COKE PLANT SURVEY
CF & I STEEL CORPORATION
PUEBLO, COLORADO

MAY 1977

ENVIRONMENTAL PROTECTION AGENCY
NATIONAL ENFORCEMENT INVESTIGATIONS CENTER
Denver

REGION VIII
Denver

ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF ENFORCEMENT
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DENVER, COLORADO 80225

TO Director, Enforcement Division
EPA, Region VIII

DATE May 12, 1977

FROM Assistant Director, Technical Programs

SUBJECT Coke Plant Survey - CF&I Steel, Pueblo, Colorado

Enclosed is a copy of a report entitled "Coke Plant Survey, CF&I Steel Corporation, Pueblo, Colorado." If you have any questions regarding this report, please contact Mr. Jonathan Dion or Mr. Gary Young at 234-4706.

Robert D. Harp

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cc: Gary E. Parish, Reg. VIII, w/c
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Director, NEIC
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COKE PLANT SURVEY
CF&I STEEL CORPORATION
Pueblo, Colorado
(February 14-15, 1977)

INTRODUCTION

Background

CF&I Steel Corporation operates an integrated steel manufacturing facility in Pueblo, Colorado. It is the single largest stationary source of air pollution in the State of Colorado.

Since 1966, various process operations, including the coke plant, have been operating under State variances and since 1975, the variances have included compliance schedules. However, for the coke plant, the issued compliance schedules only considered door leaks and pushing emissions. Since then CF&I has failed to meet final compliance requirements for its coke batteries. EPA Region VIII issued a notice of violation (NOV) and subsequently an order, pursuant to Section 113 of the Clean Air Act, as amended, requiring CF&I to comply with Colorado Air Pollution Control Commission (CAPCC) Regulation 1.A.1 for pushing emissions, door leaks, and bench cleanup emissions at its three coke batteries. CF&I failed to comply with the EPA order and the matter is currently in litigation.

Charging emissions violations had apparently not been documented by EPA prior to EPA Region VIII issuing the above mentioned NOV and order.

On September 13-14, 1976 EPA Region VIII, with the assistance of the Pueblo City/County Health Department (PC/CHD) conducted an inspection of CF&I's three coke batteries to observe charging operations. As a result of that inspection, on December 6, 1976 EPA Region VIII issued an NOV to CF&I for its charging emissions.

On February 14 and 15, 1977, EPA Region VIII, assisted by the EPA National Enforcement Investigations Center (NEIC) and the PC/CHD, conducted a survey of CF&I's three coke batteries to document continuing violations of CAPCC Regulation 1.A.1 for charging operations. Simultaneously, an EPA NEIC engineer documented process operations, work practices, and current equipment in use at CF&I to minimize charging emissions. In addition, the engineer documented available charts and records which are kept by the coke plant operations personnel.

Inspection Participants

John Winkley, Manager, Air and Water Quality Control, CF&I

Dave Shilton, Engineer, Air and Water Quality Control, CF&I

Chelsea Pearson, Coke Plant Superintendent, CF&I

Jim Oliver, Assistant Coke Plant Superintendent, CF&I

John Lane, Coke Plant Smoke Control Officer, CF&I

Avery Wyant, PC/CHD

Fred Longenberger, EPA Region VIII

John Dale, EPA Region VIII

Jim Lewis, EPA Region VIII

Jon Dion, EPA NEIC

Gary Young, EPA NEIC

Applicable Regulation

For this inspection, the CAPCC Regulation 1.A.1 applied, and read as follows:

"Regulation No. 1 - Particulates, Smokes, and Sulfur Oxides

A. Stationary Air Contamination Sources:

1. No person shall emit or cause to be emitted into the atmosphere, from any air contamination source whatsoever, any air contaminant which is of such a shade or density as to obscure an observor's vision to a degree in excess of 20 percent opacity. . ."

PROCESS DESCRIPTION - CHARGING

CF&I Corporation operates a three-battery coke plant at Pueblo, Colorado [Figure 1]. The batteries are designated as B, C, and D and have 65, 47, and 31 ovens, respectively. The three batteries are operated as two units with no distinct physical demarcation between the two operating units. Each unit has its own coal bunker, larry car, and pusher machine equipped with levelling bar. All three batteries are equipped with double collector mains and are gun-flue fired.

B Battery is divided into three sections numbered A:1-23, B:1-23, and C:1-19; C Battery is divided into two sections numbered E:1-23 and F:1-24. D Battery is not subdivided. All ovens are pushed and charged by the Marquard system (A-7, B-7, C-7, A-9, B-9, C-9, A-11. . . A-23, B-23, A-2, B-2, C-2, A-4, B-4, etc.).

Each oven has an overall length of 13.2 m (43.2 ft), with a length inside the doors of 12.3 m (40.5 ft). The height is 4.0 m (13 ft),

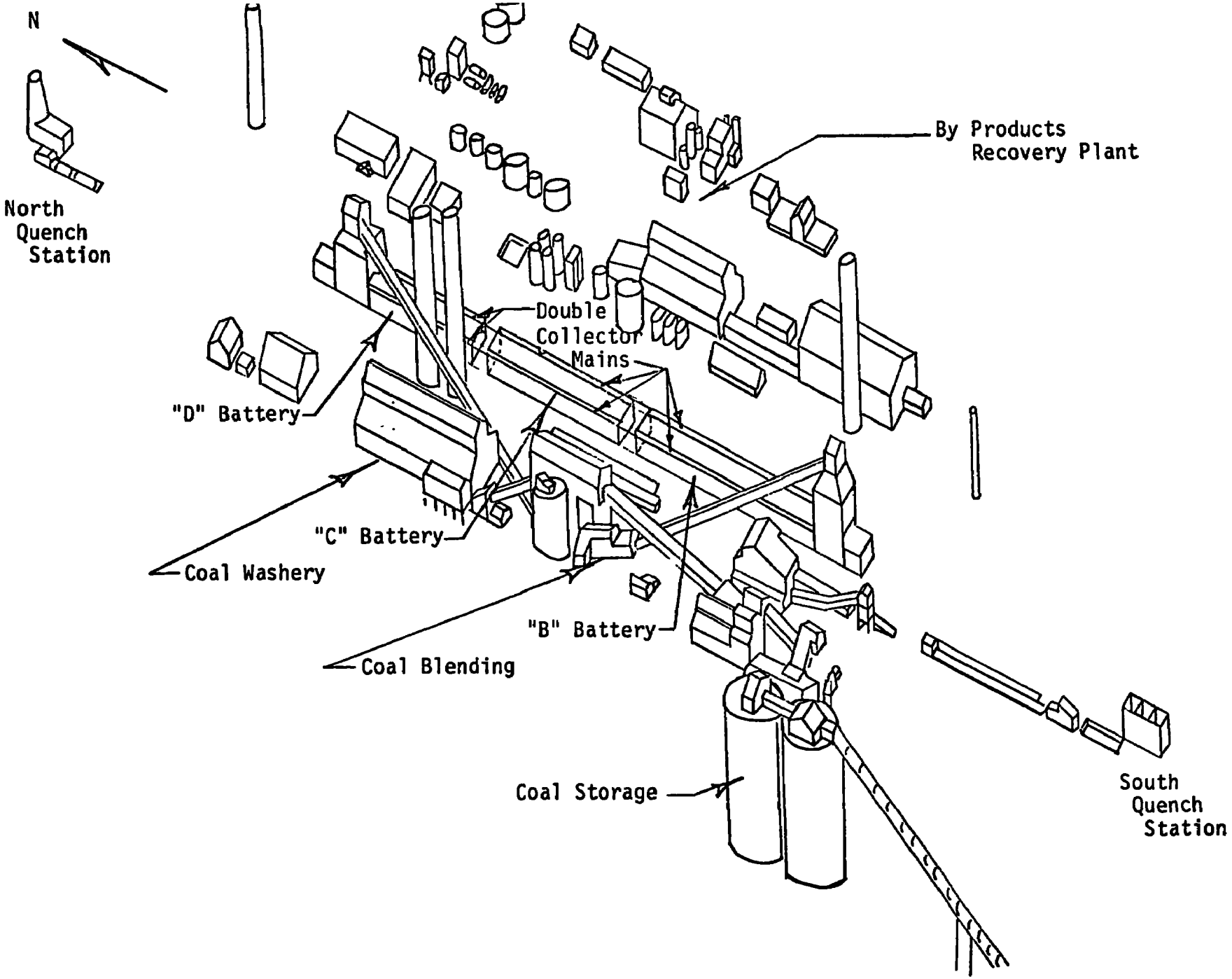


FIGURE 1: CF & I COKE PLANT

with a design coal height of 3.7 m (12 ft). The oven width tapers from 43 cm (16.8 in) on the pusher side to 50 cm (19.8 in) on the coke side. The volume of each oven is reported by the Company to be 21.2 m^3 (747 ft^3). [Note that the coal volume charged to an oven is reported as being greater than the physical volume of the oven.] The oven capacity at a bulk density of 800 kg/m^3 (50 lb/ft^3) is 17.0 m. tons (18.7 tons) of coal per charge, producing 10.3 m. tons (11.3 tons) of coke.[1]

Each oven has four charge ports numbered from push to coke side (east to west). The corresponding hoppers in the larry car contain the following volumes of coal:[2]

#1 - 5.9 m^3 (208 ft^3)	27.7%
#2 - 4.4 m^3 (155 ft^3)	20.7%
#3 - 4.1 m^3 (144 ft^3)	19.2%
#4 - 6.9 m^3 (243 ft^3)	32.4%
21.3 m^3 (750 ft^3)	100.0%

During the February 14-15 survey, the Company reported the coking times to be approximately 18 hours on B Battery, 20 hours on C Battery, and 27 hours on D Battery. The coal analysis--the composite of six incremental grab samples taken during the day shift--for the two days was as follows:[2]

Parameter (units)	2-14-77	2-15-77
Moisture (%)	9.3	10.4
Pulverization (% minus 6 mesh)	79.1	76.0
Ash (%)	8.5	8.8
Volatile Matter (%)	34.2	37.2*
Sulfur (%)	0.52	0.49
Bulk Density (lb/ft^3)	50.10	50.35

*The Company reported this value to be higher than usually experienced.[2]

The blend of coal charged the two days of inspection was as follows:[2]

Washed Allen	- 53%
Sommerset	- 19%
Low Volatile	- 24%
Petroleum Coke	- 4%

VISIBLE EMISSION OBSERVATION RESULTS

The visible emission observation methods used to determine the charging emissions were twofold. With both observers topside, one observer (X) read with a stopwatch and recorded the number of seconds of visible emissions ≥25%* opacity; X read from the south side of the larry car a distance of about seven ovens south of the oven being charged. The view of observer X was significantly obstructed by the larry car itself and required him to stoop down to obtain a limited view. The other observer (Y) located himself between the #2 and #3 charge ports north of the larry car about three to four ovens from the oven being charged. [Note: This observer's position is not indicated on his data sheets.] Observer Y read with a stopwatch and recorded the number of seconds any visible emissions were observed. However, the proximity of Y to the oven being charged prevented him from ever seeing above the larry car (as is true also of the other observer) or having a full view of all drop sleeves simultaneously. The results of the charging observations are contained in Tables 1 and 2.

*25% was stipulated by EPA Region VIII as the level at which opacity should be read by observer X.

TABLE 1: CHARGING EMISSIONS - 2/14/77
CF&I STEEL CORPORATION

Battery	Oven	Time (seconds)	
		≥25% Opacity	≥0% Opacity
C	E-18	7	0
B	A-16	4	13
B	B-16	2	18
B	C-16	2	8
B	A-18	3	23
B	B-18	4	13
B	C-18	16	30
C	F-24	7	17
D	7	0	2
B	A-20	a	3
B	B-20	30	15
B	A-22	9	24
B	B-22	b	2
C	F-1	15	11
B	A-5	1	2
B	B-5	2	8
B	C-5	61	58
B	A-7	0	1
B	B-7	5	28
C	E-11	4	21
D	17	0	5.5
B	C-7	2.5	27

a - no observation made

b - view blocked

TABLE 2: CHARGING EMISSIONS - 2/15/77
CF&I STEEL CORPORATION

Battery	Oven	Time (seconds)	
		≥25% Opacity	≥0% Opacity
C	F-24	6	40
C	E-22	7	44
D	24	27	36
C	E-1	9.5	56
C	F-1	14	113
D	26	0.5	32
D	28	2	20
C	E-5	8	49
C	F-5	0.5	5
C	E-7	2.5	14
D	30	4	37
C	F-7	2	32
C	E-9	6	51
C	F-9	13	48
C	E-17	0	2
D	7	0.5	6
B	B-17	8	51
B	C-17	4	16
B	A-19	2	17
B	B-19	3	51

PROCESS OBSERVATIONS

During the time visible emission observations were made, an NEIC engineer documented process operations, work practices, and current equipment affecting charging emissions. In addition, information on record keeping practices at the plant were obtained from CF&I management personnel. The results are discussed below.

Staged Charging Procedure

The typical charging cycle sequence presently employed at CF&I was instituted in July 1972 on B Battery and is now used on all batteries. Modifications to the sequence have been made from time to time thereafter. The cycle begins when the Koppers-designed and constructed larry car is loaded to the desired hopper loadings as permitted by the volumetric rings at the coal bunkers. The loaded car travels to the oven to be charged and is spotted over the charge ports; the charge port lids had been removed soon after the oven was pushed. Once spotted over the charge ports, the dropsleeves are lowered, the standpipe caps are closed, the dampers to the collector main are opened and the aspiration steam is turned on. The larryman then pushes one button and the charge proceeds automatically as follows:

1. The coal is charged simultaneously from #2 hopper for 16 seconds and from #3 hopper for 11 seconds and the feeders shut off; this practice was instituted in August 1976 to reduce door refractory damage caused by insufficient coal height at the doors.

2. The #1 and #4 hoppers are emptied simultaneously with #1 about 10 seconds ahead of #4, then the slide gates are closed. The slide gates close automatically when the amperage on the screw feed drive motors goes to zero. The operator raises the dropsleeves mechanically and replaces the lids mechanically with the magnetic lid lifters one at a time as the hoppers go empty; the cycle cannot continue until this is done by the larryman. This practice was adopted in February 1977. This operation takes about 100 seconds.

3. After #1 and #4 lids are replaced, #2 hopper is emptied, the dropsleeve is raised, and the lid is replaced. This requires about 38 seconds.

4. A signal is then given the pusherman to open the chuck door and start levelling the oven; this precise practice was adopted in December 1976. (The pusher machine is also Koppers-designed and constructed.)

5. The #3 hopper is emptied in a start-stop manner - run 11 seconds, down 4 seconds, run 8 seconds, down 4 seconds, run 4 seconds, down 4 seconds. The 4 - 4 run-stop then continues until the hopper is emptied, at which time the slide gate closes, the dropsleeve is raised, and the lid is replaced. This practice was developed during June - September 1976.

6. The levelling bar makes one stroke after #3 hopper is emptied and is then withdrawn and the chuck door closed.

7. When the charge is complete (the dropsleeves raised, the lids replaced, the levelling bar withdrawn, and the chuck door closed), the lidman seats the charge port lids and turns the aspirating steam off both sides.

8. The larryman, upon finishing the charge, moves to the oven just pushed and simultaneously mechanically removes the charge port lids and mechanically cleans the goosenecks with a pair of reamers.[1]

On B Battery, pushes are three ovens ahead in the sequence (i.e., when B-8 is pushed, B-6 will be charged, and A-8 and C-6 are both empty); whereas on C and D Batteries, pushes are only two ovens ahead in the sequence. This allows three ovens on B Battery and two ovens on C and D Batteries to decarbonize at a time.

During the two days of inspection, a few charging cycle sequences were timed. The results are contained in Table 3.

Gooseneck and Standpipe Carbon Buildup

Goosenecks are cleaned by a pair of mechanical reamers mounted on the larry car. These devices are used simultaneously while the charge port lids are being removed from a "just-pushed" oven. After the larry car is spotted for a charge, the larryman manually uses a chipping bar to remove carbon deposits in the gooseneck not removed by the mechanical reamers, and carbon deposits on the lip of the standpipe opening and

TABLE 3: CHARGING CYCLE SEQUENCE TIMES
CF&I STEEL CORPORATION

Date	Battery	Oven	Events and Elapsed Time (minutes:seconds)					
			1[a]	2[b]	3[c]	4[d]	5[e]	6[f]
2-14-77	B	B-7	0:00	0:14	1:29	3:14	4:17	5:52
				0:14	1:15	1:45	1:03	1:35
2-15-77	C	F-24	0:00			1:35 - #1 1:56 - #4	2:56	4:33
					1:56		1:00	1:38
2-15-77	C	E-22	0:00	1:11*	0:43*	3:10	4:06	5:28
							0:56	1:22
				0:43				
					0:28			
						1:59		

*Operator reversed practice on this charge sequence.

[a] Larry car spotted

[b] Dropsleeves lowered

[c] Goosenecks checked and/or chipped, standpipe caps closed, collector main dampers opened, aspiration steam turned on

[d] #1 and #4 dropsleeves raised and charge port lids replaced

[e] #2 dropsleeve raised and charge port lid replaced

[f] #3 dropsleeve raised and charge port lid replaced

on the standpipe cap seating edge. No cleaning of the standpipe itself was observed during the two-day inspection, although Company officials indicated this is done occasionally.

During the survey, the standpipes were inspected for carbon buildup. The results are contained in Table 4. For the one oven at which significant standpipe carbon was observed [Table 4], the emissions during the ensuing charge were significantly worse, as read by both observers, than for any other charge observed that day [Table 1].

No gooseneck carbon buildup was observed after cleaning with the reamer and chipping bar. The liquor spray entering the sides of the gooseneck prevented a view of the complete length of the gooseneck. However, no obstruction should occur because of the type and frequency of cleaning.

Aspiration System

The main header pipe for the charging steam aspiration system enters the batteries at the south end of B Battery. From there it splits into two header pipes which run along the pusher and coke sides of all three batteries.

Each header pipe feeds the aspiration steam nozzle which on B, C, and the coke side of D Battery are located atop the gooseneck pointing directly downward into the collector main. On the pusher side of D Battery the steam nozzle points into the gooseneck a few inches below the standpipe opening in the front. The steam nozzles used are multiport self-cleaning nozzles constructed of stainless steel. Each nozzle

TABLE 4: STANDPIPE CARBON BUILDUP
CF&I STEEL CORPORATION

Date	Battery	Oven	PS or CS[a]	Extent of Buildup
2-14-77	B	A-7	PS	None[b]
		B-5	PS	None
		B-7	PS	None
		C-5*	PS	Significant[c]
		C-5	CS	None
		B-7	CS	None
		B-5	CS	None
		A-7	CS	None
		A-9	PS	Some[d]
		A-9	CS	None
	D	19	PS	None
		19	CS	None
		B-9	CS	None
2/15/77	D	7	CS	None
		7	PS	Some
	B	C-17	PS	None
		B-19	PS	None
		B-17	PS	None
		A-19	PS	None
		A-19	CS	Some
		B-17	CS	None
		B-19	CS	None
		C-17	CS	None

a PS means push side; CS means coke side.

b None means no carbon buildup observed; refractory lining seen.

c Significant means greater than 2.5 cm (1 in) buildup on interior wall.

d Some means less than significant carbon buildup, but more than none.

* Observed before push, but obstruction remained after the oven was pushed.

contains six openings, the midpoints of which are on a concentric circle. Each opening is 6.4 mm (1/4 in) and angles slightly outward. The Company was experimenting with bored-out nozzles on a few ovens during our inspection. Ovens A-1 through A-9 on B Battery and Oven F-5 on C Battery have nozzles which have the openings bored out to 4.8 mm (3/16 in). Only two charges were observed on ovens (B/A-5 and B/A-7) with bored-out nozzles [Table 1]. However, these charges were among the best observed by both observers over the two-day inspection.

The principal gauge to measure header steam pressure is located on the south end of B Battery at the bench level. The steam is saturated and regulated to a nominal pressure of 9.1 kg/cm^2 (130 psi). Two additional steam gauges are located at the catwalk level of C Battery. The pusher side gauge is located behind the standpipe for oven E-13; the coke side gauge is located between the standpipes for ovens E-11 and E-12. Several readings of both static (no charging being conducted) and dynamic (during charging) steam pressures were recorded during the two-day inspection [Table 5].

Collector main pressures are measured at the Askania valves for both the pusher side and coke side for each battery by pressure gauges located in a "doghouse" (small corrugated steel shed) on a catwalk east of the battery. These pressures are also recorded on charts in the battery reversing rooms. Nominal readings range between +8 and +12 mm of water.

TABLE 5: ASPIRATION STEAM PRESSURES
CF&I STEEL CORPORATION

Date	Time	Battery	Oven Being Charged	Static Pressure		Dynamic Pressure	
				kg/cm^2	psig	kg/cm^2	psig
2-14-77	1030	a	-	8.6	123	-	-
	1040	C	-	8.8	125[b]	-	-
		C	-	8.8	125[c]	-	-
	1525	C	E-11	-	-	9.1	130[b]
		C	E-11	-	-	9.1	130[c]
	1528	C	-	9.5	135[b]	-	-
		C	-	9.5	135[c]	-	-
2-15-77	0835	C	-	9.1	130[b]	-	-
		C	-	9.1	130[c]	-	-
	1110	C	-	9.1	130[b]	-	-
		C	-	9.1	130[c]	-	-
	1138	C	E-9	-	-	9.5	135[b]
		C	E-9	-	-	9.5	135[c]
	1142	a	-	9.0	128	-	-
	1353	C	-	9.5	135[b]	-	-
		C	-	9.2	132[c]	-	-

a - Reading taken at header gauge at bench level, south end of B Battery.

b - Reading taken at C Battery pusher side gauge.

c - Reading taken at C Battery coke side gauge.

Charge Port Lid Operation

The lid removal and replacement sequences are discussed above in the subsection, Staged Charging Procedure. All lids are removed simultaneously with magnetic lid lifters while both goosenecks are being reamed. The lid replacement sequence is identical to the stage charging sequence. Typically #1 and #4 lid replacement requires 20 seconds; the charge takes 80 seconds, lid replacement 20 seconds, for a total of 100 seconds. Replacement of #2 lid after the #2 hopper is emptied takes about 12 seconds. Once the #3 hopper is discharged, it takes about 21 seconds to replace the charge port lid.[2]

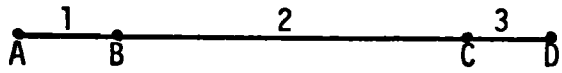
Once the lids are replaced, the lidman may lift a corner to sweep coal spillage into the oven, or he may just tamp the lids until he believes they are seated properly. The lidman then turns off aspiration steam and, if the charge ports leak around the lid, he will sweep excess coal around the perimeter of the lid in an attempt to stop the leaks. At no time is a wet luting material used; the Company believes that use of luting material inhibits effective use of the magnetic lid lifters.

Chuck Door Operation

A process observer positioned on the pusher machine timed the intervals from when the chuck door was opened until levelling began, until levelling ended, and until the chuck door was closed [Tables 6 and 7].

TABLE 6: CHUCK DOOR OPERATION - 2/14/77
CF&I STEEL CORPORATION

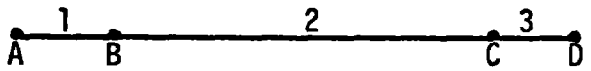
Battery	Oven	Time (minutes:seconds) 1	2	3	1+2+3
C	E-18	0:08	1:17	0:50	2:15
B	A-16	0:15	1:54	0:31	2:30
B	B-16	0:12	1:29	0:44	2:25
B	C-16	0:10	1:50	0:18	2:18
B	A-18	0:18	1:53	0:20	2:31
B	B-18	0:15	1:43	0:29	2:27
B	C-18	0:14	1:15	0:51	2:20
B	A-20	0:14	1:43	0:18	2:16
B	B-20	0:14	1:54	0:21	2:29
B	A-22	0:15	1:36	0:21	2:12
B	B-22	0:16	1:15	0:19	2:26
C	F-1	0:13	2:09	0:17	2:39
B	A-5	0:10	1:53	0:11	2:14
B	B-5	0:09	1:33	0:11	1:53
B	C-5	0:10	1:47	0:11	2:08
B	A-7	0:10	1:39	0:09	1:58
B	B-7	0:9	1:43	0:09	2:01
C	E-11	0:10	1:32	0:41	2:23
B	C-7	0:10	1:32	0:11	1:53
	AVERAGE	0:12	1:42	0:23	2:17



A = Chuck door opened
B = Levelling begun
C - Levelling ended
D - Chuck door closed

TABLE 7: CHUCK DOOR OPERATION - 2/15/77
CF&I STEEL CORPORATION

Battery	Oven	Time (minutes:seconds)			
		1	2	3	1+2+3
C	F-24	0:15	2:13	0:23	2:51
C	E-22	0:15	2:08	0:22	2:45
D	24	0:11	2:15	0:21	2:47
C	E-1	0:15	2:22	0:21	2:58
C	F-1	0:20	2:18	0:21	2:59
D	26	0:16	2:07	0:21	2:44
D	28	0:14	2:21	0:25	2:59
C	E-5	0:17	2:22	0:21	3:00
C	F-5*	0:15	2:38	0:31	3:14
C	E-7	0:15	1:56	0:16	2:27
D	30	0:15	1:57	0:20	2:32
C	F-7	0:15	1:46	0:19	2:20
C	E-9	0:11	2:11	0:15	2:37
C	F-9	0:10	2:14	0:16	2:40
C	E-17	0:11	2:04	0:13	2:28
D	7	0:10	1:58	0:17	2:25
AVERAGE		0:14	2:10	0:20	2:44



A = Chuck door opened
B = Levelling begun
C = Levelling ended
D = Chuck door closed

*Second time chuck door was opened.

Roof and Charge Port Carbon Buildup

The perimeters of a few open charge ports were inspected and no significant buildup, which could obstruct the free flow of coal into the oven, was observed. In addition, the roofs of a few ovens were inspected following the push. The results of the roof carbon buildup observations are contained in Table 8.

No air cleaning of oven roofs is conducted. The pusher machine rams are plumbed for it, but the Company has disconnected the air line because it believes air cleaning would not be worthwhile.

Peak and Channel Heights

According to a Company official, measurements of coal peak heights and channel height after levelling have been conducted by CF&I. However, no data on these measurements were requested or received. The Company desires a 30 cm (12 in) channel height. No measurements of coal peak or channel heights were made during the two-day inspection.

Personnel

CF&I provided one larryman and one lidman for each of the two operating units. However, between 2:30 and 6:30, both a.m. and p.m., only one crew of these two persons operated the batteries because of the coking schedule. [Note: only three of the four blast furnaces were in operation during this inspection.] In addition, CF&I purportedly provided one "tar chaser" per battery during the day shift, although

TABLE 8: ROOF CARBON BUILDUP
CF&I STEEL CORPORATION

Battery	Oven	Roof Carbon Buildup	Location
D	26	None[a]	-
C	E-3	None	-
C	F-3	None	-
C	E-5	Some[b]	Between CS standpipe and #4 charge port
C	F-5	None	Between PS standpipe and #1 charge port

a None means no roof carbon to some roof carbon (<2.5 cm thick)
b Some means roof carbon patches 2.5 to 5 cm (1 to 2 in) thick

this person was not readily identifiable. Patching crews, usually consisting of a patcher and a helper, were available both on the topside and at the bench level. The pusher machine man and coke side door machine man both had helpers who assisted in door cleaning. A newly appointed Smoke Control Officer (may not be correct title), who reports directly to the Coke Plant Superintendent's office, observes smoke emissions from all facets of the coking operation, including charging, and attempts to determine the reasons for and to take corrective action when significant emissions occur.

Record Keeping

An attempt was made to determine the kinds of data recorded by the Company as normal practice and the length of time such records are kept. Primary emphasis was on those kinds of data which may be directly or indirectly associated with charging operations.

In the reversing rooms of all three batteries, the following parameters and their units are recorded on circular charts:

1. Inlet and outlet temperatures of fuel gas heater (°C)
2. Fuel gas flow rate (1,000 scfm)
3. Fuel gas pressure (mm of water)
4. Waste gas draft (mm of water)
5. Waste gas flue temperature (°C)
6. Pressures (mm of water)
    a. North offtake main
    b. South offtake main
    c. North crossover main
    d. South crossover main

7. Temperatures (°C)
    a. North offtake main
    b. South offtake main

According to a Company official, these charts are removed daily, examined for aberrations, and discarded. No attempt was made to obtain the pertinent charts for the days of this inspection.

Coal is sampled daily by developing a composite of six grab samples from the conveyor belt to the coal bunkers. To date, no attempt has been made by the Company to take samples at the larry car hoppers. Daily coal analysis parameters include percent moisture, percent ash, percent volatile matter, percent sulfur, bulk density, and size distribution [+13 mm (1/2 in), - 13 mm (1/2 in) + 6 mesh, -6 mesh + 20 mesh, -20 mesh +100 mesh, -100 mesh].

Coke is also analyzed daily. Parameters of interest to the Company include percent moisture, percent ash, percent fixed carbon, percent volatile matter, percent sulfur, size distribution, and stability.

The Company presently uses the available tar in the blast furnaces, so they are not overly concerned with tar quality. However, they do measure and record tar quality as percent quinoline insolubles (QI).

Coal, coke, and tar quality analytical data are all recorded daily on special forms. These forms are kept for historical purposes. Although the precise length of time they are kept was not revealed, it is probable that they are kept for several years because of their use in the operation of the coke plant.

SUMMARY AND CONCLUSIONS

CF&I Steel Corporation operates an integrated steel manufacturing facility in Pueblo, Colorado. It is the single largest stationary source of air pollution in the State of Colorado.

On February 14 and 15, 1977 EPA Region VIII, with assistance from the EPA NEIC and the Pueblo City/County Health Department (PC/CHD), conducted a survey of CF&I's three coke batteries to document continuing violations of Colorado Air Pollution Control Commission (CAPCC) Regulation 1.A.1 for charging operations. Simultaneously, an EPA NEIC engineer observed process operation, work practices, and current equipment used at CF&I to minimize charging emissions. In addition, the engineer reviewed available charts and records which are kept by the coke plant operations personnel.

The following conclusions are based on the two-day survey and a review of the information and data obtained:

1. Charging at CF&I is not in compliance with CAPCC Regulation 1.A.1. Nearly all of the charges observed produced emissions that exceeded 25 percent opacity.

2. The automation of the larry cars reduces the probability of stage charging procedures changing from oven to oven. Indeed, the electronically controlled system should reduce the chance for operator-error-caused charging emissions to zero.

3. The mechanical reamers mounted on the larry car and used to clean the goosenecks should assure clean goosenecks, hence assure maximum effectiveness of steam aspiration.

4. Significant standpipe carbon buildup can impair airflow through the standpipe and gooseneck into the collector main. In the one case where a significant buildup was observed, the ensuing charging emissions were twice the duration of any other charges observed that day.

5. Charging emissions from the ovens with bored-out nozzles (B/A-5 and B/A-7) were of shorter duration than most charges observed. Increasing the effective steam nozzle diameter appeared to reduce charging emissions.

6. Roof and charge port carbon buildup were not significant.

REFERENCES

1. Letter from J. C. Winkley, Manager, Air and Water Quality Control, CF&I Steel Corporation to Norman A. Huey, Chief, Technical Support Section, EPA-Region VIII, March 9, 1977.

2. Letter from J. C. Winkley, Manager, Air and Water Quality Control, CF&I Steel Corporation to Gary D. Young, Chief, Air Technology Branch, EPA-NEIC, Denver, February 22, 1977