATE .01[illegible] CFM @ 11 "Hg
REFERENCE Δp .044

Moisture Pickup - 376 ml

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 5 MINUTES

ELAPSED SAMPLING TIME, min	CLOCK TIME (24 hr. CLOCK)	GAS METER READING (V_m), ft³	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F	PROBE TEMPERATURE, °F
0	1029	10.342										
5	1029	[illegible]	.095	4.0	[illegible]	[illegible]	67	[illegible]	7	270	30	248 ±25
10	1034	20.7	[illegible]	[illegible]	[illegible]	485	[illegible]	[illegible]	9	271	31	↓
15	1039	[illegible]	.095	4.0	4.0	[illegible]	83	57	10	270	40	
20	1044	[illegible]	[illegible]	[illegible]	[illegible]	500	87	57	10	235	48	
25	[illegible]	[illegible]	.01	3.8	[illegible]	[illegible]	93	57	9	225	49	
30	1054	41.6	.025	[illegible]	[illegible]	490	93	57	10	230	58	
35	1059 1104	45.6	[illegible]	2.[illegible]	2.[illegible]	490	87	57	6	245	50	
40	1109	[illegible]	[illegible]	2.8	2.8	[illegible]	77	57	7	245	58	
45	1114	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	57	10	235	54	
50	1119	[illegible]	.07	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	10	230	58	
55	1124	[illegible]	.10	[illegible]	[illegible]	[illegible]	97	63	10	240	58	
60	1129	71.4	.10	4.3	4.3	540	95	63	11	250	60	

PLANT [illegible] DATE 12-5 [illegible] RUN NO. 1

TRAVERSE POINT NUMBER	ELAPSED SAMPLING TIME, min	CLOCK TIME (24 hr. CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O		STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE		PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F	PROBE TEMPERATURE, °F
					DESIRED	ACTUAL		INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F				
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]			[illegible]	[illegible]	[illegible]	
1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	
	[illegible]	[illegible]	[illegible]	[illegible]								[illegible]	
2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]					[illegible]	
	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	
		[illegible]											
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]		
[illegible]		[illegible]	[illegible]			[illegible]					[illegible]	[illegible]	
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]		[illegible]	[illegible]	[illegible]			
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]						
			113.991	$\sqrt{.2715}$	3.229		501.08	73.60					

EPA MF[illegible]5

FIELD DATA

NT Shenango
E 12-6-89
IPLING LOCATION No. 1 Battery Stk
IPLE TYPE EPA-5
NUMBER 2
RATOR Paul Jadlowiec
IENT TEMPERATURE
OMETRIC PRESSURE ~~28.96~~ 29.03
IC PRESSURE, (P_s) 28.96
R NUMBER (s) 141
T TUBE No. & Cp. 7-1 0.841

CO_2 - 6.0
5.5
5.0

O_2 8.0
8.0
8.5

PROBE LENGTH AND TYPE 7 Ft 7-1 glass
NOZZLE I.D. .525
ASSUMED MOISTURE, % 14
SAMPLE BOX NUMBER —
METER BOX NUMBER 582-128
METER ΔH@ 1.943
K FACTOR .93
PRE-TEST LEAK CHECK RATE .012 CFM @ 15 "Hg
POST TEST LEAK CHECK RATE .021 CFM @ 11 "Hg
REFERENCE Δp .044

SCHEMATIC OF TRAVERSE POINT LAYOUT

Moisture Pickup - 367.7

READ AND RECORD ALL DATA EVERY 5 MINUTES

ER	ELAPSED SAMPLING TIME, min	CLOCK TIME (24 hr. CLOCK)	GAS METER READING (V_m, ft^3)	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O		STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE		PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F	PROBE TEMPERATURE, °F
					DESIRED	ACTUAL		INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F				
	0	0937 ~~0927~~	127.912										
	5	0942	131.9	.055	2.3	2.3	540	58	57	5	273	34	248 ± 25.
	10	0947	135.8	.055	2.3	2.3	540	73	57	5	275	36	
	15	0952	140.1	.06	2.6	2.6	543	87	58	6	275	44	
	20	0957	144.5	.06	2.6	2.6	553	88	63	6	275	38	
	25	1002	148.6	.055	2.3	2.3	425	93	67	5	274	52	
	30	1007	153.7	.055	2.3	2.3	450	93	67	5	265	58	
	35	1013 ~~1018~~	156.1	.04	1.7	1.7	550	73	67	5	252	54	
	40	1023	159.7	.04	1.7	1.7	543	93	67	5	260	58	
	45	1028	164.3	.08	3.3	3.3	548	97	66	6	270	62	
	50	1033	169.2	.08	3.3	3.3	557	103	73	6	265	63	
	55	1038	174.4	.09	3.8	3.8	532	107	73	6	240	65	
	60	1043	179.8	.11	4.1	4.1	545	107	77	6	250	65	

IT Shenango DATE 12-6-89 RUN NO. 2

VERSE NUMBER	ELAPSED SAMPLING TIME, min	CLOCK TIME (24 hr. CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F	PROBE TEMPERATURE, °F
	0	1048											
	65	1053	184.4	.08	3.3	3.3	526	93	77	7	260	68	
1	70	1058	189.2	.08	3.3	3.3	549	107	77	7	262	64	
	75	1103	194.1	.08	3.3	3.3	542	113	77	7	270	64	
2	80	1108	198.9	.08	3.3	3.3	542	113	78	7	272	64	
	85	1113	204.3	.10	4.2	4.2	545	117	83	9	270	65	
3	90	1118	209.2	.08	3.3	3.3	550	117	83	7	270	65	
	95	~~1127~~ 1132	214.1	.08	3.3	3.3	552	93	77	7	225	61	
1	100	~~1133~~ 1137	218.9	.08	3.3	3.3	538	117	77	7	223	62	
	105	~~1137~~ 1142	224.3	.10	4.2	4.2	542	118	78	9	240	63	
2	110	~~1142~~ 1147	229.6	.10	4.2	4.2	560	118	83	9	260	61	
	115	~~1147~~ 1152	234.5	.08	3.3	3.3	541	118	83	9	268	61	
3	112	~~1152~~ 1157	239.358	.08	3.3	3.3	552	117	83	9	232	61	
								2					
			111.446	.074 - $\sqrt{.271}$	3.108		535.375	86.68					

EPA MT 5

FIELD DATA

NT Sherango
E 12-6-89
IPLING LOCATION Nal Battery Stk
IPLE TYPE EPA-5
NUMBER 3
RATOR Paul Jagbower
IIENT TEMPERATURE
OMETRIC PRESSURE ~~29.96~~ 29.05
TIC PRESSURE, (P_s) 28.98
ER NUMBER (s) 142
DT TUBE No. & Cp. 7-1 0.84

O_2 - 9.0
9.0
9.0

CO_2 5.0
5.0
5.0

PROBE LENGTH AND TYPE 7Ft 7-1 glass
NOZZLE I.D. .525
ASSUMED MOISTURE, % 14
SAMPLE BOX NUMBER —
METER BOX NUMBER 582-128
METER ΔH@ 1.993 γ = 1.015
K FACTOR .93
PRE-TEST LEAK CHECK RATE .018 CFM @ 15 "Hg
POST TEST LEAK CHECK RATE .016 CFM @ 11 "Hg
REFERENCE Δp .44

3971

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 5 MINUTES

E NO.	ELAPSED SAMPLING TIME, min	CLOCK TIME (24 hr. CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F	PROBE TEMPERATURE, °F
	0	1314	239.625										
	5	1319	243.9	.065	2.7	2.7	542	78	67	4	258	40	
	10	1324	248.4	.065	2.7	2.7	552	93	68	4	260	42	
	15	1329	252.9	.07	2.9	2.9	543	103	73	4	268	48	
	20	1334	257.5	.07	2.9	2.9	552	113	73	4	269	52	
	25	1339	262.0	.06	2.9	2.9	493	113	77	4	275	53	
	30	1344	266.6	.06	2.9	2.9	536	117	78	4	254	56	
	35	1349 1354	271.1	.06	2.9	2.9	552	93	83	4	225	55	
	40	1359	274.7	.06	2.9	2.9	553	117	83	4	248	66	
	45	1404	280.6	.09	3.6	3.6	555	123	87	4	248	65	
	50	1409	285.7	.09	3.6	3.6	545	127	87	4	268	67	
	55	1414	290.9	.10	3.9	3.9	542	133	88	4	262	68	
	60	1419	296.116	.10	3.9	3.9	550	133	93	5	262	68	

Shenango DATE 12-6-89 RUN NO. 3

ERSE NUMBER	ELAPSED SAMPLING TIME, min	CLOCK TIME (24 hr. CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O		STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE		PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F	PROBE TEMPERATURE, °F
					DESIRED	ACTUAL		INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F				
		1426	296.927										
	65	1431	301.2	.08	3.2	3.2	531	118	93	4	248	68	
1	70	1436	306.0	.08	3.2	3.2	528	123	93	4	250	68	
	75	1441	311.0	.09	3.5	3.5	535	127	93	4	272	66	
2	80	1446	316.3	.10	4.0	4.0	553	128	97	4	272	66	
	85	1451	321.7	.10	4.0	4.0	520	133	97	5	272	66	
3	90	1456	327.049	.10	4.0	4.0	534	133	97	5	245	66	
	95	1502 1507	332.1	.095	3.7	3.7	547	117	97	5	239	65	
1	100	1512	337.4	.095	3.7	3.7	552	133	97	5	252	61	
	105	1517	342.7	.10	4.0	4.0	543	137	97	5	260	59	
2	110	1522	348.0	.10	4.0	4.0	554	137	98	5	268	56	
	115	1527	353.1	.08	3.2	3.2	539	137	98	5	258	57	
3	120	1532	357.885	.08	3.2	3.2	536	133	98	5	250	56	
								5011					
			118.260	.0827	$\sqrt{.286}$	3.40	541.3	104.4					

VISIBLE EMISSIONS OBSERVATION FORM

RVER Daniel R Petrovay
12-5-89
LITY Shenango Steel Inc.
RVATION PERIOD: START: 1134-1204
FINISH: 1218 - 248

RVATION POINT: South of stack in
tors Parking Lot
CE: # 1 Battery stack
DISTANCE FROM: 500 ft.
DIRECTION FROM: South
HEIGHT: 400 ft

SPEED: 17 mph
DIRECTION: West
ERATURE: 34°
CONDITION: 100% overcast

GROUND: Grey Skies

NG CONDITIONS: fair

OF EMISSIONS: Black

NTS: Run #1

F READINGS ≥ 20%: 2
F READINGS ≥ 60%: 0
GE OPACITY:
S:

TURE: Daniel R Petrovay

	0	15	30	45
1134 0	0	0	10	10
1	10	15	15	15
2	20	15	15	15
3	10	10	10	5
4	5	5	5	5
5	5	5	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
9	0	0	0	0
10	0	0	0	0
11	5	5	10	10
12	10	10	10	5
13	5	5	5	5
14	0	0	0	0
15	0	0	0	0
16	0	0	0	0
17	0	0	0	0
18	0	0	0	0
19	0	0	0	0
20	0	0	0	0
21	0	0	0	0
22	0	0	0	0
23	0	0	0	0
24	0	0	0	0
25	0	0	0	0
26	0	0	0	0
27	0	0	0	0
28	0	0	0	0
1234 29	0	0	0	0

	0	15	30	45
1218 1218 30	0	0	0	0
31	0	0	0	0
32	0	0	0	0
33	0	0	0	0
34	0	0	0	0
35	0	0	0	0
36	0	0	0	0
37	0	0	0	0
38	0	0	0	0
39	0	0	0	0
40	0	0	0	0
41	0	0	0	0
42	0	0	0	0
43	0	0	0	0
44	0	0	0	0
45	0	0	0	0
46	0	0	0	0
47	0	0	0	0
48	0	0	0	0
49	0	0	0	0
50	0	0	0	0
51	0	0	0	0
52	0	0	0	0
53	0	0	0	0
54	0	0	0	0
55	0	0	0	0
56	0	0	0	0
57	10	15	15	15
58	15	20	15	15
1248 59	10	10	5	5

VISIBLE EMISSIONS OBSERVATION FORM

ERVER Daniel R. Petrovay.

E 12-5-89

ILITY Shenango Steel Inc.

RVATION PERIOD: START: 1025-1055

FINISH: 1100-1130

RVATION POINT: South of stack in

itors parking lot

CE: #1 Battery stack

DISTANCE FROM: 500 ft.

DIRECTION FROM: South

HEIGHT: 400 ft

:

SPEED: 9 mph

DIRECTION: West

ERATURE: 34°

CONDITION: 100% overcast

GROUND: Grey skies

ING CONDITIONS: fair

R OF EMISSIONS: Black

ENTS: Run #1

OF READINGS ≥ 20%: 4

OF READINGS ≥ 60%: 0

AGE OPACITY: 1.85 %

US:

ATURE: Daniel R. Petrovay

	0	15	30	45
0	0	0	0	0
1	0	0	0	5
2	5	5	5	5
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	5	5	10	10
9	15	15	20	20
10	15	10	10	5
11	5	5	5	5
12	5	5	0	0
13	0	0	0	0
14	0	0	0	0
15	0	0	0	0
16	0	0	0	10
17	10	15	15	15
18	20	20	15	10
19	5	5	5	0
20	0	0	0	0
21	0	0	0	0
22	0	0	0	0
23	0	0	0	0
24	0	0	0	0
25	0	0	0	0
26	0	0	0	0
27	0	0	0	0
28	0	0	0	0
29	0	0	0	0

	0	15	30	45
30	0	0	0	0
31	0	0	0	0
32	0	0	0	10
33	10	15	15	10
34	5	0	0	5
35	5	5	5	5
36	0	0	0	0
37	0	0	0	0
38	0	0	0	0
39	0	0	0	0
40	0	0	0	0
41	0	0	0	0
42	0	0	0	0
43	0	0	0	0
44	0	0	0	0
45	0	0	0	0
46	0	0	0	0
47	0	0	0	0
48	0	0	0	0
49	0	0	0	0
50	0	0	0	0
51	0	0	0	0
52	0	0	0	0
53	0	0	0	0
54	0	0	0	0
55	0	0	0	0
56	0	0	0	0
57	0	0	0	5
58	5	5	5	0
59	0	0	0	0

VISIBLE EMISSIONS OBSERVATION FORM

KVER Daniel R. Petroway

12-6-89

LITY Shenango Steel Inc.

RVATION PERIOD: START: 0938-1008

FINISH: 1014-1044

RVATION POINT: South of stack in truck parking lot

CE: #1 Battery stack

DISTANCE FROM: 500 ft.

DIRECTION FROM: South

HEIGHT: 400 ft.

SPEED: 7 mPH

DIRECTION: South

ERATURE: 41°

CONDITION: 100% overcast

GROUND: Grey + white clouds

ING CONDITIONS: fair to good

OF EMISSIONS: Black

ENTS: Run #2

OF READINGS ≥ 20%: 0

OF READINGS ≥ 60%: 0

AGE OPACITY:

US:

ATURE: Daniel R Petroway

	0	15	30	45
0938 0	0	0	0	0
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
9	0	0	0	0
10	0	0	0	0
11	0	0	0	0
12	0	0	0	0
13	0	0	0	0
14	0	0	0	0
15	0	0	0	0
16	0	0	0	0
17	0	0	0	0
18	0	0	0	0
19	0	0	0	0
20	0	0	0	0
21	0	0	0	0
22	0	0	0	0
23	0	0	0	0
24	0	0	0	0
25	0	0	0	0
26	0	0	0	0
27	0	0	0	0
28	0	0	0	0
29	0	0	0	0

	0	15	30	45
1014 30	0	0	0	0
31	0	0	0	0
32	0	0	0	0
33	0	0	0	0
34	0	0	0	0
35	0	0	0	5
36	5	5	5	10
37	10	10	5	5
38	5	0	0	0
39	0	0	0	0
40	0	0	0	0
41	0	0	0	0
42	0	0	0	0
43	0	0	0	0
44	0	0	0	0
45	0	0	0	0
46	0	0	0	0
47	0	0	0	0
48	0	0	0	0
49	0	0	0	0
50	0	0	0	0
51	0	0	0	0
52	0	0	0	0
53	0	0	0	0
54	0	0	0	0
55	0	0	0	0
56	0	0	0	0
57	0	0	0	0
58	0	0	0	0
1044 59	0	0	0	0

VISIBLE EMISSIONS OBSERVATION FORM

ERVER Daniel R. Petroway.

E 12-6-89

ILITY Shenango Steel Tns

RVATION PERIOD: START: 1049-1119

FINISH: 1128-1158

RVATION POINT: South of #1 Battery

E IN Visitors Parking Lot

CE:

DISTANCE FROM: 500 ft.

DIRECTION FROM: South

HEIGHT: 400 ft.

N

SPEED: 7 mph

DIRECTION: South

ERATURE: 24.67°F 70% RH 41°

CONDITION: Blue sky with Greyand

E Clouds

CROUND: 90% overcast 10% Blue

ING CONDITIONS: Fair to Good

N OF EMISSIONS: Black

ENTS: Run #2

F READINGS ≥ 20%: 4

F READINGS ≥ 60%: 0

GE OPACITY: 0.864 %

LS:

ATURE: Daniel R Petroway

	0	15	30	45
1049 0	20	20	15	10
1	5	5	5	5
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	10	10
9	10	15	15	15
10	20	20	15	15
11	10	5	10	10
12	5	5	5	5
13	5	5	5	0
14	0	0	0	0
15	0	0	0	0
16	0	0	0	0
17	0	0	0	0
18	0	0	0	0
19	0	0	0	0
20	0	0	0	0
21	0	0	0	0
22	0	0	0	0
23	0	0	0	0
24	0	0	0	0
25	0	0	0	0
26	0	0	0	0
27	0	0	0	0
28	0	0	0	0
1119 29	0	0	0	0

	0	15	30	45
1128 30	0	0	0	0
31	0	0	0	0
32	0	0	0	0
33	0	0	0	0
34	0	0	0	0
35	0	0	0	0
36	0	0	0	0
37	0	0	0	0
38	0	0	0	0
39	0	0	0	0
40	0	0	0	0
41	0	0	0	0
42	0	0	0	0
43	0	0	0	0
44	0	0	0	0
45	0	0	0	0
46	0	0	0	0
47	0	0	0	0
48	0	0	0	0
49	0	0	0	0
50	0	0	0	0
51	0	0	0	0
52	0	0	0	0
53	0	0	0	0
54	0	0	0	0
55	0	0	0	0
56	0	0	0	5
57	5	5	5	5
58	10	10	5	5
1158 59	5	0	0	0

VISIBLE EMISSIONS OBSERVATION FORM

VER Daniel R. Petroway
12-6-89
LITY Shenango Steel Inc.
VATION PERIOD: START: 1427-1457
FINISH: 1503-1533

VATION POINT: South of #1 Battery
CE IN Visitors Parking Lot
CE:
DISTANCE FROM: 500 ft
DIRECTION FROM: South
HEIGHT: 400 ft

SPEED: 10 mph
DIRECTION: Southwest
RATURE: 45°
ONDITION: 100% overcast Rain

ROUND: Grey-white clouds

ING CONDITIONS: fair

OF EMISSIONS: Black

NTS: Run #3

F READINGS ≥ 20%: 0
F READINGS ≥ 60%: 0
CE OPACITY:
S:

ATURE: Daniel R Petroway

X	0	15	30	45
1427 0	0	0	0	0
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	5	10
9	10	10	10	5
10	5	5	5	5
11	5	5	5	0
12	0	0	0	0
13	0	0	0	0
14	0	0	0	0
15	0	0	0	0
16	0	0	0	0
17	0	0	0	0
18	0	0	0	0
19	0	0	0	0
20	0	0	0	0
21	0	0	0	0
22	0	0	0	0
23	0	0	0	0
24	0	0	0	0
25	0	0	0	0
26	0	0	0	0
27	0	0	0	0
28	0	0	0	0
1457 29	0	0	0	0

X	0	15	30	45
1503 30	0	0	0	0
31	0	0	0	0
32	0	0	0	0
33	0	0	0	0
34	0	0	0	0
35	0	0	0	0
36	0	0	0	0
37	0	0	0	0
38	0	0	0	0
39	0	0	0	0
40	0	0	0	0
41	0	0	0	0
42	0	0	0	0
43	0	0	0	0
44	0	0	0	0
45	0	0	0	0
46	0	0	0	0
47	0	0	0	0
48	0	0	0	0
49	0	0	0	0
50	0	0	0	0
51	0	0	0	0
52	0	0	0	0
53	0	0	0	0
54	0	0	0	0
55	0	0	0	0
56	0	0	0	0
57	0	0	0	0
58	0	0	0	0
1533 59	0	0	0	0

VISIBLE EMISSIONS OBSERVATION FORM

RVER Daniel R Petroway.

12-6-89

LITY Shenango Steel Inc

RVATION PERIOD: START: 1315-1345

FINISH: 1350-1420

RVATION POINT: South of #1 battery

CK IN Visitors Parking Lot

CE:

DISTANCE FROM: 500 ft

DIRECTION FROM: South

HEIGHT: 400 ft

:

SPEED: 13 mph

DIRECTION: South West

ERATURE: 90% 45°

CONDITION: Grey And white Clouds

IN

CROUND: 100% overcast

ING CONDITIONS: Fair

R OF EMISSIONS: Black

ENTS: Run #3

OF READINGS ≥ 20%: 0

OF READINGS ≥ 60%: 0

AGE OPACITY: 0.9375%

US:

ATURE: Daniel R Petroway

X	0	15	30	45
1315 0	0	0	0	0
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
9	0	0	0	0
10	0	0	0	0
11	0	0	0	0
12	0	0	0	0
13	0	0	0	0
14	0	0	0	0
15	0	0	0	0
16	0	0	0	0
17	0	0	5	5
18	10	15	15	15
19	15	15	15	15
20	10	5	5	5
21	5	5	5	0
22	0	0	0	0
23	0	0	0	0
24	0	0	0	0
25	0	0	0	0
26	0	0	0	0
27	0	5	5	5
28	10	15	15	15
29	10	5	5	0

X	0	15	30	45
1350 30	0	0	0	0
31	0	0	0	0
32	0	0	0	0
33	0	0	0	0
34	0	0	0	0
35	0	0	0	0
36	0	0	0	0
37	0	0	0	0
38	0	0	0	0
39	0	0	0	0
40	0	0	0	0
41	0	0	0	0
42	0	0	0	0
43	5	5	5	5
44	5	5	5	5
45	5	0	0	0
46	0	0	0	0
47	0	0	0	0
48	0	0	0	0
49	0	0	0	0
50	0	0	5	5
51	5	5	5	5
52	5	5	5	5
53	5	5	5	0
54	0	0	0	0
55	0	0	0	0
56	0	0	0	0
57	0	0	0	0
58	0	0	0	0
1400 59	0	0	0	0

APPENDIX B

CALCULATIONS

BLANK ANALYTICAL DATA

Plant Shenango STEEL INC.

Sample location #1 BATTERY STACK

Type of blank ACETONE

Container number 5U

Density of blank (pa) 0.7857 g/ml

Blank volume (Va) 137 ml

Gross wt. 102232.1 mg

Tare wt. 102216.2 mg

Weight of blank (ma) 15.9 mg

$$Ca = \frac{ma}{Va\ pa} = \frac{(15.9)}{(137)(.7857)} = .148 \text{ mg/g}$$

METHOD 5 TRAIN ANALYTICAL PARTICULATE DATA

Plant SHENANGO STEEL INC. Date 12-7-89 Run No. 1

Sample location #1 BATTERY STACK Relative humidity 210 %

Density of acetone (pa) 0.7857 g/ml
Acetone rinse container No. 5T
Acetone rinse volume (Vaw) 115 ml
Acetone blank residue concentration (Ca) .148 mg/g
Wa = Ca Vaw pa = (.148) (115) (.7857) = 13.4 mg
Date and time of wt 12-10-89 0932 Gross wt 97504.9 mg
Date and time of wt 12-11-89 Gross wt 97504.5 mg
Average Gross wt 97504.4 mg
Tare wt 97476.6 mg
Less acetone blank wt (Wa) 13.4 mg
Weight of particulate in acetone rinse 14.4 mg

Water rinse container No.
Water rinse volume (Vww) ml
Water blank residue concentration (Cw) mg/g
Ww = Ca Vww pa = ( ) ( ) ( ) = mg
Date and time of wt Gross wt mg
Date and time of wt Gross wt mg
Average Gross wt mg
Tare wt mg
Less water blank wt (Ww) mg
Weight of particulate in water rinse mg

Filter No. 145
Date and time of wt. 12-13-89 1000 Gross wt 421.8 mg
Date and time of wt. 12-14-89 0920 Gross wt 422.2 mg
Average Gross wt 422.0 mg
Tare wt 407.5 mg
Weight of particulate on filter(s) 14.5 mg
Weight of particulate in acetone rinse 14.4 mg
Weight of particulate in water rinse — mg
Total weight of particulate 28.9 mg

METHOD 5 TRAIN ANALYTICAL PARTICULATE DATA

Plant Shenango Steel Inc. Date 12-7-89 Run No. 2

Sample location #1 Battery Stack Relative humidity 40 %

Density of acetone (pa) 0.7857 g/ml
Acetone rinse container No. 5C
Acetone rinse volume (Vaw) 118 ml
Acetone blank residue concentration (Ca) .148 mg/g
Wa = Ca Vaw pa = (.148) (118) (.7857) = 13.7 mg
Date and time of wt 12-10-89 0923 Gross wt 100 509.3 mg
Date and time of wt 12-11-89 1623 Gross wt 100 508.9 mg
Average Gross wt 100 509.1 mg
Tare wt 100.464.9 mg
Less acetone blank wt (Wa) 13.7 mg
Weight of particulate in acetone rinse 30.5 mg

Water rinse container No.
Water rinse volume (Vww) ml
Water blank residue concentration (Cw) mg/g
Ww = Ca Vww pa = ( ) ( ) ( ) = mg
Date and time of wt Gross wt mg
Date and time of wt Gross wt mg
Average Gross wt mg
Tare wt mg
Less water blank wt (Ww) mg
Weight of particulate in water rinse mg

Filter No. 141
Date and time of wt. 12-10-89 0918 Gross wt 411.9 mg
Date and time of wt. 12-11-89 — Gross wt 411.8 mg
Average Gross wt 411.85 mg
Tare wt 400.8 mg
Weight of particulate on filter(s) 11.05 mg
Weight of particulate in acetone rinse 30.50 mg
Weight of particulate in water rinse — mg
Total weight of particulate 41.55 mg

METHOD 5 TRAIN ANALYTICAL PARTICULATE DATA

Plant SACNANGO STEEL INC. Date 12-7-89 Run No. 3

Sample location #1 BATTERY STACK Relative humidity <10%

Density of acetone (pa) 0.7857 g/ml
Acetone rinse container No. 44
Acetone rinse volume (Vaw) 74 ml
Acetone blank residue concentration (Ca) .148 mg/g
Wa = Ca Vaw pa = (.148) (74) (.7857) = 8.605 mg
Date and time of wt 12-10-89 0924 Gross wt 103044.5 mg
Date and time of wt 12-11-89 — Gross wt 103044.0 mg
Average Gross wt 103044.25 mg
Tare wt 103026.8 mg
Less acetone blank wt (Wa) -8.60 mg
Weight of particulate in acetone rinse 14.15 mg

Water rinse container No. ____
Water rinse volume (Vww) ____ ml
Water blank residue concentration (Cw) ____ mg/g
Ww = Ca Vww pa = ( ) ( ) ( ) = ____ mg
Date and time of wt ____ Gross wt ____ mg
Date and time of wt ____ Gross wt ____ mg
Average Gross wt ____ mg
Tare wt ____ mg
Less water blank wt (Ww) ____ mg
Weight of particulate in water rinse ____ mg

Filter No. 142
Date and time of wt. 12-10-89 0917 Gross wt 408.6 mg
Date and time of wt. 12-11-89 — Gross wt 408.5 mg
Average Gross wt 408.55 mg
Tare wt 400.8 mg
Weight of particulate on filter(s) 7.75 mg
Weight of particulate in acetone rinse 14.45 mg
Weight of particulate in water rinse ____ mg
Total weight of particulate 22.2 mg

SHENANGO 12-5-89
NO. 1 COKE OVEN BATTERY COMBUSTION STACK RUN 1

EPA METHOD 5

SYMBOL		DESCRIPTION		VALUE
Theta	=	Duration of test, min.	=	120
Vm	=	Dry sample volume (meter conditions), cu. ft.	=	113.991
SQRT(dP)	=	Average of square roots of pitot pressure differential, in. H2O	=	0.272
dH	=	Orifice pressure drop, in. water	=	3.23
Ts	=	Average stack temperature, deg. F	=	550.8
Tm	=	Average dry gas meter temperature, deg. F	=	73.6
CO2	=	CO2 in stack gas, %	=	4.7
O2	=	O2 in stack gas, %	=	8.7
CO	=	CO in stack gas, %	=	0.0
N2	=	N2 in stack gas, %	=	86.6
Pbar	=	Barometric pressure, in. Hg	=	29.07
Ps	=	Stack pressure (absolute), in. Hg.	=	29.00
Cp	=	Pitot correction factor, dimensionless	=	0.84
Y	=	Dry gas meter correction factor	=	1.015
Dn	=	Diameter of nozzle, in.	=	0.525
Ds	=	Diameter of stack, in.	=	114
Vwc	=	Volume of liquid collected in impingers and silica gel, ml	=	378.0
Wt	=	Total particulate catch, mg	=	28.9
An	=	Area of the nozzle, sq. ft.	=	0.00150
As	=	Area of the stack, sq.ft.	=	70.88
Md	=	Dry molecular weight of stack gas, lb/lb-mole	=	29.10
Vw(std)	=	Volume of liquid collected, cu .ft.	=	17.792
Ms	=	Molecular weight of stack gas, lb/lb-mole	=	27.58
Vm(std)	=	Dry sample volume (standard conditions), cu .ft.	=	112.098
Vs	=	Stack velocity, ft/sec	=	21.96

SHENANGO
NO. 1 COKE OVEN BATTERY COMBUSTION STACK

12-5-89
RUN 1

EPA METHOD 5

SYMBOL		DESCRIPTION		VALUE
Qs	=	Stack gas flow, acfm	=	93389.8
Qs(std)	=	Stack gas flow, dscfm	=	40804.6
Ts	=	Average stack temperature, deg. F	=	550.833
Bws	=	Moisture content of the gas stream, %	=	13.70
CO2	=	CO2 in stack gas, %	=	4.7
O2	=	O2 in stack gas, %	=	8.7
CO	=	CO in stack gas, %	=	0
N2	=	N2 in stack gas, %	=	86.6
I	=	Isokinetic ratio, percent	=	108.0
C's	=	Particulate concentration, gr/dscf	=	0.0040
E	=	Particulate emission rate, lb/hr	=	1.39

SHENANGO
NO. 1 COKE OVEN BATTERY COMBUSTION STACK

12-6-89
RUN 2

EPA METHOD 5

SYMBOL		DESCRIPTION		VALUE
Theta	=	Duration of test, min.	=	120
Vm	=	Dry sample volume (meter conditions), cu. ft.	=	111.446
SQRT(dP)	=	Average of square roots of pitot pressure differential, in. H2O	=	0.271
dH	=	Orifice pressure drop, in. water	=	3.10
Ts	=	Average stack temperature, deg. F	=	535.4
Tm	=	Average dry gas meter temperature, deg. F	=	86.7
CO2	=	CO2 in stack gas, %	=	5.5
O2	=	O2 in stack gas, %	=	8.2
CO	=	CO in stack gas, %	=	0.0
N2	=	N2 in stack gas, %	=	86.3
Pbar	=	Barometric pressure, in. Hg	=	29.03
Ps	=	Stack pressure (absolute), in. Hg.	=	28.96
Cp	=	Pitot correction factor, dimensionless	=	0.84
Y	=	Dry gas meter correction factor	=	1.015
Dn	=	Diameter of nozzle, in.	=	0.525
Ds	=	Diameter of stack, in.	=	114
Vwc	=	Volume of liquid collected in impingers and silica gel, ml	=	367.7
Wt	=	Total particulate catch, mg	=	41.55
An	=	Area of the nozzle, sq. ft.	=	0.00150
As	=	Area of the stack, sq.ft.	=	70.88
Md	=	Dry molecular weight of stack gas, lb/lb-mole	=	29.21
Vw(std)	=	Volume of liquid collected, cu .ft.	=	17.308
Ms	=	Molecular weight of stack gas, lb/lb-mole	=	27.64
Vm(std)	=	Dry sample volume (standard conditions), cu .ft.	=	106.788
Vs	=	Stack velocity, ft/sec	=	21.70

SHENANGO
NO. 1 COKE OVEN BATTERY COMBUSTION STACK

12-6-89
RUN 2

EPA METHOD 5

SYMBOL		DESCRIPTION		VALUE
Qs	=	Stack gas flow, acfm	=	92287.9
Qs(std)	=	Stack gas flow, dscfm	=	40774.0
Ts	=	Average stack temperature, deg. F	=	535.4
Bws	=	Moisture content of the gas stream, %	=	13.95
CO2	=	CO2 in stack gas, %	=	5.5
O2	=	O2 in stack gas, %	=	8.2
CO	=	CO in stack gas, %	=	0
N2	=	N2 in stack gas, %	=	86.3
I	=	Isokinetic ratio, percent	=	103.0
C's	=	Particulate concentration, gr/dscf	=	0.0060
E	=	Particulate emission rate, lb/hr	=	2.09

SHENANGO 12-6-89
NO. 1 COKE OVEN BATTERY COMBUSTION STACK RUN 3

EPA METHOD 5

SYMBOL		DESCRIPTION		VALUE
Theta	=	Duration of test, min.	=	120
Vm	=	Dry sample volume (meter conditions), cu. ft.	=	118.260
SQRT(dP)	=	Average of square roots of pitot pressure differential, in. H2O	=	0.286
dH	=	Orifice pressure drop, in. water	=	3.40
Ts	=	Average stack temperature, deg. F	=	535.4
Tm	=	Average dry gas meter temperature, deg. F	=	104.4
CO2	=	CO2 in stack gas, %	=	5.0
O2	=	O2 in stack gas, %	=	9.0
CO	=	CO in stack gas, %	=	0.0
N2	=	N2 in stack gas, %	=	86.0
Pbar	=	Barometric pressure, in. Hg	=	29.05
Ps	=	Stack pressure (absolute), in. Hg.	=	28.98
Cp	=	Pitot correction factor, dimensionless	=	0.84
Y	=	Dry gas meter correction factor	=	1.015
Dn	=	Diameter of nozzle, in.	=	0.525
Ds	=	Diameter of stack, in.	=	114
Vwc	=	Volume of liquid collected in impingers and silica gel, ml	=	397.1
Wt	=	Total particulate catch, mg	=	22.2

An	=	Area of the nozzle, sq. ft.	=	0.00150
As	=	Area of the stack, sq.ft.	=	70.88
Md	=	Dry molecular weight of stack gas, lb/lb-mole	=	29.16
Vw(std)	=	Volume of liquid collected, cu .ft.	=	18.691
Ms	=	Molecular weight of stack gas, lb/lb-mole	=	27.54
Vm(std)	=	Dry sample volume (standard conditions), cu .ft.	=	109.922
Vs	=	Stack velocity, ft/sec	=	22.94

SHENANGO
NO. 1 COKE OVEN BATTERY COMBUSTION STACK

12-6-89
RUN 3

EPA METHOD 5

SYMBOL		DESCRIPTION		VALUE
Qs	=	Stack gas flow, acfm	=	97551.0
Qs(std)	=	Stack gas flow, dscfm	=	42835.2
Ts	=	Average stack temperature, deg. F	=	535.4
Bws	=	Moisture content of the gas stream, %	=	14.53
CO2	=	CO2 in stack gas, %	=	5
O2	=	O2 in stack gas, %	=	9
CO	=	CO in stack gas, %	=	0
N2	=	N2 in stack gas, %	=	86
I	=	Isokinetic ratio, percent	=	100.9
C's	=	Particulate concentration, gr/dscf	=	0.0031
E	=	Particulate emission rate, lb/hr	=	1.14

APPENDIX C

CALIBRATIONS

DRY GAS METER ORIFICE SYSTEM CALIBRATION

DATE 9-22-89 OPERATOR JIM PHILLIPPI CONSOLE NUMBER 5E2-12E Box #2

Orifice Manometer Setting In. H_2O ΔH	Minimum Volume of Gas ft^3	WET TEST METER GAS VOLUMES AND TEMPERATURES: Initial ft^3 V_{w_i}	Initial Temp. °F T_{w_i}	Final ft^3 V_{w_f}	Final Temp °F T_{w_f}	Net Volume ft^3 V_w	Avg. Temp. °F T_w	DRY TEST METER GAS VOLUMES AND TEMPERATURES: Initial ft^3 V_{d_i}	Final ft^3 V_{d_f}	Temp. °F T_{d_i}	Temp. °F T_{d_f}	Net Volume ft^3 V_d	Avg. Temp. °F T_d	Total Test Time Minutes θ	Barometer Reading, Inches Hg P_b
0.5	5	0.000	78	5.000	79	5.000	78.5	695.965	700.983	93	78	5.018	85.5	13.00	29.05
0.75	5	0.000	79	5.000	79	5.000	79	701.247	706.245	107	87	4.998	97	10.767	29.04
1.00	5	0.000	78	5.000	78	5.000	78	706.753	711.869	117	93	5.116	105	9.467	29.04
1.50	10	0.000	78	10.000	78	10.000	78	713.415	723.821	113	97	10.406	105	15.383	29.04
2.00	10	0.000	78	10.000	78	10.000	78	724.352	734.865	127	98	10.513	112.5	13.583	29.04
2.50	10														

• Check at least every 2 minutes and adjust if needed.

CALCULATIONS

$$Y = \frac{(V_w)(P_b)(T_d + 460)}{(V_d)\left(P_b + \frac{\Delta H}{13.6}\right)(T_w + 460)}$$

$$\Delta H@ = \frac{0.0317\,(\Delta H)}{(P_b)(T_{d_a} + 460)}\left[\frac{(T_w + 460)\,\theta}{(V_w)}\right]^2$$

Calc. By: JEP II
Checked By: RJ
Date: 9-22-89

ΔH	GAMMA CALCULATIONS	Y	$\Delta H@$ CALCULATIONS	$\Delta H@$
0.5	$\frac{(5.000)(29.05)(85.5 + 460)}{(5.018)\left(29.05 + \frac{.5}{13.6}\right)(78.5 + 460)}$	.990	$\frac{0.0317\,(.5)}{(29.05)(85.5 + 460)}\left[\frac{(79.5 + 460)(13.000)}{(5.000)}\right]^2$	1.961
0.75	$\frac{(5.000)(29.04)(97 + 460)}{(4.998)\left(29.04 + \frac{.75}{13.6}\right)(79 + 460)}$	1.013	$\frac{0.0317\,(.75)}{(29.04)(97 + 460)}\left[\frac{(79 + 460)(10.767)}{(5.000)}\right]^2$	1.980
1.00	$\frac{(5.000)(29.04)(105 + 460)}{(5.116)\left(29.04 + \frac{1.00}{13.6}\right)(78 + 460)}$	1.005	$\frac{0.0317\,(1.00)}{(29.04)(105 + 460)}\left[\frac{(78 + 460)(9.467)}{(5.000)}\right]^2$	2.005
1.50	$\frac{(10.000)(29.04)(105 + 460)}{(10.406)\left(29.04 + \frac{1.50}{13.6}\right)(78 + 460)}$	.987	$\frac{0.0317\,(1.50)}{(29.04)(105 + 460)}\left[\frac{(78 + 460)(15.383)}{(10.000)}\right]^2$	1.985
2.00	$\frac{(10.000)(29.04)(112.5 + 460)}{(10.513)\left(29.04 + \frac{2.00}{13.6}\right)(78 + 460)}$	.989	$\frac{0.0317\,(2.00)}{(29.04)(112.5 + 460)}\left[\frac{(78 + 460)(13.583)}{(10.00)}\right]^2$	2.036
2.50	$\frac{(\quad)(\quad)}{(\quad)\left(\quad + \frac{\quad}{13.6}\right)(\quad + 460)}$		$\frac{0.0317\,(\quad)}{(\quad)(\quad + 460)}\left[\frac{(\quad + 460)(\quad)}{(\quad)}\right]^2$	
	AVERAGE	.997	AVERAGE	1.993

CONSTRUCTION STANDARDS :

1. Dt - between 0.48 and 0.95 centimeters

2. $Pa = Pb$ $1.05\ Dt \leqq P \leqq 1.50\ Dt$

3. $a1, a2 < 10°$

4. $B1, B2 < 5°$

5. $Z \leqq 0.32$ cm

6. $W \leqq 0.08$ cm

PITOT ALIGNMENT STANDARDS :

1. $X \geqq 3/4$ in.

2. Ip must be higher than Np

3. $Z \geqq 1.90$ cm

4. $Y \geqq 3$ in.

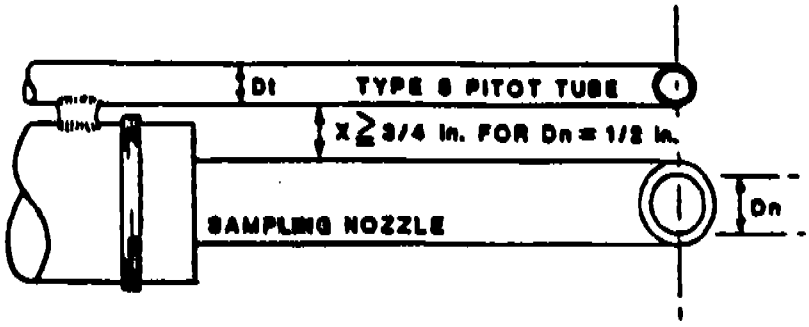
TYPE S PITOT
CALIBRATION STANDARDS

BCM Engineers
Engineers Planners Scientists and Laboratory Services
5777 Baum Boulevard • Pittsburgh Pa 15206 • (412) 361-6000

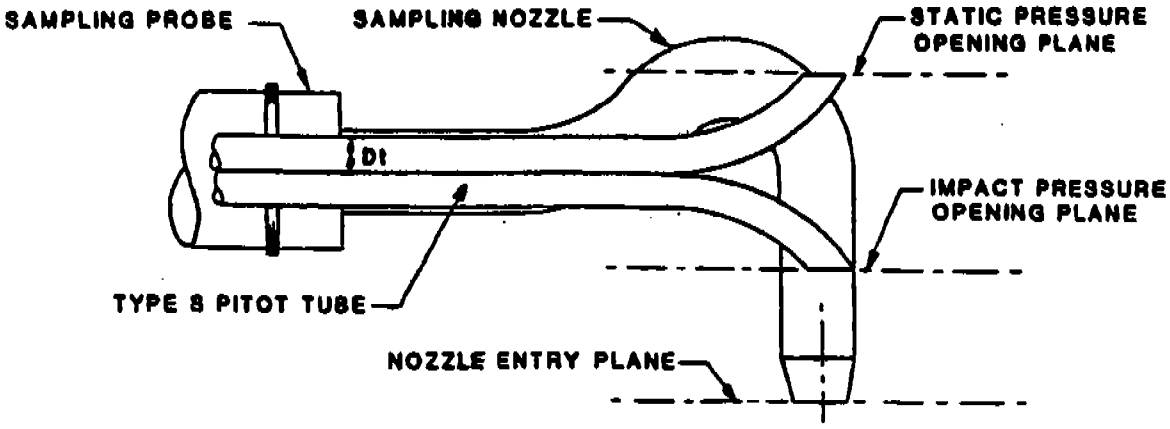
DRAWN BY: JSA
SCALE: NONE
DATE: SEPT. 1989

PROJECT NO:
FILE NO:
SHEET 1 OF 4

PITOT ALIGNMENT CALIBRATIONS



X = ≥ 3/4"



Is Ip higher than Np = YES

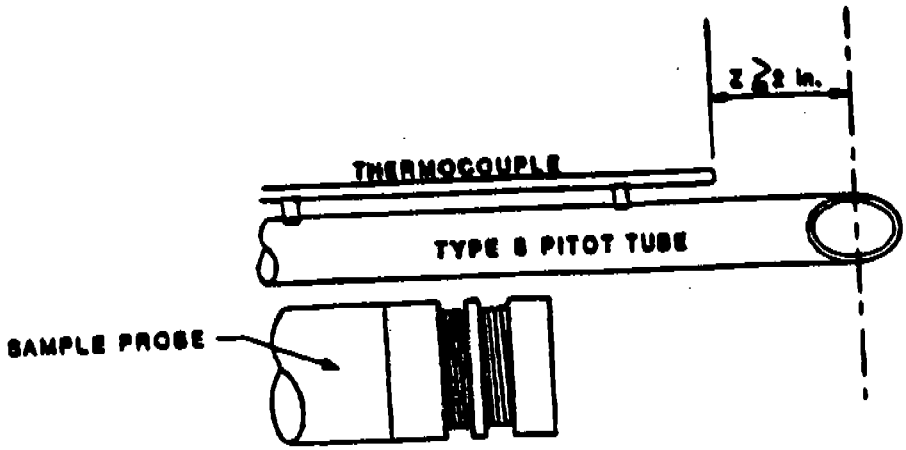
Pitot I.D. No. 7-1 Date 8-24-89 Performed By TWS

TYPE S PITOT TUBE
CALIBRATION SHEET

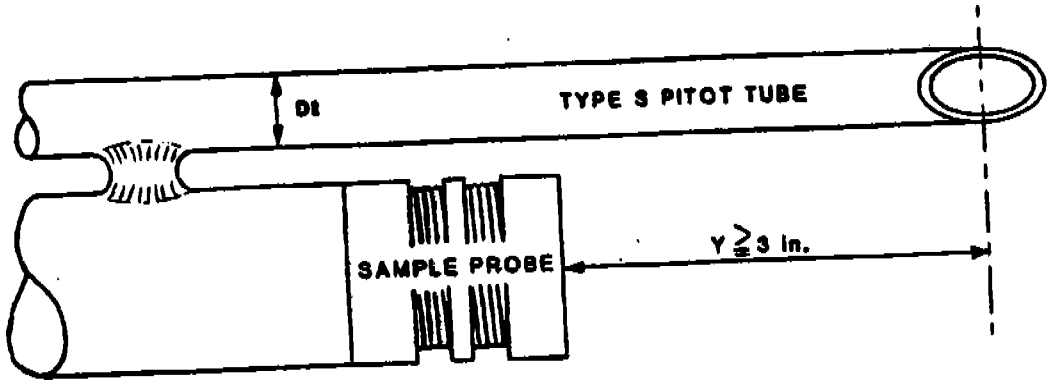
BCM Engineers
Engineers Planners Scientists and Laboratory Services
5777 Baum Boulevard • Pittsburgh PA 15206 • (412) 361-6000

DRAWN BY: JSA PROJECT NO:
SCALE: NONE FILE NO:
DATE: SEPT. 1989 SHEET 3 OF 4

PITOT ALIGNMENT CALIBRATIONS



Z = 2"



Y = 3"

Determined Coefficient 0.84

Pitot I.D. No. 7-1 Date 8-24-89 Performed By TWS

TYPE S PITOT TUBE
CALIBRATION SHEET

BCM Engineers
Engineers Planners Scientists and Laboratory Services
5777 Baum Boulevard • Pittsburgh PA 15206 • (412) 361-8000

DRAWN BY: JSA PROJECT NO:
SCALE: NONE FILE NO:
DATE: SEPT. 1989 SHEET 4 OF 4

THERMOCOUPLE CALIBRATION DATA SHEET

Thermocouple No. : 7-1 Date: 10-3-89

Ambient Temperature: ~70 °F Barometric Pressure: 29.27" Hg

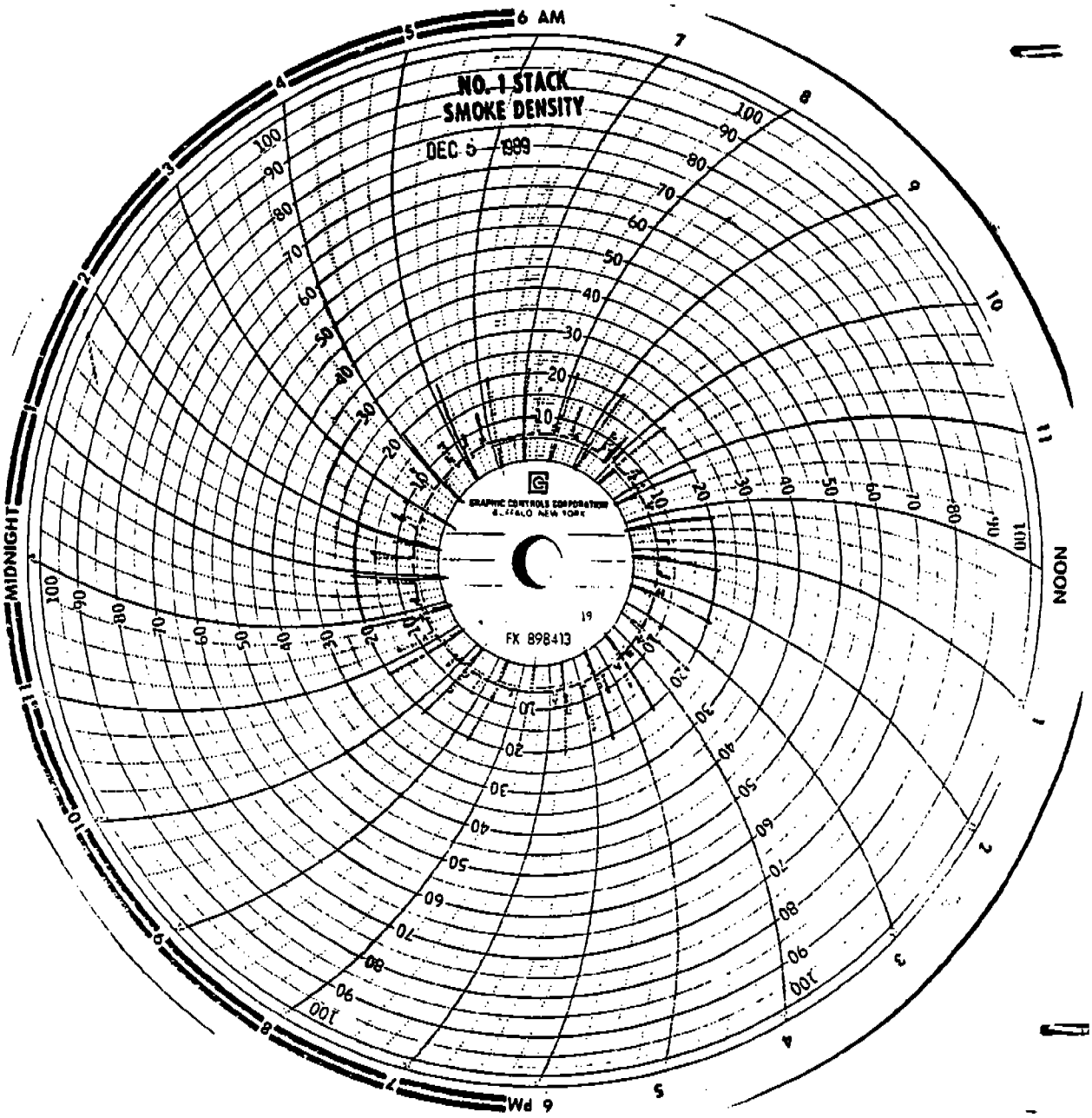
Calibrator: TWS Reference: Mercury-in-glass: ✓

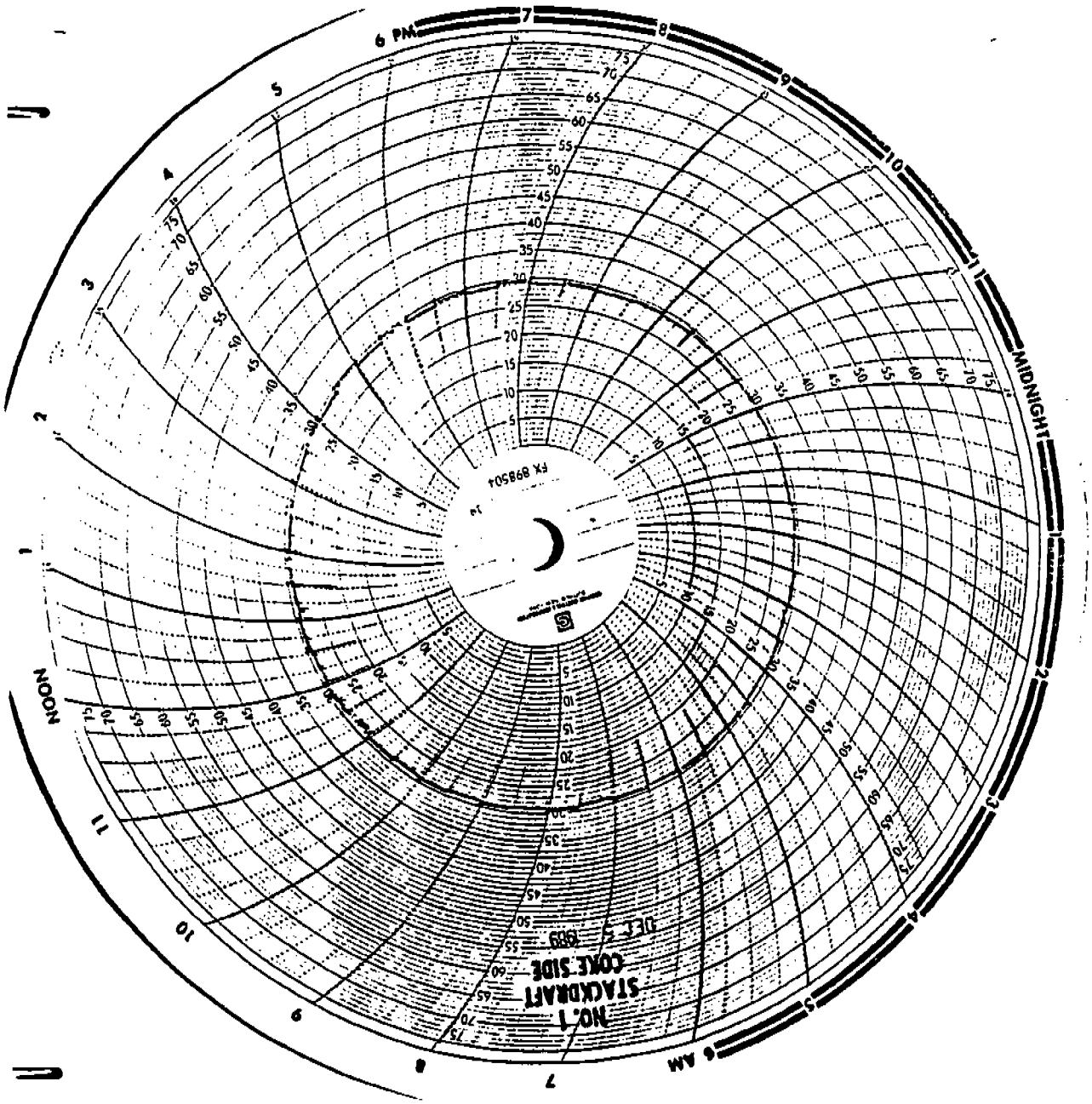
Other: _____

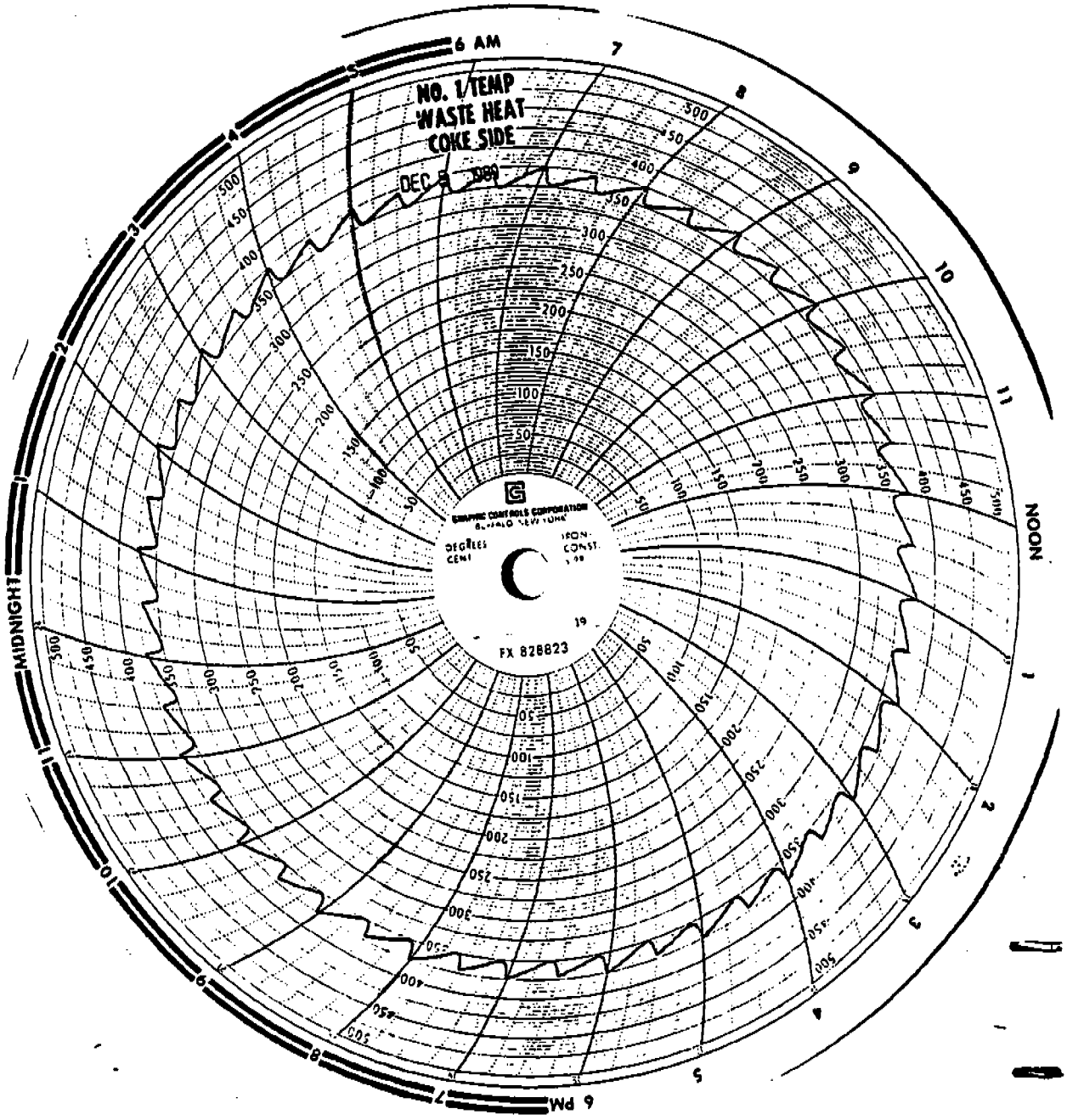
Reference Point No.	Source (Specify)	Reference Thermometer Temperature °F	Thermocouple Potentiometer Temperature °F	Difference %
1	AMBIENT AIR	72	65	10.8
2	OIL	373	370	0.8
3	WATER	212	217	2.3
			Average % Difference	4.6

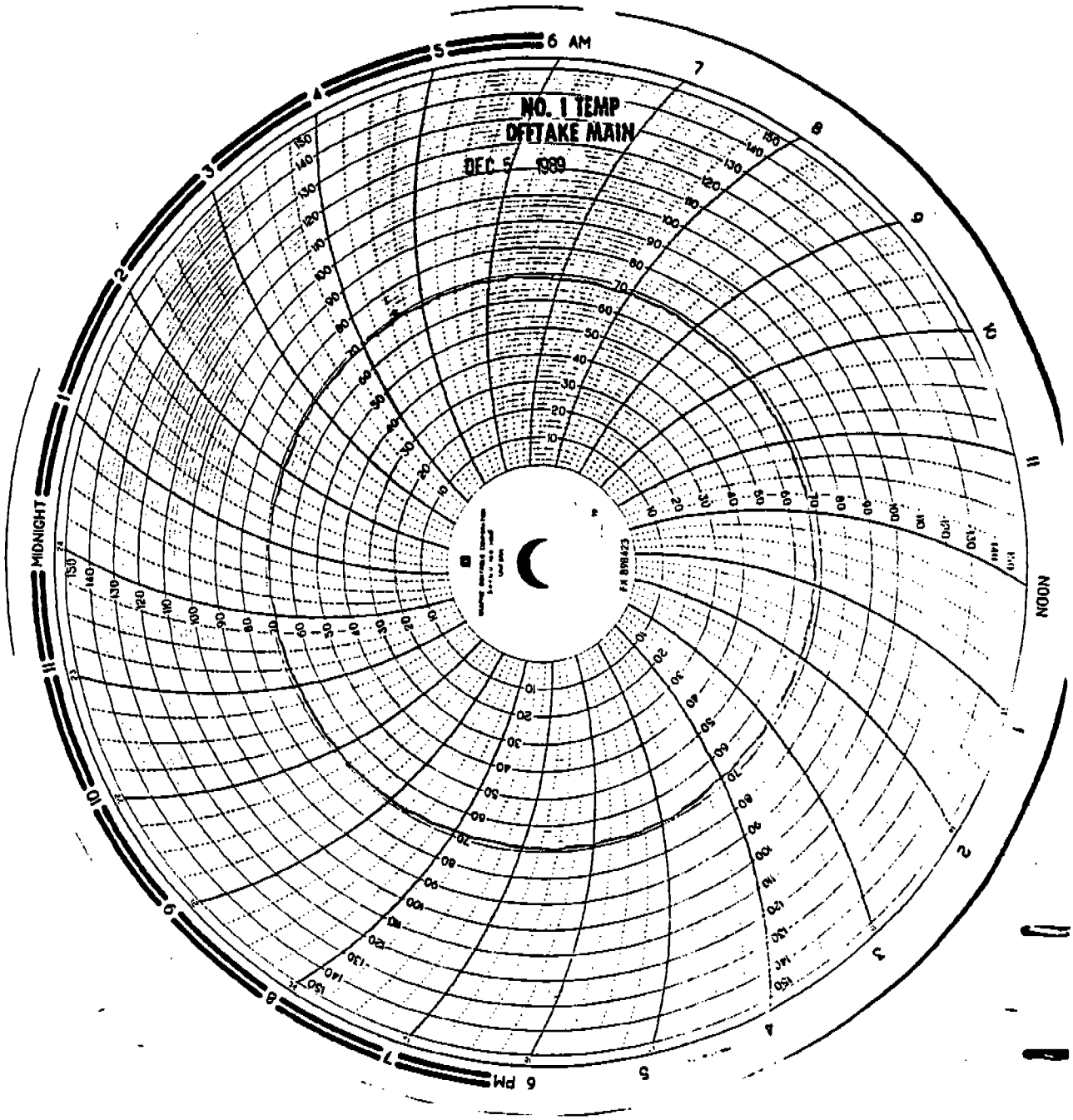
APPENDIX D

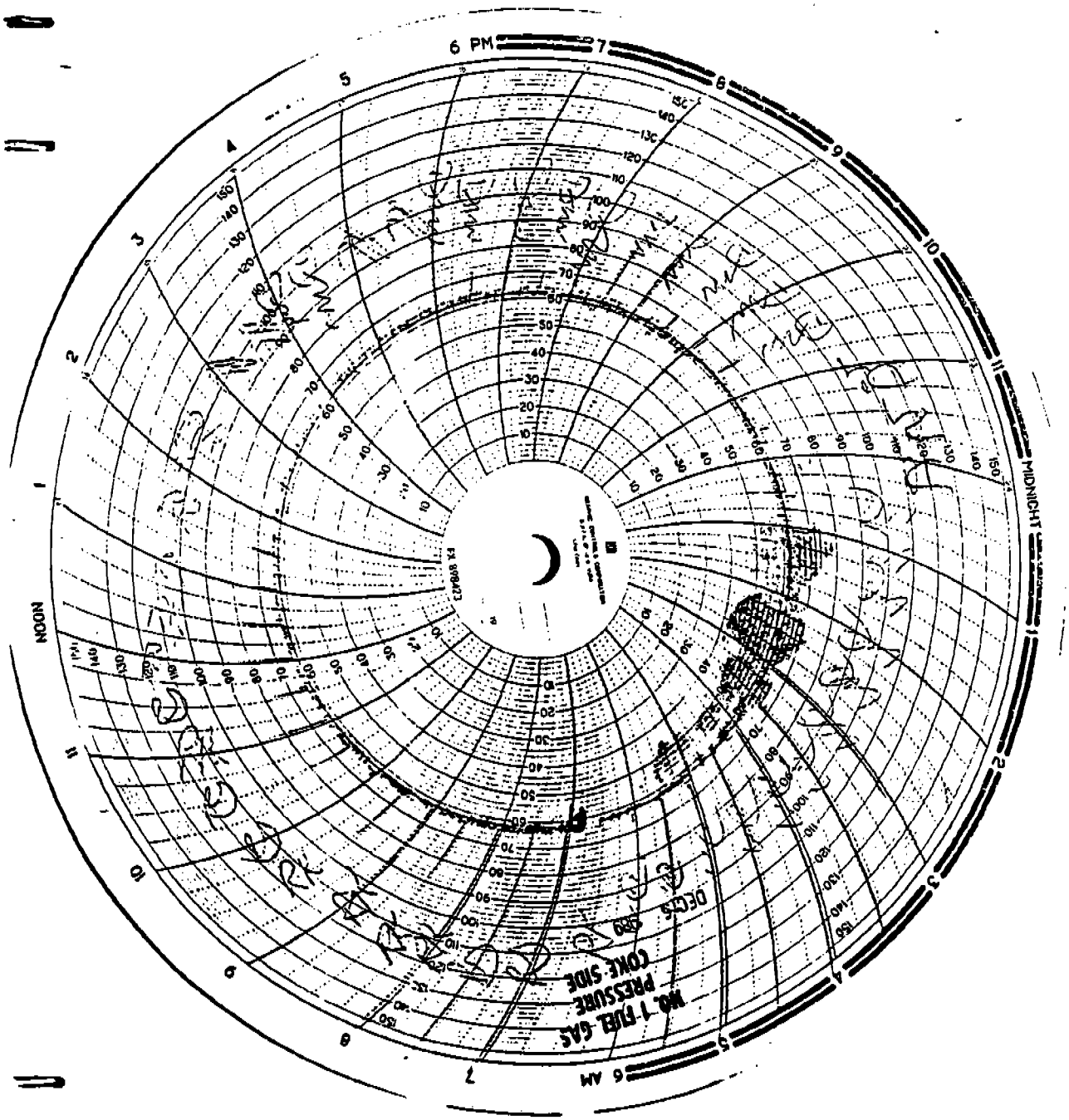
PROCESS DATA


NO. 1 STACK
SMOKE DENSITY
DEC 5 1989
6 AM
NOON
6 PM
MIDNIGHT
GRAPHIC CONTROLS CORPORATION
BUFFALO NEW YORK
FX 898413

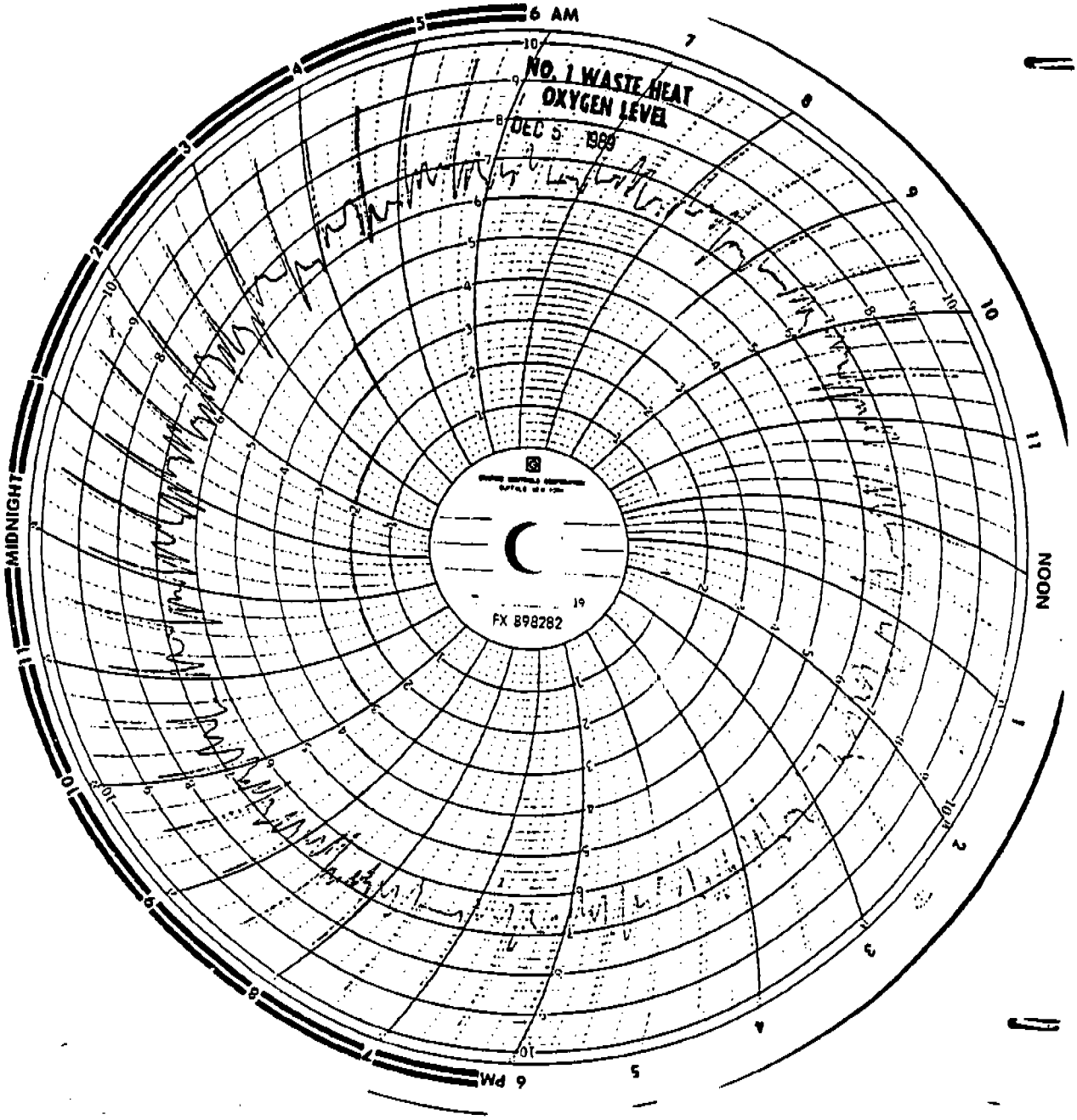

6 PM
MIDNIGHT
NOON
6 AM
NO. 1
STACKDRAFT
COKE SIDE
DEC 5 1989
FX 898504

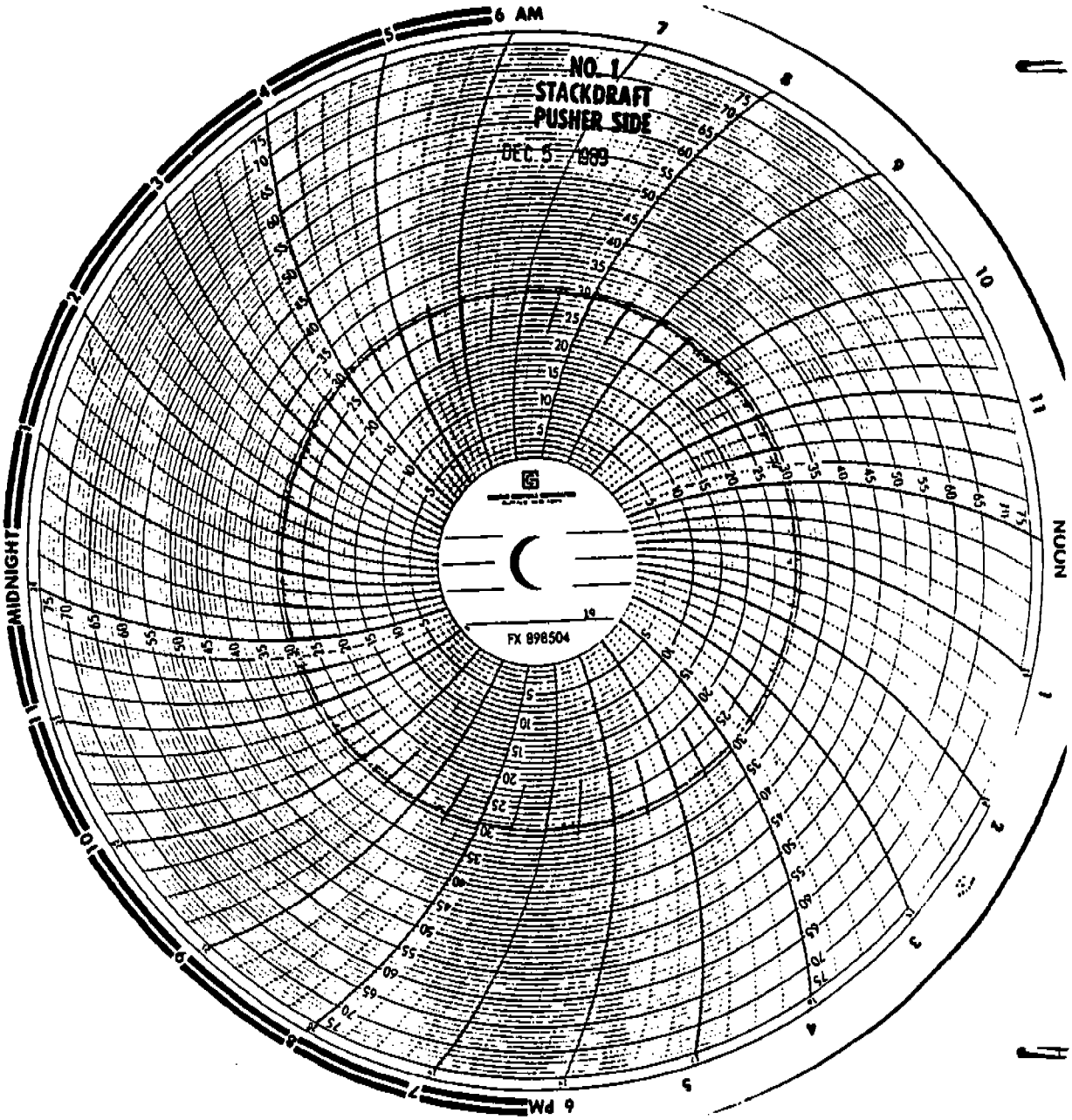

NO. 1/TEMP
WASTE HEAT
COKE SIDE
DEC 5 1989
6 AM
NOON
6 PM
MIDNIGHT
GRAPHIC CONTROLS CORPORATION
DEGREES CENT
IRON-CONST.
FX 828823


NO. 1 TEMP
OFFTAKE MAIN
DEC 5 1989
6 AM
6 PM
MIDNIGHT
NOON


6 PM
MIDNIGHT
NOON
6 AM
NO. 1 FUEL GAS
PRESSURE
COKE SIDE
DEC 6 1980

NO-1 FUEL GAS
PRESSURE
PUSHER SIDE
DEC 3 1999
NOON
MIDNIGHT
6 AM
6 PM


6 AM
NOON
6 PM
MIDNIGHT
NO. 1 WASTE HEAT
OXYGEN LEVEL
DEC 5 1969
FX 898282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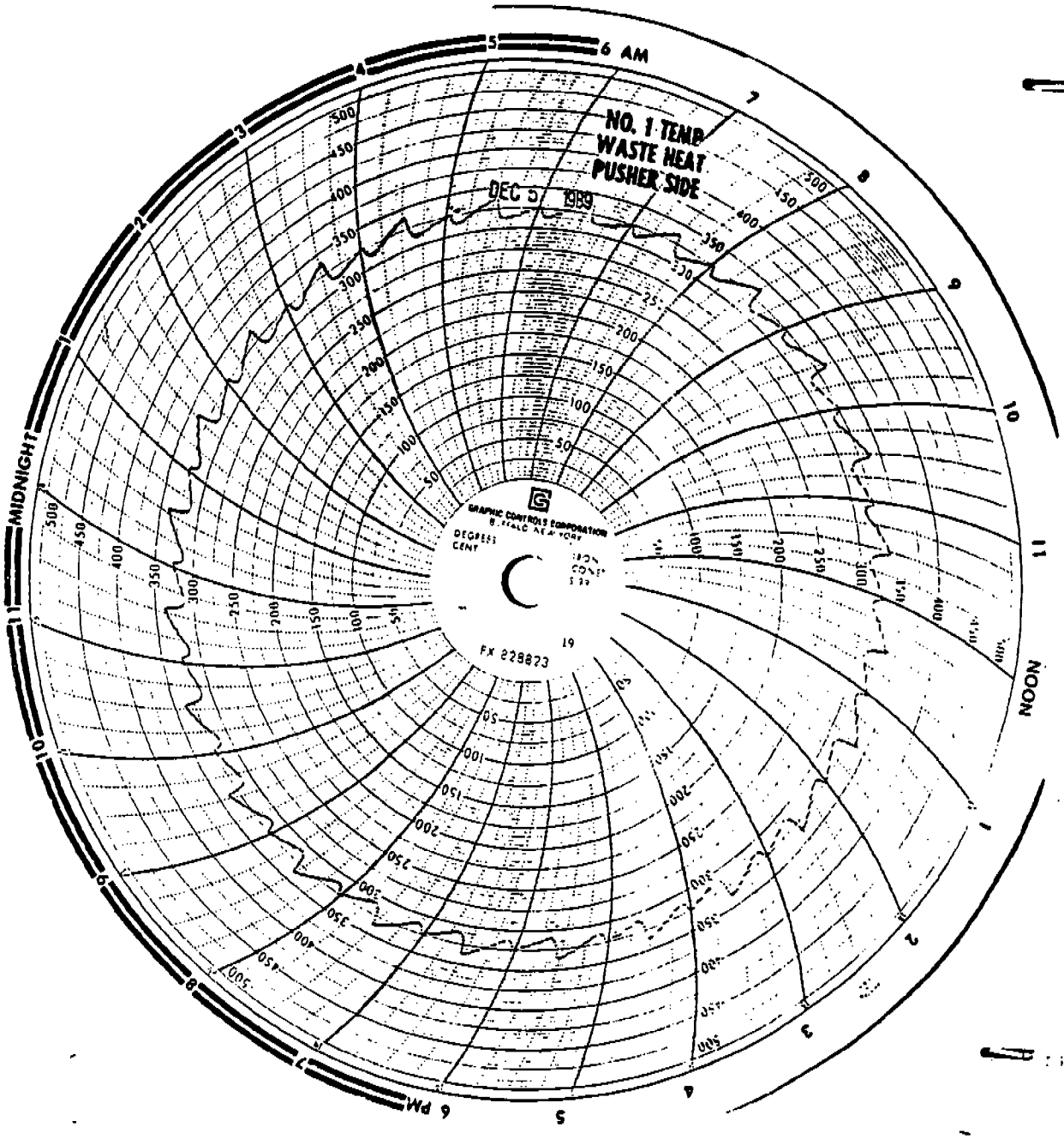
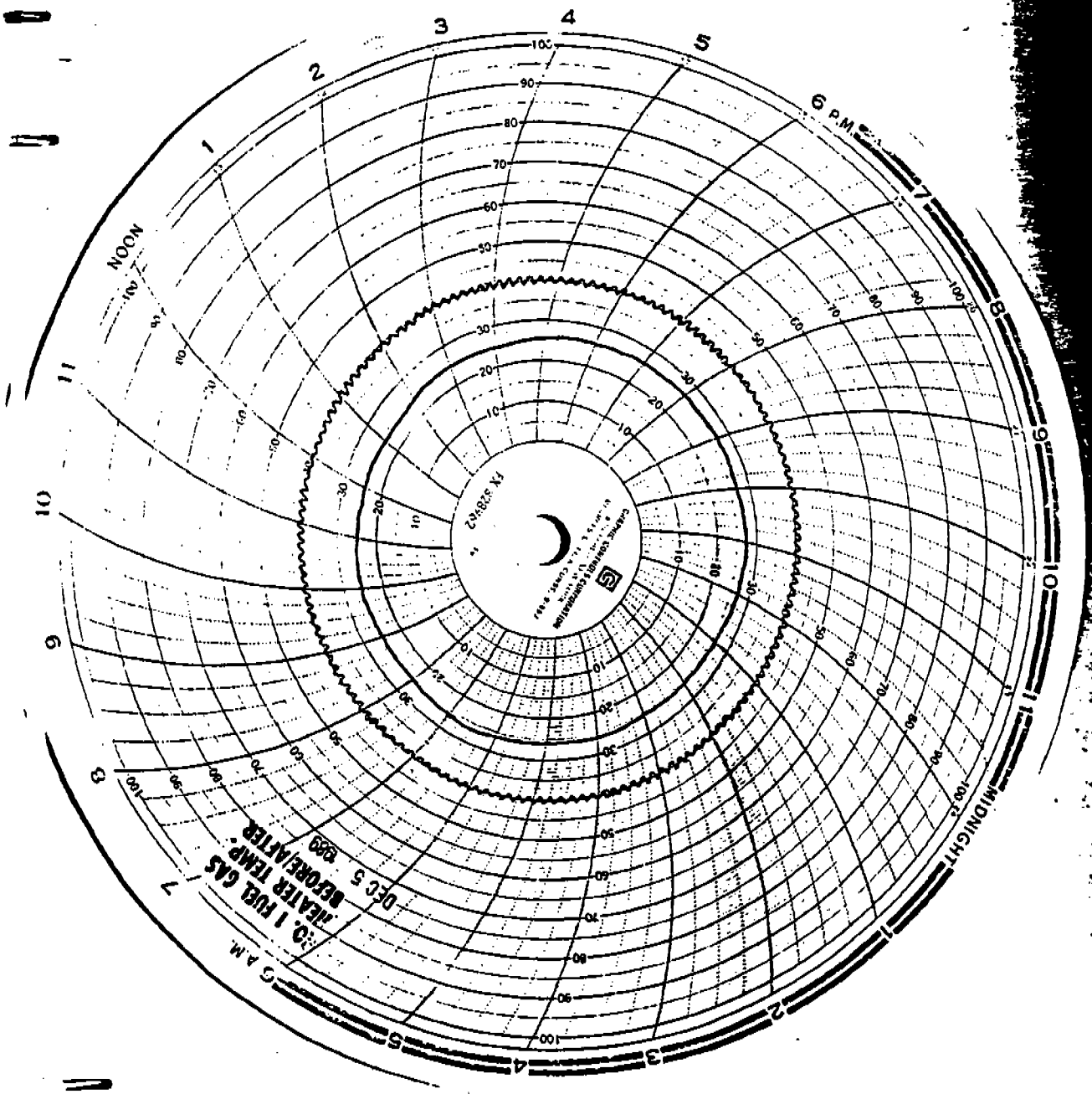
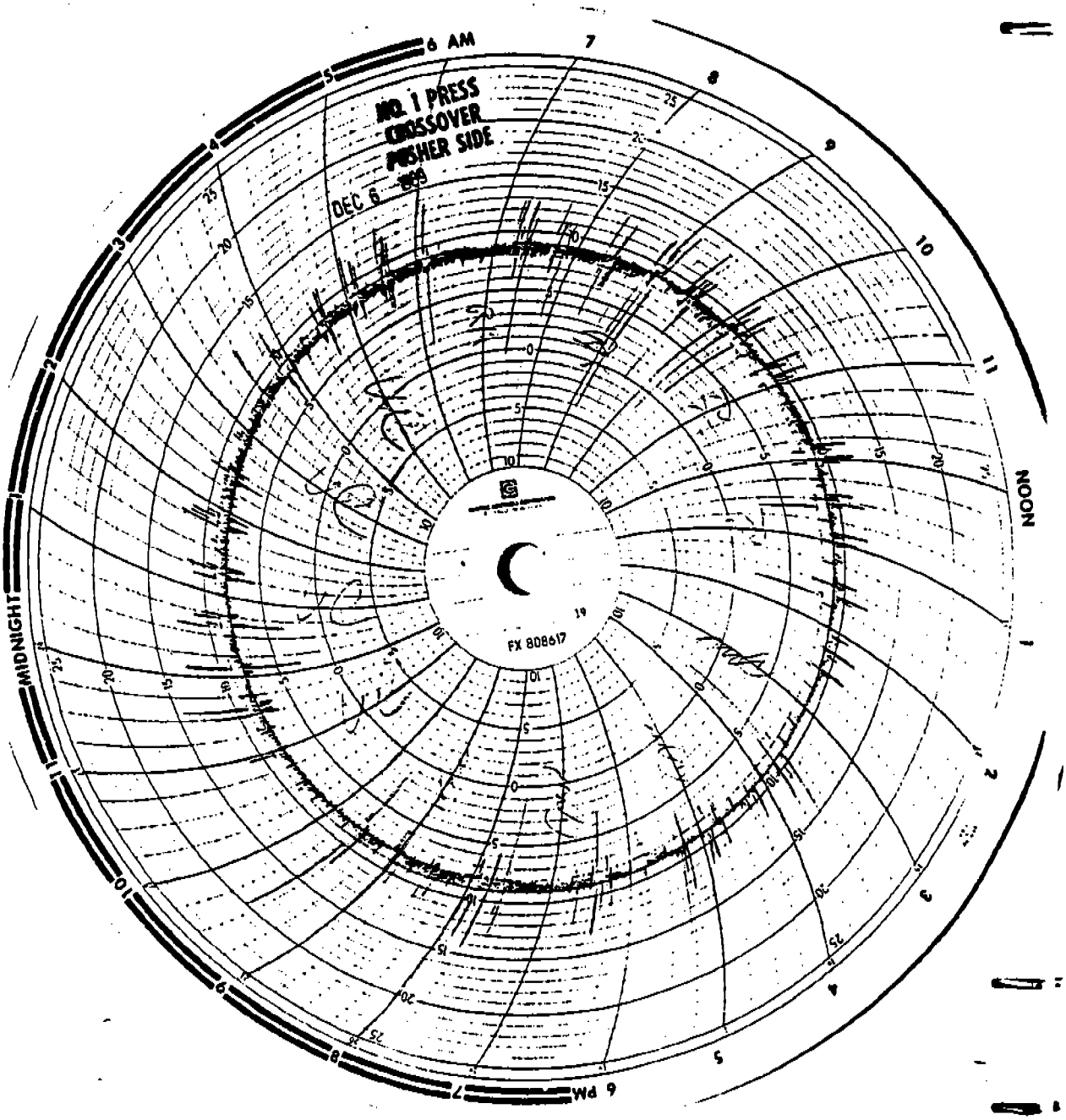
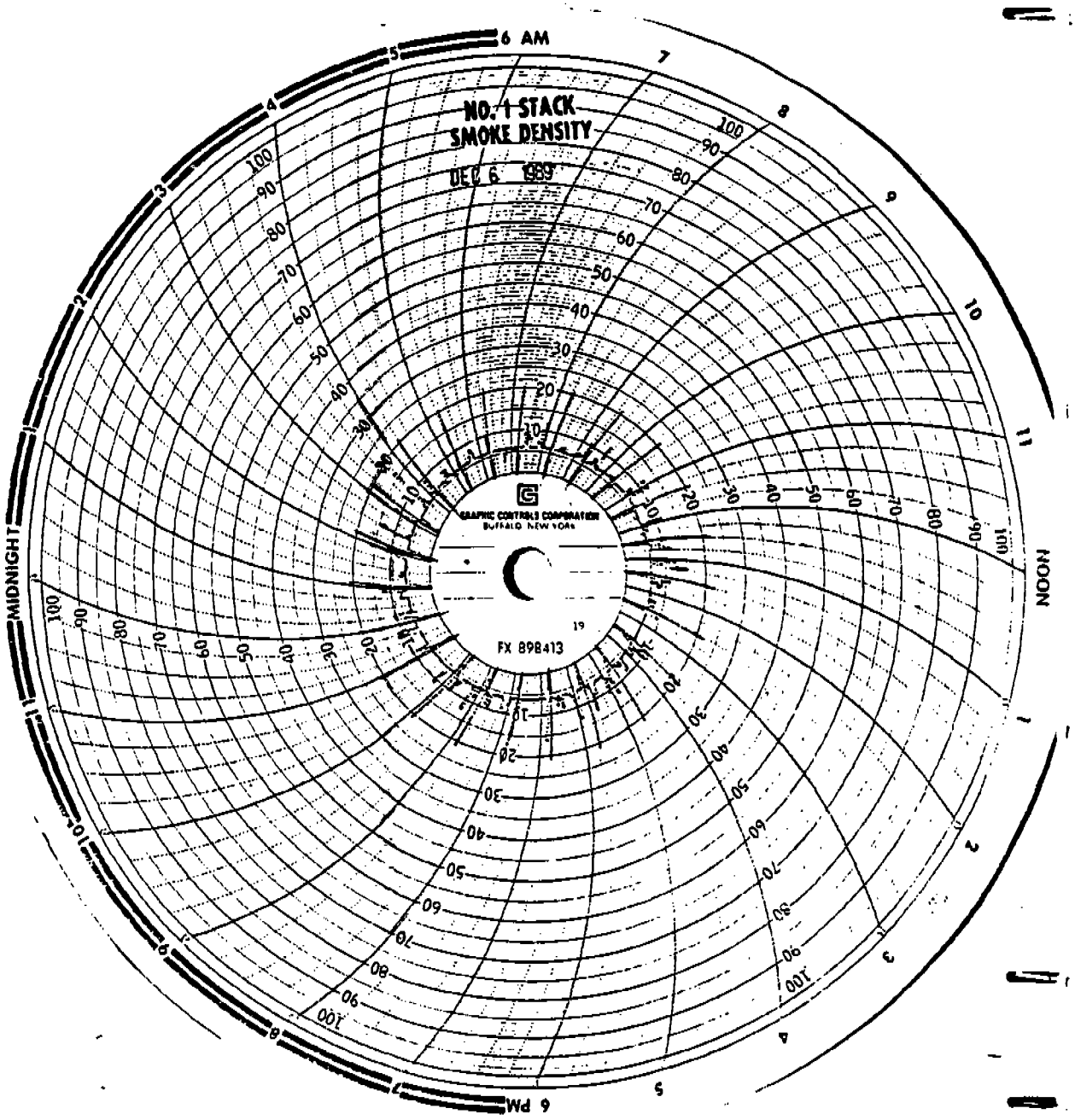
STACKDRAFT
PUSHER SIDE
DEC. 5 1989
6 AM
NOON
6 PM
MIDNIGHT
FX 898504


NO. 1 TEMP
WASTE HEAT
PUSHER SIDE
DEC 5 1989
6 AM
NOON
6 PM
MIDNIGHT
GRAPHIC CONTROLS CORPORATION
DEGREES
CENT
FX 228823


NOON
MIDNIGHT
6 P.M.
6 A.M.
DEC 5
1989
NO. 1 FUEL GAS
HEATER TEMP.
BEFORE/AFTER

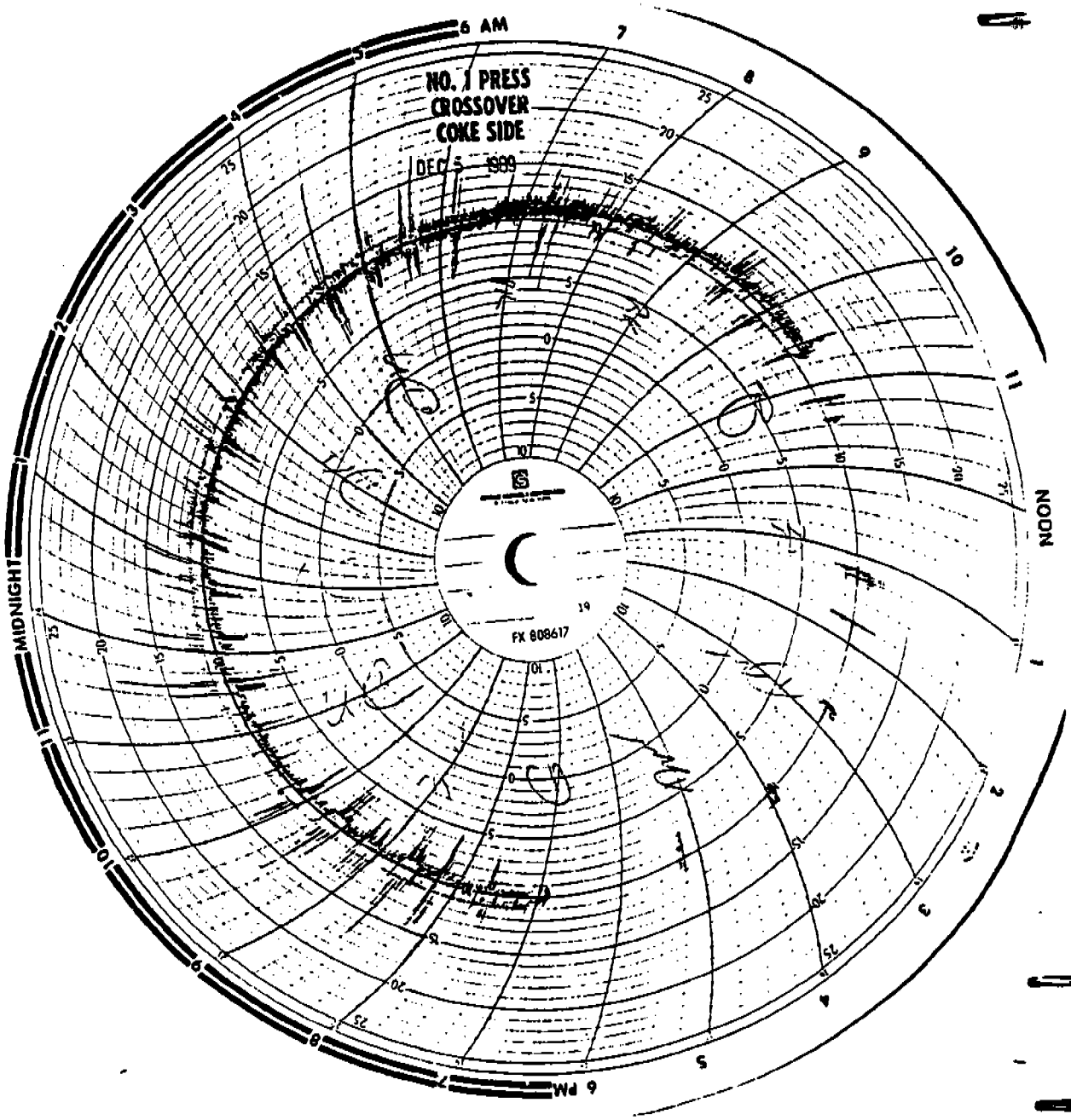
NO. 1 POL GAS
PRESSURE
TO HEATER
6 AM
6 PM
NOON
MIDNIGHT

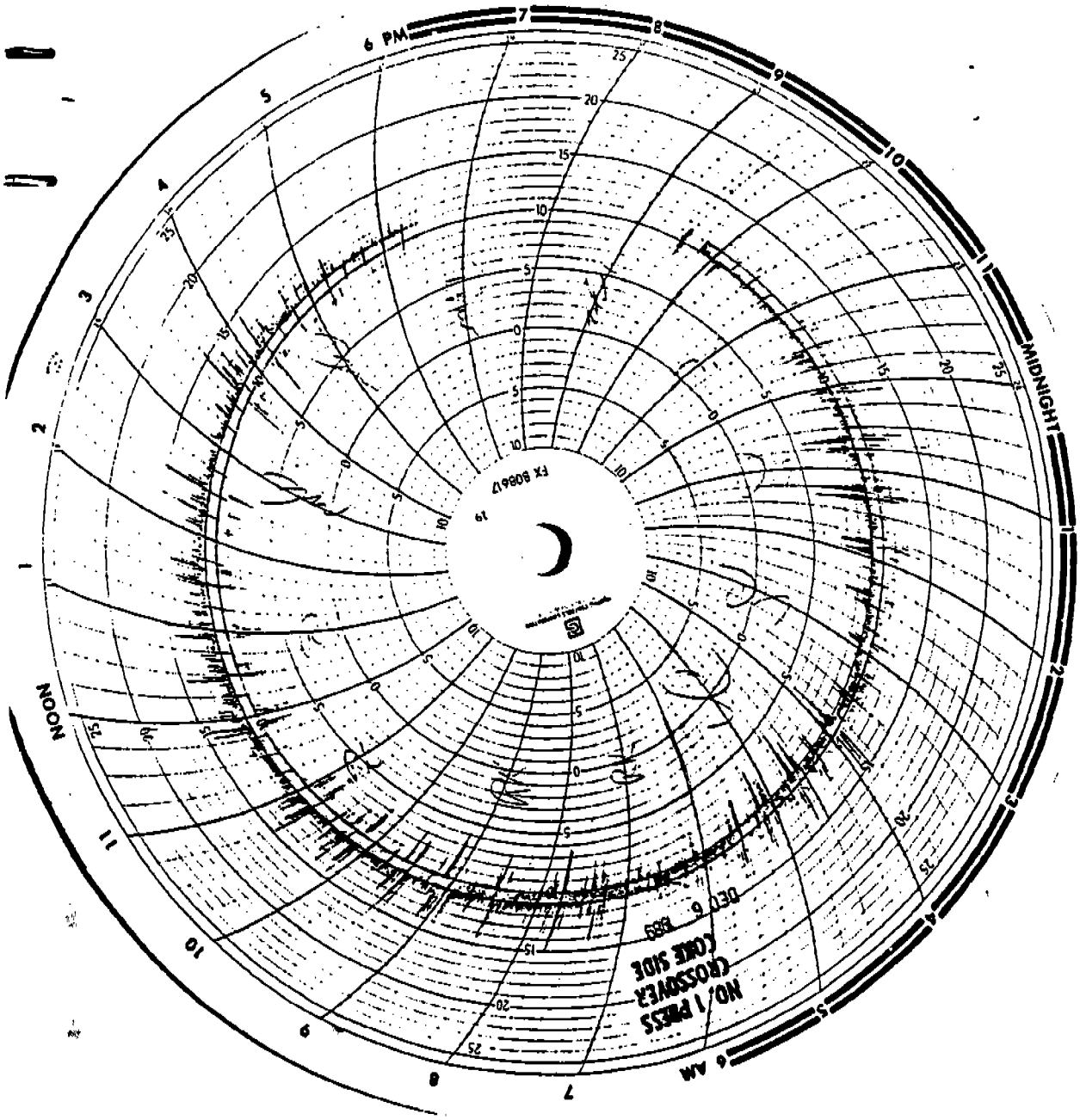

NO. 1 PRESS
CROSSOVER
PUSHER SIDE
DEC 6
6 AM
NOON
6 PM
MIDNIGHT
FX 808617

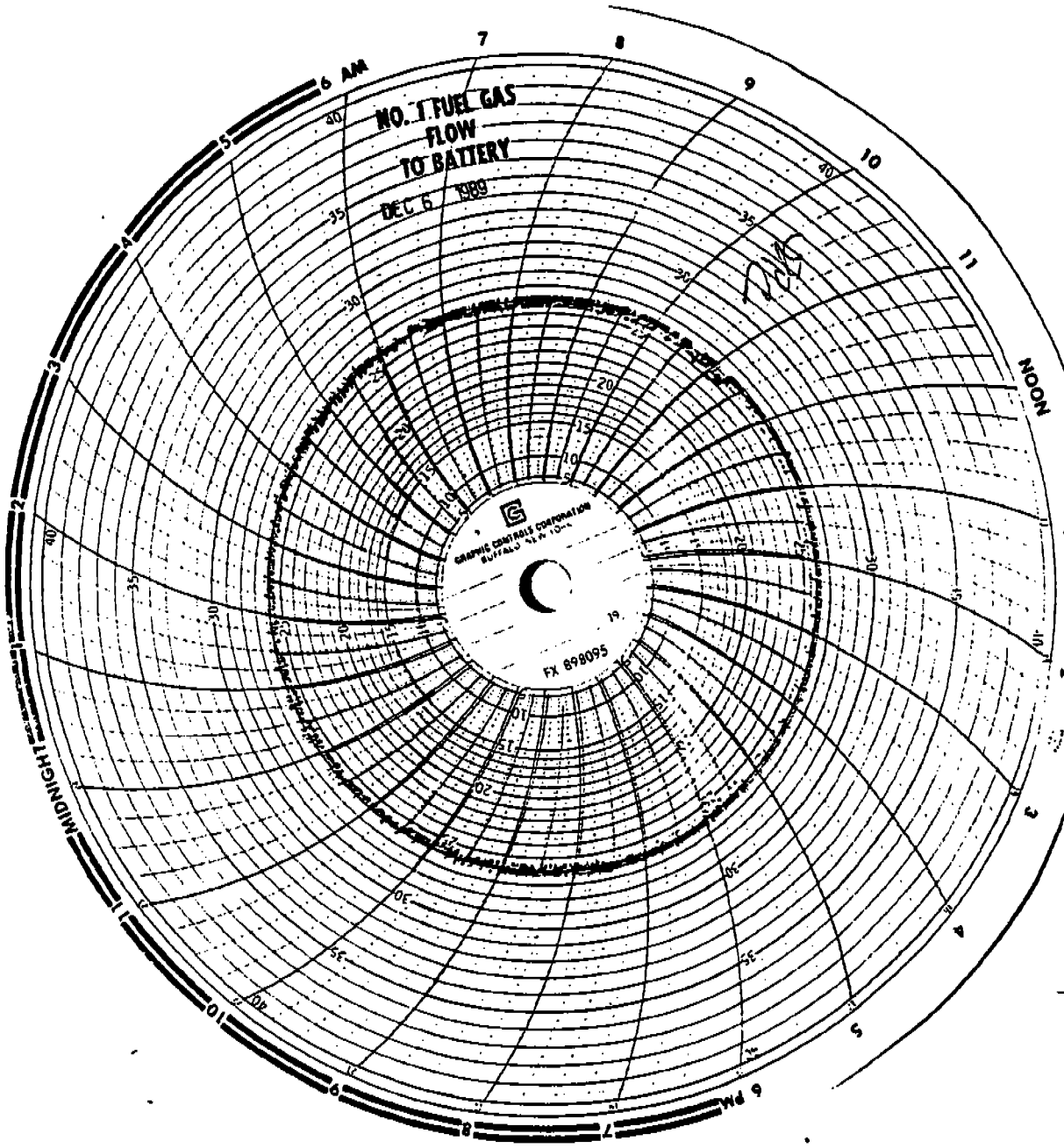

NO. 1 STACK
SMOKE DENSITY
DEC 6 1989
6 AM
6 PM
MIDNIGHT
NOON
GRAPHIC CONTROLS CORPORATION
BUFFALO NEW YORK
FX 898413

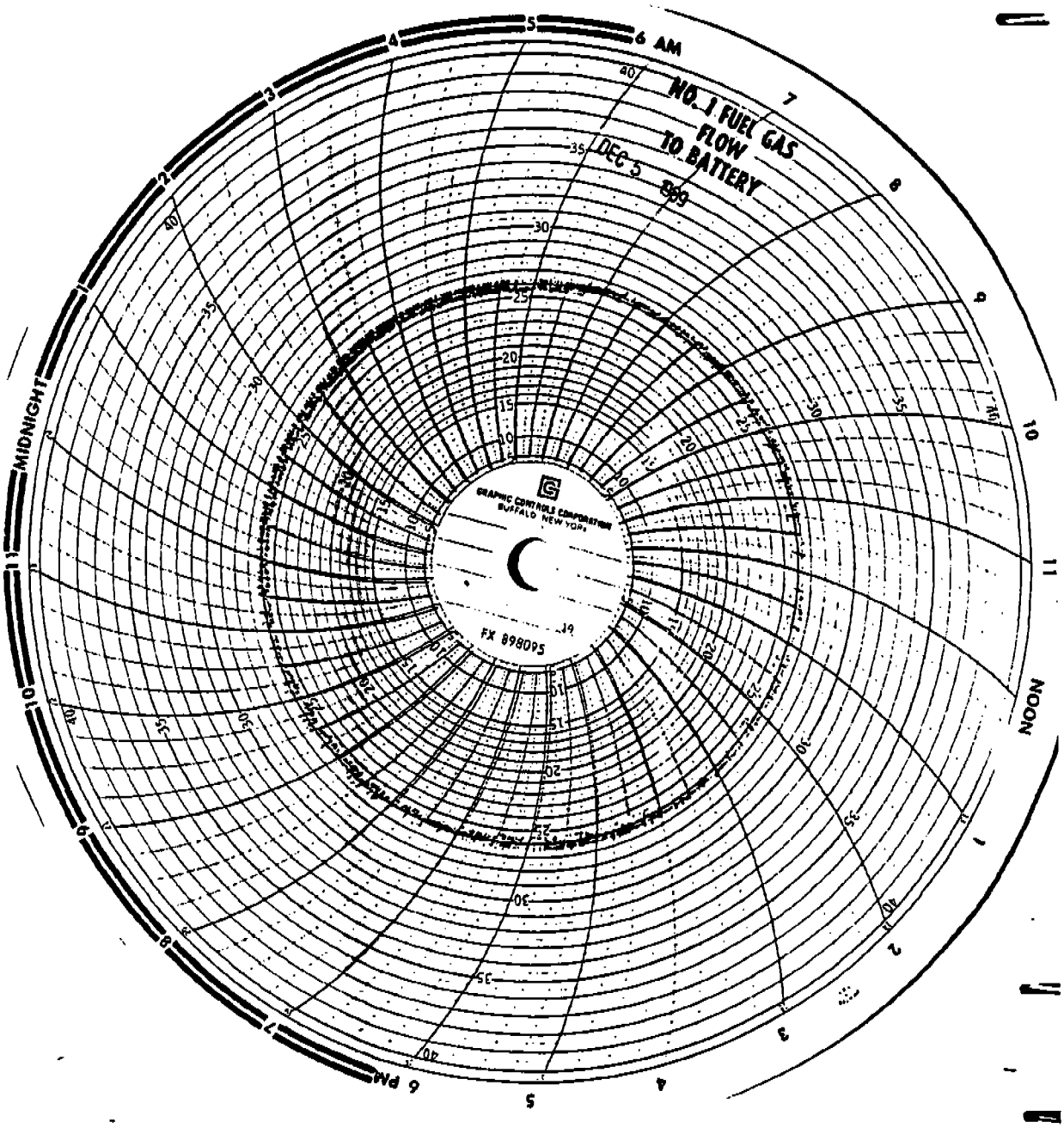
NO. 1 PRESS
CROSSOVER
PUSHER SIDE
DEC 5 1989
6 AM
6 PM
MIDNIGHT
NOON
FX 808617

NO. 1 FUEL/GAS
PRESSURE
TO HEATER
DEC 6 1969
6 PM
MIDNIGHT
NOON
6 AM

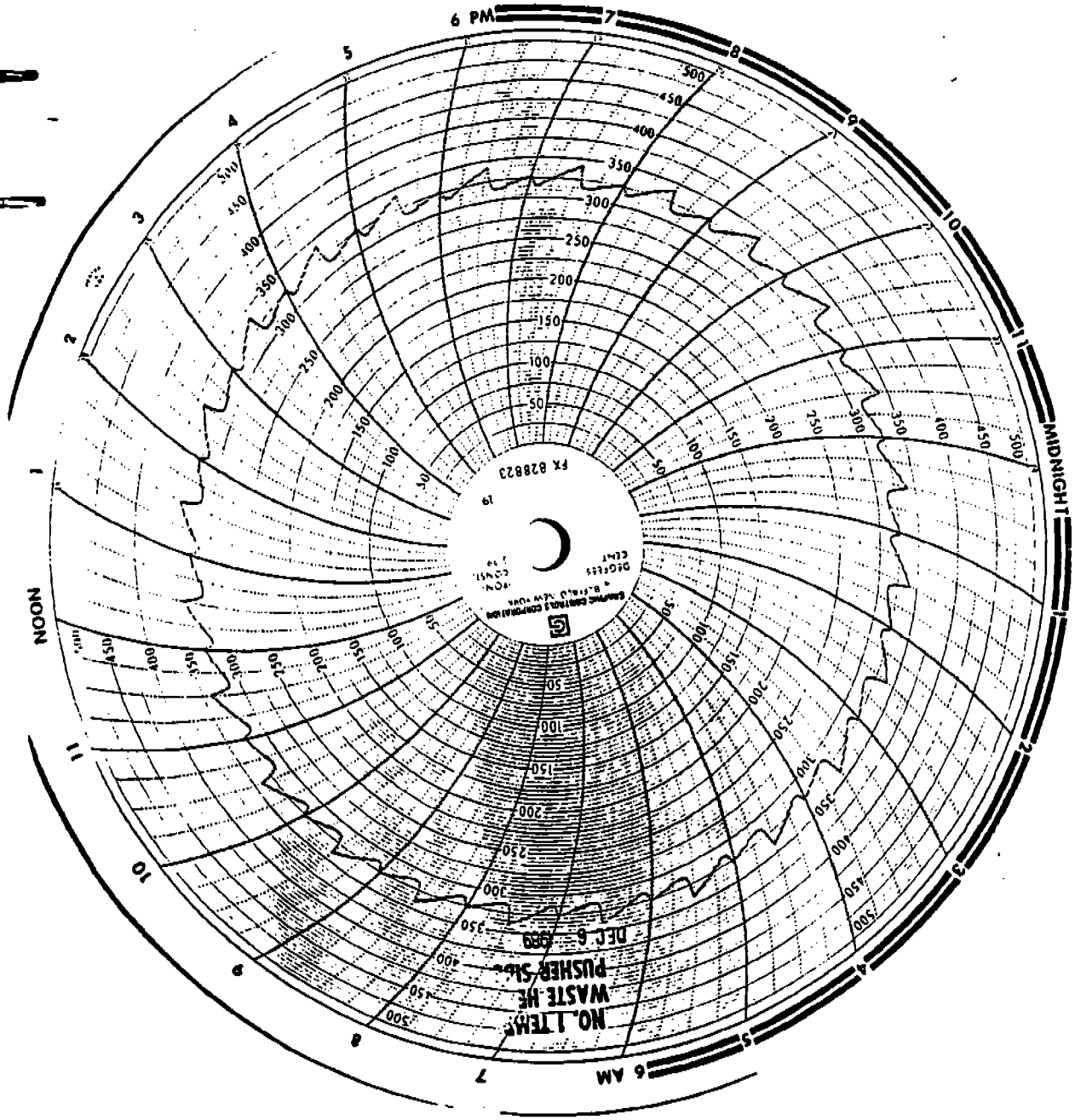

NO. 1 PRESS
CROSSOVER
COKE SIDE
DEC 5 1989
6 AM
NOON
MIDNIGHT
6 PM
FX 808617

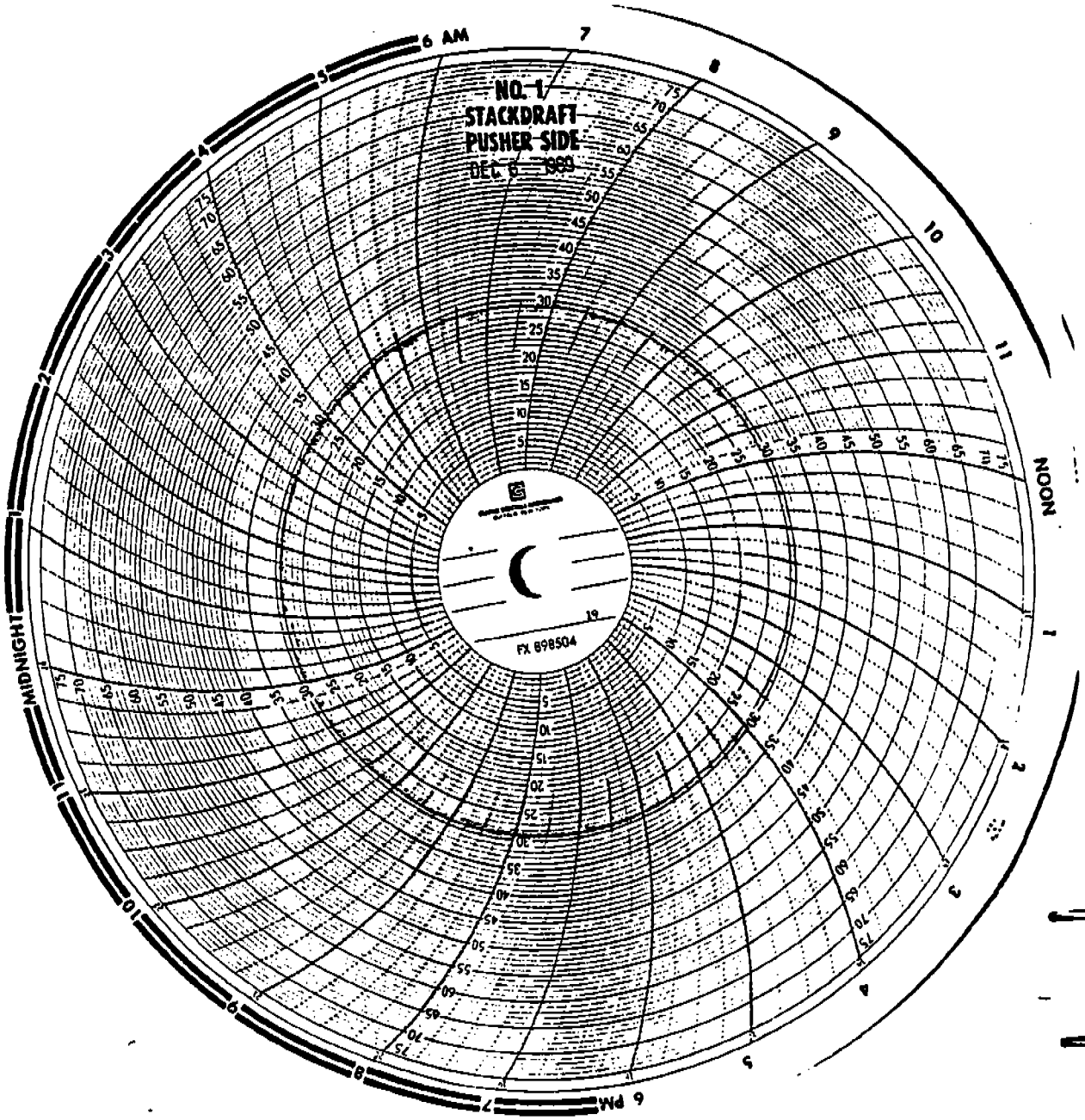

6 PM
MIDNIGHT
NOON
6 AM
NO. 1 PRESS
CROSSOVER
COKE SIDE
DEC 6 1989
FX 808617

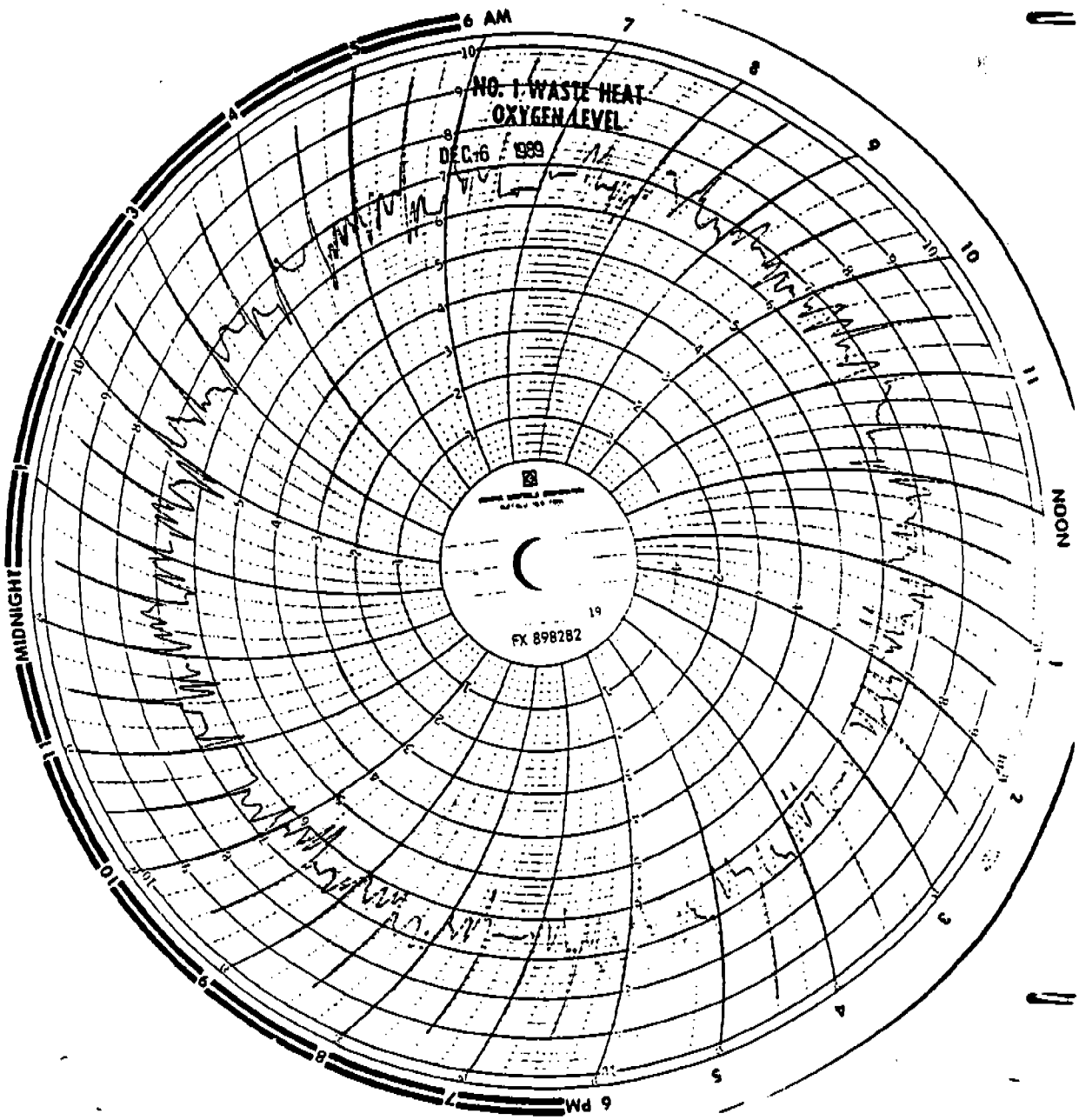

NO. 1 FUEL GAS
FLOW
TO BATTERY
DEC 6 1989
6 AM
NOON
6 PM
MIDNIGHT
GRAPHIC CONTROLS CORPORATION
BUFFALO, N.Y.
FX 898095

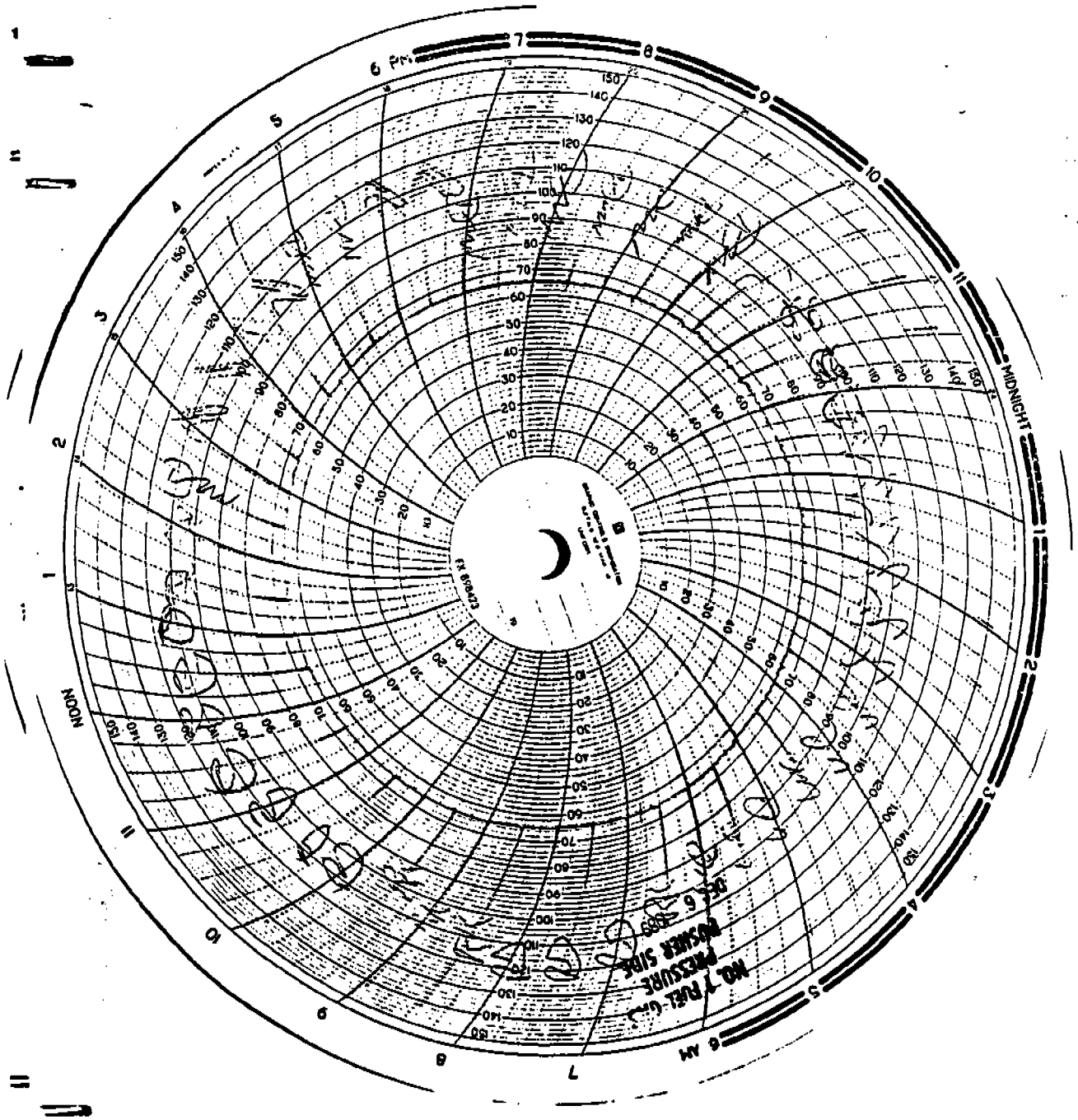

NO. 1 FUEL GAS
FLOW
TO BATTERY
DEC 5 899
GRAPHIC CONTROLS CORPORATION
BUFFALO NEW YORK
FX 898095
MIDNIGHT
6 AM
NOON
6 PM

NO. 1 FUEL GAS
HEATER TEMP.
BEFORE/AFTER
DEC 6 1999
6 A.M.
6 P.M.
NOON
MIDNIGHT


6 PM
7
8
9
10
11
MIDNIGHT
1
2
3
4
5
6 AM
7
8
9
10
11
NOON
FX 828823
NO. 1 TEMP
WASTE HE
PUSHER SL
DEC 6 1989


NO. 1
STACKDRAFT
PUSHER SIDE
DEC. 6 1989
6 AM
NOON
MIDNIGHT
6 PM
FX 898504

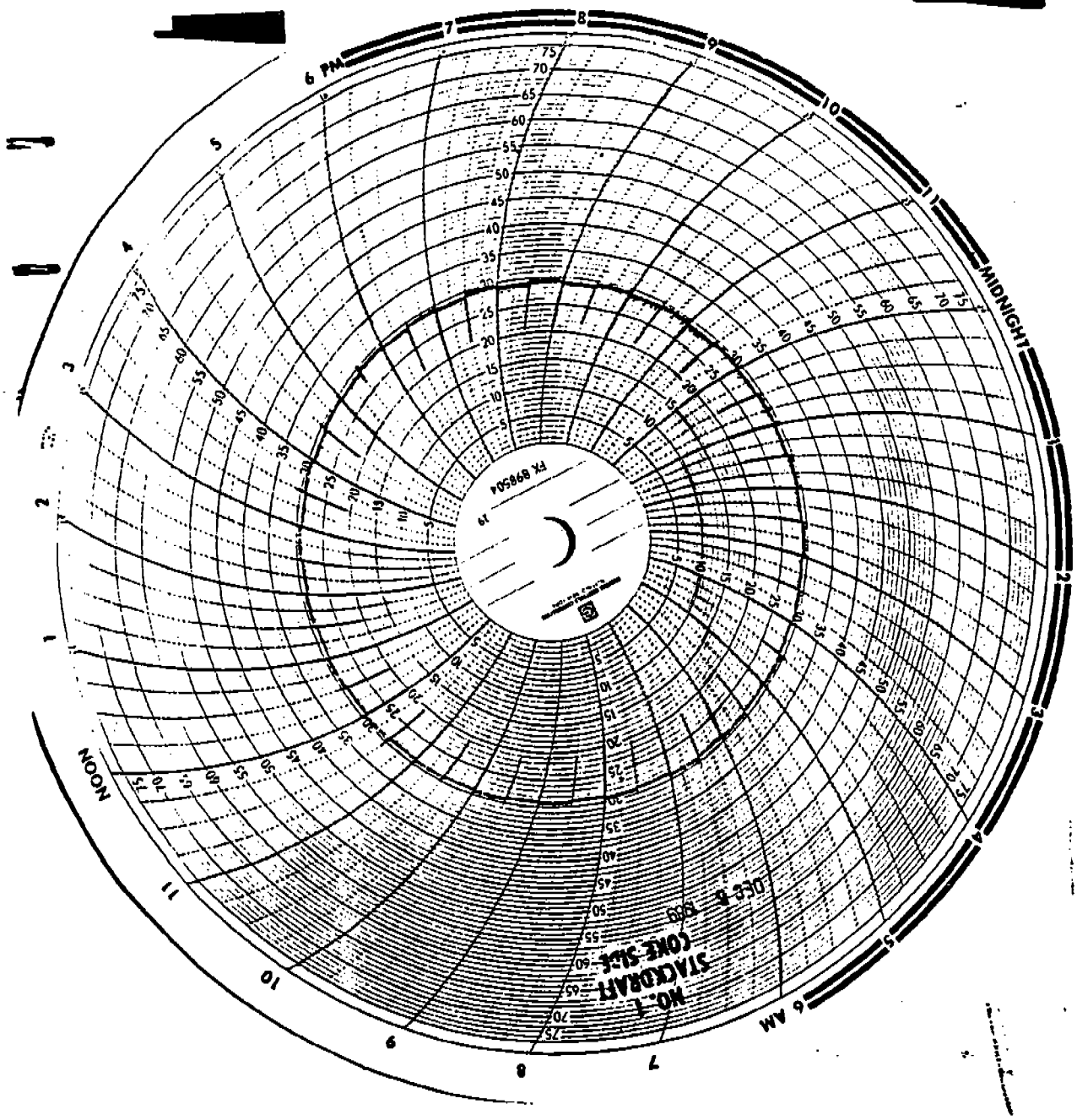

NO. 1 WASTE HEAT
OXYGEN LEVEL
DEC 16 1989
6 AM
NOON
6 PM
MIDNIGHT
FX 898282


MIDNIGHT
NOON
6 AM
6 PM
NO. 1 FUEL GAS
PRESSURE
BUSHER SIDE
DEC 6
EX 898423

NO. 1 FUEL-GAS
PRESSURE
COKE SIDE
DEC 6
NOON
MIDNIGHT
6 AM

6 PM
MIDNIGHT
NOON
6 AM
NO. 1 TEMP
OFFLAKE MAIN
DEC 6 1989

NO. 1 TEMP
WASTE-HEAT
COKE-SIDE
6 PM
MIDNIGHT
NOON
6 AM


MIDNIGHT
6 AM
NOON
6 PM
NO. 1
STACKDRAFT
COKE SIDE
FX 898504

The opacities monitored during the test runs averaged 1.8%, 0.9% and 0.9%. As a result the test results were also in compliance with the opacity limitations.

Should you have any questions following your review of the attached report, please contact me at 777-6655.

Very truly yours,

Nicholas S. Buchko
Environmental Compliance Engineer

bcc: A Aloe - Letter only
G Owens
J McEwen
B Erhardt
V Pendergast
P Belculfine
R Cusano - Letter only
File

52

~~G.J. Goff~~

GTZ → JDG

GTZ 16 Jan 1990

Shenango
INCORPORATED

PLANTS
NEVILLE ISLAND PA
SHARPSVILLE, PA

COKE OVENS
NEVILLE ISLAND PA

16 Jan 1990

JDG,

I have reviewed this report.

While the numbers look good, do you think they are accurate?

GTZ

January 5, 1990

Allegheny County Health Department
Bureau of Air Pollution Control
301 - 39th Street
Pittsburgh, Pa. 15201

Attention: Mr. Ronald J. Chleboski
Deputy Director

Subject: #1 Coke Oven Battery
Stack Test

Dear Mr. Chleboski:

As detailed in our correspondence dated November 13, 1989, Shenango Incorporated conducted a re-evaluation of the particulate emissions from the #1 coke oven battery combustion stack. The test, which was conducted on December 5-6, 1989 by BCM Engineers, Inc. was witnessed by Bureau personnel and utilized the protocol previously submitted by Shenango. The report, titled "Particulate Evaluation of Coke Oven Battery No. 1 Combustion Stack at Shenango Incorporated Neville Island Plant", is attached for your review.

The following particulate concentrations were measured during the test runs: 0.0040, 0.0060 and 0.0031 gr/dscf. The three runs averaged 0.0044 gr/dscf which is in compliance with the mass emission limitations of 0.015 gr/dscf.

52

~~G.J. Goetz~~

GTZ → JDG

GTZ 16 Jan 1990

Shenango
INCORPORATED

PLANTS
NEVILLE ISLAND PA
SHARPSVILLE PA

COKE OVENS
NEVILLE ISLAND PA

16 Jan 1990

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52

~~G.V. Goff~~

GTZ → JDG

GTZ 16 Jan 1990

Shenango
INCORPORATED

PLANTS
NEVILLE ISLAND PA
SHARPSVILLE PA

COKE OVENS
NEVILLE ISLAND PA

16 Jan 1990

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52

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GTZ → JDG

GTZ

16 Jan 1990

Shenango
INCORPORATED

PLANTS
NEVILLE ISLAND PA
SHARPSVILLE PA

COKE OVENS
NEVILLE ISLAND PA

16 Jan 1990

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