AN AIR POLLUTION CONTROL EQUIPMENT INVENTORY OF THE AMERICAN STEEL INDUSTRY

Volume 2

Draft Final Report

GCA CORPORATION
Technology Division

213 Burlington Road
Bedford, Mass. 01730

GCA-TR-82-11-G

U.S. ENVIRONMENTAL PROTECTION AGENCY
Division of Stationary Source Enforcement
Washington, D.C.

Contract No. 68-01-6316
Technical Service Area 1
Work Assignment No. 28

EPA Project Officer	EPA Task Manager	EPA Assignment Manager
John R. Busik	Bernard Bloom	Laxmi Kesari

AN AIR POLLUTION CONTROL EQUIPMENT INVENTORY OF THE AMERICAN STEEL INDUSTRY

Volume 2

Draft Final Report

February 1982

Prepared by:

Michael Jasinski
Peter Spawn
Sandra Beaton
Eugene Bergson
William Farino

GCA CORPORATION
GCA/TECHNOLOGY DIVISION
Bedford, Massachusetts

DISCLAIMER

This Draft Final Report was furnished to the Environmental Protection Agency by GCA Corporation, GCA/Technology Division, Burlington Road, Bedford, Massachusetts 01730, in partial fulfillment of Contract No. 68-01-6136, Technical Service Area 1, Work Assignment No. 28. The opinions, findings, and conclusions expressed are those of the authors and not necessarily those of the Environmental Protection Agency. Mention of company or product names is not to be considered as an endorsement by the Environmental Protection Agency.

SPECIAL NOTE

The inventory reported in this document was initiated in October 1980 under EPA Contract No. 68-01-4143, Technical Service Area 1, Task No. 94. Additional data compilation and investigation were performed in January 1981 under EPA Contract No. 68-01-6316, Technical Service Area 1, Task No. 6 (Phase II), and in March 1981 under EPA Contract No. 68-01-6316, Technical Service Area 1, Work Assignment No. 6 (Amendment 1 - Phase III). Mr. Bernard Bloom and Mr. Laxmi Kesari served as EPA Task Directors/Assignment Managers for this program.

All material presented in this document is subject to a confidentiality review, and is not releasable as of February 1, 1982. For further information, contact Mr. Laxmi Kesari, United States Environmental Protection Agency, Division of Stationary Source Enforcement, Washington, D.C.

TABLES
(Volume 2)

MATERIAL IN THIS SECTION SUBJECT TO CONFIDENTIALITY REVIEW AND IS NOT RELEASABLE AS OF FEBRUARY 1, 1982. FOR INFORMATION, CONTACT L. KESARI, U.S. ENVIRONMENTAL PROTECTION AGENCY, DIVISION OF STATIONARY SOURCE ENFORCEMENT.

TABLE 1. ARMCO INC./MIDDLETOWN WORKS IN MIDDLETOWN, OH

COKE PLANT NOS. 2[a] AND 3[b] COKE OVEN GAS DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

BATTERY DESIGNATION:	No. 1[1]	No. 1[1]	No. 2[1]
MANUFACTURER:	Wilputte[1]	Dravo-Still (both batteries)[1]	
STARTUP DATE:	1953[2,3]	1976[1]	1977[1]
RECENT REHABILITATION DATE:			
SCHEDULED SHUTDOWN DATE:			
NO. OF OVENS:	76[1]	57[1]	57[1]
OVEN HEIGHT (ft-in.):	13-6[1]	19-8[1]	19-8[1]
OVEN LENGTH (ft-in.):	43-9[1]	52-6[1]	52-6[1]
COKE PRODUCTION:			
RATED TONS/DAY:	5,150 (all three batteries combined)[4]		
TYPICAL TONS/DAY:	4,890 (all three batteries combined)[4]		
PERCENT SULFUR OF COAL (BY WEIGHT):	0.6 (for all three batteries)[2]		
QUANTITY OF COG PRODUCED (ft^3/day):	77 x 10^6 (all three batteries combined)[5]		
TYPE OF DESULFURIZATION PROCESS:	Carl Still (serves all three batteries)[6,7]		
MANUFACTURER:	Dravo[8]		
DATE INSTALLED:	1976[7]		
SYSTEM DESCRIPTION:	• Carl Still process uses liquid oxidation for sulfur removal[8] • Process handles 60 x 10^6 scfd of COG, and uses sulfuric acid production for sulfur recovery[8] • NH_3 used as an absorbent in sulfur removal process[8]		

ADDITIONAL COMMENTS:

[a]Battery No. 1 (Wilputte).[2]

[b]Battery Nos. 1 and 2 (Dravo-Still).[2]

TABLE 2. BETHLEHEM STEEL CORP./BETHLEHEM PLANT IN BETHLEHEM, PA

COKE OVEN GAS DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

BATTERY DESIGNATION:	2A[2]	2B[2]	3A[2]	3B[2]
MANUFACTURER:	Koppers-Becker (batteries 2A through 3B)[2]			
STARTUP DATE:	1941[2]	1941[2]	1942[2]	1942[2]
RECENT REHABILITATION DATE:				
SCHEDULED SHUTDOWN DATE:				
NO. OF OVENS:	102[b,10]		102[c,10]	
OVEN HEIGHT (m):	3[2]	3[2]	3[2]	3[2]
OVEN LENGTH (ft-in.):				
COKE PRODUCTION:				
RATED TONS/DAY:	5,840 (all six batteries combined)[4]			
TYPICAL TONS/DAY:	5,058 (all six batteries combined)[4]			
PERCENT SULFUR OF COAL (BY WEIGHT):	1.0 (for all six batteries)[2]			
QUANTITY OF COG PRODUCED (ft^3/day):	100×10^6 (all six batteries combined)[11]			
TYPE OF DESULFURIZATION PROCESS:	Sulfiban (2 plants-serve all six batteries)[6,8]			
MANUFACTURER:	Bethlehem Steel/Applied Technology[8]			
DATE INSTALLED:	1975[d,8,12]			
SYSTEM DESCRIPTION:	• Liquid absorption for sulfur removal[8] • Amine solution (approximately 15% monoethanol amine "MEA") as absorbent[8] • Claus plant for sulfur recovery[8] • Each sulfiban plant handles approximately 60×10^6 cu ft COG per day[8]			

(continued)

TABLE 2 (continued)

COKE OVEN GAS DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

BATTERY DESIGNATION:	5[2]	A[2]
MANUFACTURER:	Koppers-Becker[2]	McKee-Otto[2]
STARTUP DATE:	1953[a,2]	1976[2]
RECENT REHABILITATION DATE:		
SCHEDULED SHUTDOWN DATE:		
NO. OF OVENS:	80[2]	80[2]
OVEN HEIGHT (m):	4[2]	6[2]
OVEN LENGTH (ft-in.):		
COKE PRODUCTION:		
RATED TONS/DAY:	See previous page[4]	
TYPICAL TONS/DAY:		
PERCENT SULFUR OF COAL (BY WEIGHT):	See previous page[2]	
QUANTITY OF COG PRODUCED (ft^3/day):	See previous page[11]	
TYPE OF DESULFURIZATION PROCESS:	Sulfiban (2 plants--serve all six batteries)[6,8]	
MANUFACTURER:		
DATE INSTALLED:		
SYSTEM DESCRIPTION:	See previous page for description.[8]	

ADDITIONAL COMMENTS:

[a]Battery 5 rebuilt in 1977.[9]

[b]Battery 2A and 2B combined.[1,10]

[c]Battery 3A and 3B combined.[1,10]

[d]Sulfiban plants rebuilt in 1976.[8,12]

TABLE 3. BETHLEHEM STEEL CORP./BURNS HARBOR PLANT IN CHESTERTON, IN

COKE OVEN GAS DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

BATTERY DESIGNATION:	No. 1[1]	No. 2[1]
MANUFACTURER:	Wilputte[1]	Koppers[1]
STARTUP DATE:	1969[13]	1972[13]
RECENT REHABILITATION DATE:	1980[a,14]	
SCHEDULED SHUTDOWN DATE:	1982[b,16]	
NO. OF OVENS:	82[1]	82[1]
OVEN HEIGHT (ft-in.):	20-5[14]	20-5[14]
OVEN LENGTH (ft-in.):	50-7[14]	50-7[14]
COKE PRODUCTION:		
RATED TONS/DAY:	6,670 (both batteries combined)[4]	
TYPICAL TONS/DAY:	5,179 (both batteries combined)[4]	
PERCENT SULFUR OF COAL (BY WEIGHT):	0.89 (for both batteries)[14]	
QUANTITY OF COG PRODUCED (ft^3/day):	120 x 10^6 (both batteries combined)[11]	
TYPE OF DESULFURIZATION PROCESS:	Vacuum Carbonate (serves both batteries)[6]	
MANUFACTURER:	Koppers[9]	
DATE INSTALLED:	1972[6,15]	
SYSTEM DESCRIPTION:	• Process uses liquid absorption for sulfur removal[8] • Claus plant used for sulfur recovery (HCN destruct)[8] • Sodium carbonate solution used for absorption[8]	

ADDITIONAL COMMENTS:

[a]Involved changing steam nozzles, i.e., increasing aspiration and rebuilding battery top.[14]

[b]Scheduled shutdown for rebuild, i.e., double collector mains to be installed.[16]

TABLE 4. BETHLEHEM STEEL CORP./LACKAWANNA PLANT IN LACKAWANNA, NY

COKE OVEN GAS DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

BATTERY DESIGNATION:[a]	No. 7[2]	No. 8[2]	No. 9[2]
MANUFACTURER:	Wilputte[2]	Wilputte[2]	Wilputte[2]
STARTUP DATE:	1952[2]	1961[2]	1969[2]
RECENT REHABILITATION DATE:		1980[b,17]	
SCHEDULED SHUTDOWN DATE:			1982[c,18]
NO. OF OVENS:	76[2]	76[2]	76[2]
OVEN HEIGHT (ft-in.):	12-2[19]	12-2[19]	20-4[19]
OVEN LENGTH (ft-in.):	40-7[19]	40-7[19]	48-3[19]

COKE PRODUCTION:[d]

RATED TONS/DAY:	8,140 (for seven battery operation)[4]
TYPICAL TONS/DAY:	6,908 (for seven battery operation)[4]
PERCENT SULFUR OF COAL (BY WEIGHT):	1.1 (for all three batteries)[2]
QUANTITY OF COG PRODUCED (ft^3/day):	50-60 x 10^6 (all three batteries combined)[8,18]
TYPE OF DESULFURIZATION PROCESS:	Vacuum Carbonate (serves all three batteries)[6]
MANUFACTURER:	Koppers[8]
DATE INSTALLED:[e]	1976[18]
SYSTEM DESCRIPTION:	• Uses liquid absorption for sulfur removal[8] • Sulfuric acid production for sulfur recovery[8] • Sodium carbonate solution used for absorption[8]

ADDITIONAL COMMENTS:

[a]Batteries No. 3, 4, 5 and 6 were shut down in 1977.[18]

[b]Battery was completely rebuilt.[17]

[c]Scheduled shutdown for rebuild.[18]

[d]Production data appears to be prior to 1977 battery shut downs.[4]

[e]System was rebuilt in 1979.[18]

TABLE 5. BETHLEHEM STEEL CORP./SPARROWS POINT PLANT IN SPARROWS POINT, MD

COKE OVEN GAS DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

BATTERY DESIGNATION:[a]	No. 1[2]	No. 2[2]	No. 3[2]	No. 4[2]
MANUFACTURER:	Koppers (all four batteries)[2]			
STARTUP DATE:	1960[2]	1961[2]	1951[2]	1978[2]
RECENT REHABILITATION DATE:				
SCHEDULED SHUTDOWN DATE:	1985[b,20]	1985[b,20]	1982[c,21]	1985[b,20]
NO. OF OVENS:	63[2]	60[2]	63[2]	63[2]
OVEN HEIGHT (m):	3 (each, all six batteries)[2]			
OVEN LENGTH (ft-in.):	43-0 (each, all six batteries)[1]			
COKE PRODUCTION:				
RATED TONS/DAY:	5,500 (all eight batteries combined)[21]			
TYPICAL TONS/DAY:				
PERCENT SULFUR OF COAL (BY WEIGHT):	1.1;[2] 0.74-avg. in 1974[22] (for all eight batteries)			
QUANTITY OF COG PRODUCED (ft^3/day):	100 x 10^6;[11] 131.9 x 10^6--avg. in 1974[22] (all eight batteries combined)			
TYPE OF DESULFURIZATION PROCESS:	Vacuum Carbonate (serves all eight batteries)[6,20]			
MANUFACTURER:	Koppers[8]			
DATE INSTALLED:				
SYSTEM DESCRIPTION:	• Liquid absorption for sulfur removal[8] • Sodium carbonate solution (approximately 2 percent) used as absorbent[8,22]			

(continued)

TABLE 5 (continued)

COKE OVEN GAS DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

BATTERY DESIGNATION:[a]	No. 5[2]	No. 6[2]	No. 11[2]	No. 12[2]
MANUFACTURER:	Koppers[2]	Koppers[2]	Koppers-Becker[2]	Koppers-Becker[2]
STARTUP DATE:	1978[2]	1953[2]	1955[2]	1957[2]
RECENT REHABILITATION DATE:				
SCHEDULED SHUTDOWN DATE:	1985[b,20]	1982[c,21]		
NO. OF OVENS:	63[2]	63[2]	65[2]	65[2]
OVEN HEIGHT (m):	3[2]	3[2]	4[2]	4[2]
OVEN LENGTH (ft-in.):	43-0[1]	43-0[1]	43-0[1]	43-0[1]
COKE PRODUCTION:				
RATED TONS/DAY:	See previous page[21]			
TYPICAL TONS/DAY:				
PERCENT SULFUR OF COAL (BY WEIGHT):	See previous page[2,22]			
QUANTITY OF COG PRODUCED (ft^3/day):	See previous page[11,22]			
TYPE OF DESULFURIZATION PROCESS:	Vacuum Carbonate (serves all eight batteries)[6,20]			
MANUFACTURER:				
DATE INSTALLED:				
SYSTEM DESCRIPTION:	See previous page for description[8,22]			

ADDITIONAL COMMENTS:

[a]Battery Nos. 9 and 10 were shut down in early 1981.[21]

[b]New Battery "A" to start-up in December 1981; new Battery "B" scheduled to start-up in December 1985 will replace Battery Nos. 1, 2, 4, and 5.[21]

[c]Plant has the option to either shut down Battery Nos. 3 and 6 in 1982, or continue their operation until 1985.[21]

TABLE 6. INLAND STEEL CORP./INDIANA HARBOR WORKS IN E. CHICAGO, IN

COKE PLANT NO. 2 COKE OVEN GAS DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

BATTERY DESIGNATION:	No. 6[1]	No. 7[1]	No. 8[1]
MANUFACTURER:	Koppers-Becker (all three batteries)[1]		
STARTUP DATE:	1950[1]	1956[1]	1958[1]
RECENT REHABILITATION DATE:	1971[a,2]	1974[a,2]	
SCHEDULED SHUTDOWN DATE:			
NO. OF OVENS:	65[1]	87[1]	87[1]
OVEN HEIGHT (ft-in.):	12-0[1]	12-0[1]	12-0[1]
OVEN LENGTH (ft-in.):	37-7[1]	37-7[1]	37-7[1]
COKE PRODUCTION:			
RATED TONS/DAY:	6170 (all five batteries combined)[4]		
TYPICAL TONS/DAY:	5640 (all five batteries combined)[4]		
PERCENT SULFUR OF COAL (BY WEIGHT):	0.8 (for all five batteries)[2]		
QUANTITY OF COG PRODUCED (ft^3/day):	50×10^6 (all five batteries combined)[8]		
TYPE OF DESULFURIZATION PROCESS:	Vacuum Carbonate (serves all five batteries)[6]		
MANUFACTURER:	Koppers[8]		
DATE INSTALLED:	1974[6]		
SYSTEM DESCRIPTION:	• Vacuum carbonate process uses liquid absorption for sulfur removal.[8] • Claus plant, with water wash of HCN, for sulfur recovery.[8] • Sodium carbonate solution used for absorption.[8]		

(continued)

TABLE 6 (continued)

COKE PLANT NO. 2 COKE OVEN GAS DESULFURIZATION PROCESS
AND EMISSION CONTROL DATA

BATTERY DESIGNATION:	No. 9[1]	No. 10[1]
MANUFACTURER:	Koppers-Becker (both batteries)[1]	
STARTUP DATE:	1959[1]	1970[1]
RECENT REHABILITATION DATE:		
SCHEDULED SHUTDOWN DATE:		
NO. OF OVENS:	87[1]	51[1]
OVEN HEIGHT (ft-in.):	12-0[1]	20-0[1]
OVEN LENGTH (ft-in.):	37-7[1]	37-4[1]
COKE PRODUCTION:		
RATED TONS/DAY:	See previous page[4]	
TYPICAL TONS/DAY:		
PERCENT SULFUR OF COAL (BY WEIGHT):	See previous page[2]	
QUANTITY OF COG PRODUCED (ft^3/day):	See previous page[8]	
TYPE OF DESULFURIZATION PROCESS:	Vacuum Carbonate (serves all five batteries)[6]	
MANUFACTURER:		
DATE INSTALLED:		
SYSTEM DESCRIPTION:	See previous page for description[6,8]	

ADDITIONAL COMMENTS:

[a]Involved end-flue rehabilitation[2]

TABLE NO. 7. INLAND STEEL CORP./INDIANA HARBOR WORKS IN E. CHICAGO, IN

COKE PLANTS NO. 3[a] AND 4[b] COKE OVEN GAS DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

BATTERY DESIGNATION:	C[1]	11[1]
MANUFACTURER:	Koppers[1]	Koppers[1]
STARTUP DATE:	1974[1]	1978[1]
RECENT REHABILITATION DATE:	1979[c,23]	
SCHEDULED SHUTDOWN DATE:		
NO. OF OVENS:	56[1]	69[1]
OVEN HEIGHT (ft-in.):	20-2[1]	20-2[1]
OVEN LENGTH (ft-in.):	47-11[1]	47[1]
COKE PRODUCTION:		
RATED TONS/DAY:	3014 (battery C)[4]	2500 (battery No. 11)[4]
TYPICAL TONS/DAY:	2740 (battery C)[4]	1562 (battery No. 11)[4]
PERCENT SULFUR OF COAL (BY WEIGHT):	1.1 (for both batteries)[2]	
QUANTITY OF COG PRODUCED (ft^3/day):		
TYPE OF DESULFURIZATION PROCESS:	Vacuum Carbonate (serves battery C)[23]	Vacuum Carbonate (serves battery No. 11)[6]
MANUFACTURER:	Koppers[23]	Koppers[8]
DATE INSTALLED:	1974[23]	1978[6]
SYSTEM DESCRIPTION:	• Vacuum carbonate processes use liquid absorption for sulfur removal.[8] • Claus plant, with water wash of HCN, for sulfur recovery.[8] • Sodium carbonate solution used for absorption.[8]	

ADDITIONAL COMMENTS:

[a]Battery C

[b]Battery No. 11

[c]Involved end-flue rehabilitation[23]

TABLE 8. JONES & LAUGLIN STEEL CORP./ALIQUIPPA WORKS IN ALIQUIPPA, PA

COKE OVEN GAS DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

BATTERY DESIGNATION:[a]	A-1[1]	A-5[b,1]
MANUFACTURER:	Koppers-Becker[2]	Koppers[1]
STARTUP DATE:	1945[1]	1976[13]
RECENT REHABILITATION DATE:	1978[24]	
SCHEDULED SHUTDOWN DATE:		
NO. OF OVENS:	106[1]	56[1]
OVEN HEIGHT (ft-in.):	13-0[1]	20-6[1]
OVEN LENGTH (ft-in.):	40-5[1]	50-7[1]
COKE PRODUCTION:[c]		
RATED TONS/DAY:	4,308 (both batteries combined)[25]	
TYPICAL TONS/DAY:	3,500 (both batteries combined)[26]	
PERCENT SULFUR OF COAL (BY WEIGHT):	1.0 (for both batteries)[2,26]	
QUANTITY OF COG PRODUCED (ft^3/day):	64.6×10^6 (both batteries combined)[25]	
TYPE OF DESULFURIZATION PROCESS:	Carl Still (serves both batteries)[6,25]	
MANUFACTURER:	Dravo[8]	
DATE INSTALLED:	1981[24,25]	
SYSTEM DESCRIPTION:	• Liquid absorption used for sulfur removal[8]	

ADDITIONAL COMMENTS:

[a]Batteries A-3 and A-4 were shut down in 1980.[24]

[b]Battery A-5 replaced battery A-2 in 1975-1976.[26]

[c]Production data for a 4-battery operation (A-1, A-3, A-4, and A-5) = 6,946 (rated tons/day); 4,506 (typical tons/day).[4]

TABLE 9. JONES & LAUGHLIN STEEL CORP./PITTSBURGH WORKS IN PITTSBURGH, PA

COKE OVEN GAS DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

BATTERY DESIGNATION:	P1[1]	P2[1]	P3N[1]
MANUFACTURER:	Wilputte[1]	Wilputte[1]	Wilputte[1]
STARTUP DATE:	1960[1]	1961[1]	1961[1]
RECENT REHABILITATION DATE:	1979[27]	1977[a,2]	1980[27]
SCHEDULED SHUTDOWN DATE:			
NO. OF OVENS:	59 (each, batteries P1 through P3N)[1]		
OVEN HEIGHT (ft-in.):	13-0 (each, batteries P1 through P3N)[1]		
OVEN LENGTH (ft-in.):	40-9 (each, batteries P1 through P3N)[1]		
COKE PRODUCTION:			
RATED TONS/DAY:	5,300 (all five batteries combined)[4]		
TYPICAL TONS/DAY:	5,230 (all five batteries combined)[4]		
PERCENT SULFUR OF COAL (BY WEIGHT):	1.2;[2] 0.9-1.2[27] (for all five batteries)		
QUANTITY OF COG PRODUCED (ft^3/day):	80 x 10^6;[11] 90 x 10^6 (all five batteries combined)[27]		
TYPE OF DESULFURIZATION PROCESS:	Sulfiban (serves all five batteries)[6]		
MANUFACTURER:	Bethlehem Steel/Applied Technology[8]		
DATE INSTALLED:	1975[b,8]		
SYSTEM DESCRIPTION:	• Process uses liquid absorption for sulfur removal[8] • Amine solution (~15% monoethanol amine) used as absorbent[8] • Sulfuric acid production used for sulfur recovery[c,8]		

(continued)

TABLE 9 (continued)

COKE OVEN GAS DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

BATTERY DESIGNATION:	P3S[1]	P4[1]
MANUFACTURER:	Wilputte[1]	Koppers-Becker[2]
STARTUP DATE:	1961[1]	1953[1]
RECENT REHABILITATION DATE:	1978[a,2]	1979[a,2]
SCHEDULED SHUTDOWN DATE:		
NO. OF OVENS:	59[1]	79[1]
OVEN HEIGHT (ft-in.):	13-0[1]	13-0[1]
OVEN LENGTH (ft-in.):	40-9[1]	40-6[1]
COKE PRODUCTION:		
RATED TONS/DAY:	See previous page[4]	
TYPICAL TONS/DAY:		
PERCENT SULFUR OF COAL (BY WEIGHT):	See previous page[2,27]	
QUANTITY OF COG PRODUCED (ft^3/day):	See previous page[11,27]	
TYPE OF DESULFURIZATION PROCESS:	Sulfiban (serves all five batteries)[6]	
MANUFACTURER:		
DATE INSTALLED:		
SYSTEM DESCRIPTION:	See previous page for description[8]	

ADDITIONAL COMMENTS:

[a]Involved end-flue rehabilitation.[2]

[b]Relined in 1977.[8]

[c]Sulfuric acid plant has not operated since Dec. 1976.[8]

TABLE 10. KAISER STEEL CORP. IN FONTANA, CA

COKE OVEN GAS DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

BATTERY DESIGNATION:	A[1]	B[1]
MANUFACTURER:	Koppers-Becker[2]	Koppers-Becker[2]
STARTUP DATE:	1942[28]	1942[28]
RECENT REHABILITATION DATE:[a]	1973[28]	1973[28]
SCHEDULED SHUTDOWN DATE:		
NO. OF OVENS:	45[28]	45[28]
OVEN HEIGHT (ft-in.):	13-0[28]	13-0[28]
OVEN LENGTH (ft-in.):	40-5[28]	40-5[28]
COKE PRODUCTION:		
RATED TONS/DAY:	4,250;[1] 4,100[4] (all seven batteries combined)	
TYPICAL TONS/DAY:	3,800 (all seven batteries combined)[4]	
PERCENT SULFUR OF COAL (BY WEIGHT):	0.75 (avg.);[28] 0.9[2] (for all seven batteries)	
QUANTITY OF COG PRODUCED (ft^3/day):		
TYPE OF DESULFURIZATION PROCESS:	Takahax-A (serves all seven batteries)[6]	
MANUFACTURER:	Nippon/Chemico[8]	
DATE INSTALLED:	1981[c,29]	
SYSTEM DESCRIPTION:	• Process uses liquid oxidation for sulfur removal[8] • NH_3 absorption together with wet oxidation removes sulfur[8]	

(continued)

TABLE 10 (continued)

COKE OVEN GAS DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

BATTERY DESIGNATION:	C[1]	D[1]
MANUFACTURER:	Koppers-Becker[2]	Koppers-Becker[2]
STARTUP DATE:	1949[28]	1952[28]
RECENT REHABILITATION DATE:	1976[a,28]	1979-80[b,28]
SCHEDULED SHUTDOWN DATE:		
NO. OF OVENS:	45[28]	45[28]
OVEN HEIGHT (ft-in.):	13-0[28]	13-0[28]
OVEN LENGTH (ft-in.):	40-5[28]	40-5[28]
COKE PRODUCTION:		
RATED TONS/DAY:	See previous page[1,4]	
TYPICAL TONS/DAY:		
PERCENT SULFUR OF COAL (BY WEIGHT):	See previous page[2,28]	
QUANTITY OF COG PRODUCED (ft^3/day):		
TYPE OF DESULFURIZATION PROCESS:	Takahax-A (serves all seven batteries)[6]	
MANUFACTURER:		
DATE INSTALLED:		
SYSTEM DESCRIPTION:	See previous page for description[8,29]	

(continued)

TABLE 10 (continued)

COKE OVEN GAS DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

BATTERY DESIGNATION:	E[1]	F[1]	G[1]
MANUFACTURER:	Koppers-Becker[2]	Koppers-Becker[2]	Koppers-Becker[2]
STARTUP DATE:	1952[28]	1958[28]	1958[28]
RECENT REHABILITATION DATE:	1978[b,28]		
SCHEDULED SHUTDOWN DATE:			
NO. OF OVENS:	45[28]	45[28]	45[28]
OVEN HEIGHT (ft-in.):	13-0[28]	13-0[28]	13-0[28]
OVEN LENGTH (ft-in.):	40-5[28]	40-5[28]	40-5[28]

COKE PRODUCTION:

RATED TONS/DAY:	See previous pages[1,4]
TYPICAL TONS/DAY:	

PERCENT SULFUR OF COAL (BY WEIGHT): See previous pages[2,28]

QUANTITY OF COG PRODUCED (ft^3/day):

TYPE OF DESULFURIZATION PROCESS: Takahax-A (serves all seven batteries)[6]

MANUFACTURER:	
DATE INSTALLED:	
SYSTEM DESCRIPTION:	See previous pages for description[8,29]

ADDITIONAL COMMENTS:

[a]Involved trimwork.[28]

[b]Involved end-flue rehabilitation.[28]

[c]Facility shut down in March 1981 due to corrosion problems.[29]

TABLE 11. NATIONAL STEEL CORP./WEIRTON STEEL DIVISION IN WEIRTON, WV

COKE OVEN GAS DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

BATTERY DESIGNATION:	I-1[1]
MANUFACTURER:	Koppers[1]
STARTUP DATE:	1973[1,30]
RECENT REHABILITATION DATE:	1979[a,2]
SCHEDULED SHUTDOWN DATE:	
NO. OF OVENS:	87[1]
OVEN HEIGHT (ft-in.):	20-4[31]
OVEN LENGTH (ft-in.):	47-3[31]
COKE PRODUCTION:	
RATED TONS/DAY:	3,600 (battery I-1)[4]
TYPICAL TONS/DAY:	3,000 (battery I-1)[4]
PERCENT SULFUR OF COAL (BY WEIGHT):	1.03 (avg. in 1974);[34] 1.2[2]
QUANTITY OF COG PRODUCED (ft^3/day):	35 x 10^6 (avg. in 1974);[34] 70 x 10^6 [8]
TYPE OF DESULFURIZATION PROCESS:	Vacuum Carbonate (serves battery I-1)[6,30]
MANUFACTURER:	Koppers[8]
DATE INSTALLED:	1973[30]
SYSTEM DESCRIPTION:	• Liquid absorption for sulfur removal[8] • Claus plant, with water wash of HCN, for sulfur recovery[8] • Sodium carbonate solution used for absorption.[8]

ADDITIONAL COMMENTS:

[a]Involved end-wall rehabilitation.[31]

TABLE 12. REPUBLIC STEEL CORP./CHICAGO DISTRICT IN CHICAGO, IL

COKE OVEN GAS DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

BATTERY DESIGNATION:	No. 1[1]
MANUFACTURER:	Wilputte[1]
STARTUP DATE:	1943[1]
RECENT REHABILITATION DATE:	
SCHEDULED SHUTDOWN DATE:	1981[a,33]
NO. OF OVENS:	75[1]
OVEN HEIGHT (ft-in.):	13-0[1]
OVEN LENGTH (ft-in.):	42-7[33]
COKE PRODUCTION:	
RATED TONS/DAY:	1,369;[4] 1,200[1]
TYPICAL TONS/DAY:	1,300[4]
PERCENT SULFUR OF COAL (BY WEIGHT):	
QUANTITY OF COG PRODUCED (ft^3/day):	
TYPE OF DESULFURIZATION PROCESS:[b]	

ADDITIONAL COMMENTS:

[a]Battery No. 1 to be replaced by a Battery No. 2 with 60 ovens, 6 m high, double collector mains, 4 charge holes, automatic lid lifters using stage charging and rated at 1,800 tons of coke per day.[33]

[b]The new battery will include a Takahax (Nippon/Chemico) coke oven gas desulfurization process upon initial battery start up. Takahax process uses liquid oxidation for sulfur removal.[33]

TABLE 13. REPUBLIC STEEL CORP./CLEVELAND DISTRICT IN CLEVELAND, OH

COKE OVEN GAS DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

BATTERY DESIGNATION:[a]	No. 1[1]	No. 2[1]	No. 3[1]	No. 4[1]
MANUFACTURER:	Koppers (all four batteries)[1]			
STARTUP DATE:	1976[9]	1958[2]	1958[2]	1958[2]
RECENT REHABILITATION DATE:[b]		1972[2]	1972[2]	1972[2]
SCHEDULED SHUTDOWN DATE:				
NO. OF OVENS:	51[1]	51[1]	51[1]	51[1]
OVEN HEIGHT (ft-in.):	13-2 (each; all four batteries)[1]			
OVEN LENGTH (ft-in.):	41-0 (each; all four batteries)[1]			
COKE PRODUCTION:				
RATED TONS/DAY:	2,782 (all four batteries combined)[4]			
TYPICAL TONS/DAY:	2,049 (all four batteries (combined)[4]			
PERCENT SULFUR OF COAL (BY WEIGHT):				
QUANTITY OF COG PRODUCED (ft^3/day):	64 x 10^6 (all four batteries combined)[34]			
TYPE OF DESULFURIZATION PROCESS:	Sulfiban (serves all six batteries)[6]			
MANUFACTURER:	Bethlehem Steel/Applied Tech.[8]			
DATE INSTALLED:				
SYSTEM DESCRIPTION:	• Sulfiban process uses liquid absorption for sulfur removal[8] • Amine absorber solution (~15% monoethanol amine, "MEA") used for sulfur removal[8]			

(continued)

TABLE 13 (continued)

COKE OVEN GAS DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

BATTERY DESIGNATION:	No. 6[1]	No. 7[1]
MANUFACTURER:	Koppers-Becker[1]	Koppers-Becker[1]
STARTUP DATE:	1952[13]	1952[13]
RECENT REHABILITATION DATE:	1979[2]	1979[2]
SCHEDULED SHUTDOWN DATE:		
NO. OF OVENS:	63[1]	63[1]
OVEN HEIGHT (ft-in.):	13-2[1]	13-2[1]
OVEN LENGTH (ft-in.):	41-0[1]	41-0[1]
COKE PRODUCTION:		
RATED TONS/DAY:	1,954 (both batteries combined)[4]	
TYPICAL TONS/DAY:	1,286 (both batteries combined)[4]	
PERCENT SULFUR OF COAL (BY WEIGHT):		
QUANTITY OF COG PRODUCED (ft^3/day):	55×10^6 (both batteries combined)[34]	
TYPE OF DESULFURIZATION PROCESS:	Sulfiban (serves all six batteries)[6]	
MANUFACTURER:		
DATE INSTALLED:		
SYSTEM DESCRIPTION:	See previous page for description[8]	

ADDITIONAL COMMENTS:

[a]Battery No. 5 was shut down in 1975.[35]

[b]Involved end-flue rehabilitation.[2]

TABLE 14. REPUBLIC STEEL CORP./MAHONING VALLEY DISTRICT IN WARREN, OH

COKE OVEN GAS DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

BATTERY DESIGNATION:	No. 4[2]
MANUFACTURER:	Koppers[2]
STARTUP DATE:	1979[2]
RECENT REHABILITATION DATE:	
SCHEDULED SHUTDOWN DATE:	
NO. OF OVENS:	85[2,36]
OVEN HEIGHT (ft-in.):	13-0[36]
OVEN LENGTH (ft-in.):	41-11[37]
COKE PRODUCTION:	
RATED TONS/DAY:	1,852[4]
TYPICAL TONS/DAY:	1,279[4]
PERCENT SULFUR OF COAL (BY WEIGHT):	1.0[2]
QUANTITY OF COG PRODUCED (ft^3/day):	29.1×10^6[37]
TYPE OF DESULFURIZATION PROCESS:	Sulfiban[6,36,37]
MANUFACTURER:	Beth. Steel/Applied Tech[8,37]
DATE INSTALLED:	1980[36,37]
SYSTEM DESCRIPTION:	• Sulfiban process uses liquid absorption for sulfur removal[8] • Amine absorber solution (~15% monoethanol amine, "MEA") used for sulfur removal[8]

ADDITIONAL COMMENTS:

[a]Batteries No. 1 and 2 were shut down in March 1979.[36]

TABLE 15. UNITED STATES STEEL CORP./CLAIRTON WORKS IN CLAIRTON, PA

COKE OVEN GAS DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

BATTERY DESIGNATION:	No. 1[38]	No. 2[38]	No. 3[38]
MANUFACTURER:	Wilputte[38]	Wilputte[38]	Wilputte[38]
STARTUP DATE:	1955[38]	1955[38]	1955[38]
RECENT REHABILITATION DATE:	1979[38]	1979[38]	1979[38]
SCHEDULED SHUTDOWN DATE:			
NO. OF OVENS:	64[38]	64[38]	64[38]
OVEN HEIGHT (ft-in.):	13-0[38]	13-0[38]	13-0[38]
OVEN LENGTH (ft-in.):	37-0[38]	37-0[38]	37-0[38]
COKE PRODUCTION:			
RATED TONS/DAY:	20,780 (entire coke plant)[4]		
TYPICAL TONS/DAY:	16,342 (entire coke plant)[4]		
PERCENT SULFUR OF COAL (BY WEIGHT):	0.9 (average for all batteries)[2]		
QUANTITY OF COG PRODUCED (ft^3/day):	300×10^6 (all batteries combined)[27]		
TYPE OF DESULFURIZATION PROCESS:	Vacuum Carbonate (two systems serve all batteries)[6]		
MANUFACTURER:	Koppers[8]		
DATE INSTALLED:	First unit--1968[8]		
SYSTEM DESCRIPTION:	• Process uses liquid absorption for sulfur removal[8] • Sodium carbonate solution used as absorbent[8] • "Keystone" unit services 90×10^6 scfd of COG and has a Claus plant (with HCN water wash) for sulfur recovery[8] • "No. 1" unit services 60×10^6 scfd of COG and has a Claus plant (with HCN water wash) for sulfur recovery[8]		

(continued)

TABLE 15 (continued)

COKE OVEN GAS DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

BATTERY DESIGNATION:	No. 7[38]	No. 8[38]	No. 9[38]
MANUFACTURER:	Koppers[38]	Koppers[38]	Koppers[38]
STARTUP DATE:	1954[39]	1954[40]	1954[41]
RECENT REHABILITATION DATE:			
SCHEDULED SHUTDOWN DATE:	1984[42]	1984[42]	1984[42]
NO. OF OVENS:	64[39]	64[40]	64[41]
OVEN HEIGHT (m):	4[2]	4[2]	4[2]
OVEN LENGTH (ft-in.):			
COKE PRODUCTION:			
RATED TONS/DAY:	See previous page[4]		
TYPICAL TONS/DAY:			
PERCENT SULFUR OF COAL (BY WEIGHT):	See previous page[2]		
QUANTITY OF COG PRODUCED (ft^3/day):	See previous page[27]		
TYPE OF DESULFURIZATION PROCESS:	Vacuum Carbonate (two systems serve all batteries)[6]		
MANUFACTURER:			
DATE INSTALLED:			
SYSTEM DESCRIPTION:	See previous page for description[8]		

(continued)

TABLE 15 (continued)

COKE OVEN GAS DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

BATTERY DESIGNATION:	No. 15[38]	No. 16[38]	No. 17[38]
MANUFACTURER:	Koppers[43]	Wilputte[44]	Wilputte[45]
STARTUP DATE:	1953[a,43]	1950[44]	1950[45]
RECENT REHABILITATION DATE:			
SCHEDULED SHUTDOWN DATE:		1982[42]	1982[42]
NO. OF OVENS:	61[43]	61[38]	61[38]
OVEN HEIGHT (m):	4[2]	4[2]	4[2]
OVEN LENGTH (ft-in.):			
COKE PRODUCTION:			
RATED TONS/DAY:	See previous pages[4]		
TYPICAL TONS/DAY:			
PERCENT SULFUR OF COAL (BY WEIGHT):	See previous pages[2]		
QUANTITY OF COG PRODUCED (ft^3/day):	See previous pages[27]		
TYPE OF DESULFURIZATION PROCESS:	Vacuum Carbonate (two systems serve all batteries)[6]		
MANUFACTURER:			
DATE INSTALLED:			
SYSTEM DESCRIPTION:	See previous pages for description[8]		

(continued)

TABLE 15 (continued)

COKE OVEN GAS DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

BATTERY DESIGNATION:	No. 19[38]	No. 20[38]	No. 21[38]	No. 22[38]
MANUFACTURER:	Koppers-Becker (all four batteries)[38]			
STARTUP DATE:	1951[46]	1947[b,47]	1947[48]	1946[49]
RECENT REHABILITATION DATE:	1977[38]		1972[c,38]	1973[d,38]
SCHEDULED SHUTDOWN DATE:				
NO. OF OVENS:	87[38]	87[38]	87[38]	87[38]
OVEN HEIGHT (m):	5[2]	5[2]	5[2]	5[2]
OVEN LENGTH (ft-in.):				
COKE PRODUCTION:				
RATED TONS/DAY:	See previous pages[4]			
TYPICAL TONS/DAY:				
PERCENT SULFUR OF COAL (BY WEIGHT):	See previous pages[2]			
QUANTITY OF COG PRODUCED (ft^3/day):	See previous pages[27]			
TYPE OF DESULFURIZATION PROCESS:	Vacuum Carbonate (two systems serve all batteries)[6]			
MANUFACTURER:				
DATE INSTALLED:				
SYSTEM DESCRIPTION:	See previous pages for description[8]			

ADDITIONAL COMMENTS:

[a]Battery No. 15 was rebuilt in 1979.[2]

[b]Battery No. 20 was rebuilt in 1978.[38]

[c]Involved end-flue rehabilitation.[38]

[d]Involved rehabilitation from bench-up.[38]

TABLE 16. WHEELING-PITTSBURGH STEEL CORP./STEUBENVILLE PLANT IN EAST STEUBENVILLE, WV

COKE OVEN GAS DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

BATTERY DESIGNATION:[a]	No. 1[2]	No. 2[2]	No. 3[2]	No. 8[2]
MANUFACTURER:	Koppers[2]	Koppers[2]	Koppers-Becker[2]	Koppers[2]
STARTUP DATE:	1917[b,50]	1917[c,50]	1917[d,50]	1976[50]
RECENT REHABILITATION DATE:	1978[e,2]	1978[e,2]	1978[e,2]	
SCHEDULED SHUTDOWN DATE:				
NO. OF OVENS:	47[2]	47[2]	51[2]	79[2]
OVEN HEIGHT (m):	3[50]	3[50]	3[50]	6[50]
OVEN LENGTH (ft-in.):	37-5[50]	37-5[50]	38-5[50]	47-11[50]

COKE PRODUCTION:

RATED TONS/DAY:	4,400;[1] 5,205[4] (all four batteries combined)
TYPICAL TONS/DAY:	4,310 (all four batteries combined)[4]
PERCENT SULFUR OF COAL (BY WEIGHT):	1.0 (for all four batteries)[2]
QUANTITY OF COG PRODUCED (ft^3/day):	9 x 10^6 scfd (all four batteries combined)[6,8]
TYPE OF DESULFURIZATION PROCESS:	Carl Still (serves all four batteries)[6]
MANUFACTURER:	Dravo[8]
DATE INSTALLED:	1978[50]
SYSTEM DESCRIPTION:	• Carl Still process uses liquid absorption for sulfur removal[8] • NH_3 used as absorbent[8] • Sulfuric acid production used for sulfur recovery[8]

ADDITIONAL COMMENTS:

[a]Plant shut down Battery No. 4 (53 ovens) in 1977, Battery No. 5 (53 ovens) in 1976, and Battery No. 6 (63 ovens) in 1977.[50]

[b]Battery No. 1 rebuilt in 1955.[50]

[c]Battery No. 2 rebuilt in 1953.[50]

[d]Battery No. 3 rebuilt in 1964.[50]

[e]Involved end-flue rehabilitation.[2]

MATERIAL IN THIS SECTION SUBJECT TO CONFIDENTIALITY REVIEW AND IS NOT RELEASABLE AS OF FEBRUARY 1, 1982. FOR INFORMATION, CONTACT L. KESARI, U.S. ENVIRONMENTAL PROTECTION AGENCY, DIVISION OF STATIONARY SOURCE ENFORCEMENT.

TABLE 1. ALLIED CHEMICAL CORP./ASHLAND PLANT IN ASHLAND, KY

COKE OVEN GAS DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

BATTERY DESIGNATION:	No. 3[2]	No. 4[a,2]
MANUFACTURER:	Wilputte[2]	Wilputte[2]
STARTUP DATE:	1953[2]	b
RECENT REHABILITATION DATE:	1973[c,2]	
SCHEDULED SHUTDOWN DATE:		
NO. OF OVENS:	76[2]	70[2]
OVEN HEIGHT (m):	4.5[2]	4.5;[2] 5[52]
OVEN LENGTH (ft-in.):	40-8[53]	46-10[53]
COKE PRODUCTION:		
RATED TONS/DAY:	3,480 (both batteries combined)[4]	
TYPICAL TONS/DAY:	2,100 (both batteries combined)[4]	
PERCENT SULFUR OF COAL (BY WEIGHT):	0.8 (for both batteries)[2]	
QUANTITY OF COG PRODUCED (ft^3/day):	45×10^6 (normal; both batteries combined), 53×10^6 (maximum; both batteries combined)[53]	
TYPE OF DESULFURIZATION PROCESS:	Sulfiban (serves both batteries)[6,51]	
MANUFACTURER:	Bethlehem Steel/Applied Technology[8]	
DATE INSTALLED:	1978[51]	
SYSTEM DESCRIPTION:	• Process uses liquid absorption for sulfur removal[8] • Amine solution as absorber; approximately 15% monoethanolamine (MEA) solution[8]	

ADDITIONAL COMMENTS:

[a]Battery No. 4 was shut down in December 1980 due to low coke demand.[51]

[b]Battery No. 4 was rebuilt in 1978.[2]

[c]Involved end-flue rehabilitation.[2]

TABLE 2. DONNER-HANNA COKE CORP IN BUFFALO, NY

COKE OVEN GAS DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

BATTERY DESIGNATION:	AB[2]	No. 3[2]	No. 4[2]
MANUFACTURER:	Koppers[2]	Koppers[2]	Koppers[2]
STARTUP DATE:	1951[2]	1964[2]	1967[2]
RECENT REHABILITATION DATE:			
SCHEDULED SHUTDOWN DATE:			
NO. OF OVENS:	51[2]	50[2]	50[2]
OVEN HEIGHT (m):	4;[2] 2[19]	4[2,19]	4[2,19]
OVEN LENGTH (ft-in.):			
COKE PRODUCTION:			
RATED TONS/DAY:	3,004 (all three batteries combined)[4]		
TYPICAL TONS/DAY:	3,004 (all three batteries combined)[4]		
PERCENT SULFUR OF COAL (BY WEIGHT):	1.1 (for all three batteries)[2]		
QUANTITY OF COG PRODUCED (ft^3/day):	30 x 10^6 (all three batteries combined)[34]		
TYPE OF DESULFURIZATION PROCESS:	Vacuum Carbonate (serves all three batteries)[6]		
MANUFACTURER:	Koppers[8]		
DATE INSTALLED:	1978 (approximately)[19]		
SYSTEM DESCRIPTION:	• Sulfur removal via liquid absorption (sodium carbonate solution)[8]		

ADDITIONAL COMMENTS:

TABLE 3. KOPPERS CO., INC./INDUSTRIAL PRODUCTS DIVISION, ERIE PLANT IN ERIE, PA

COKE OVEN GAS DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

BATTERY DESIGNATION:[a]	A[2]	B[2]
MANUFACTURER:	Koppers[2]	Koppers[2]
STARTUP DATE:	1943[b,54]	1943[b,2]
RECENT REHABILITATION DATE:		
SCHEDULED SHUTDOWN DATE:		
NO. OF OVENS:	23[2]	35[2]
OVEN HEIGHT (ft-in.):	12-0[55]	12-0[55]
OVEN LENGTH (ft-in.):	43-0[55]	42-0[55]
COKE PRODUCTION:		
RATED TONS/DAY:	730;[1] 625[4] (both batteries combined)	
TYPICAL TONS/DAY:	600 (both batteries combined)[4]	
PERCENT SULFUR OF COAL (BY WEIGHT):	0.7 (for both batteries)[2]	
QUANTITY OF COG PRODUCED (ft^3/day):	6.5×10^6 (both batteries combined)[56]	
TYPE OF DESULFURIZATION PROCESS:	Hydro-Quinone (serves both batteries)[56]	
MANUFACTURER:	Koppers[56]	
DATE INSTALLED:		
SYSTEM DESCRIPTION:		

ADDITIONAL COMMENTS:

[a]Facility previously owned and operated by Interlake, Inc.[1]

[b]Both batteries rebuilt in 1971.[2]

MATERIAL IN THIS SECTION SUBJECT TO CONFIDENTIALITY REVIEW AND IS NOT RELEASABLE AS OF FEBRUARY 1, 1982. FOR INFORMATION, CONTACT L. KESARI, U.S. ENVIRONMENTAL PROTECTION AGENCY, DIVISION OF STATIONARY SOURCE ENFORCEMENT.

REFERENCES

COKE OVEN GAS DESULFURIZATION

1. World Steel Industry Data Handbook: Volume 1, The United States. McGraw-Hill Magazine. 1978. p. 40. (Reliability No. 4.)

2. Technical Approach for a Coke Production Cost Model. PEDCo Environmental, Inc. EPA Contract No. 68-02-3071. p. 47. (Reliability No. 4.)

3. EPA Region V Files. (Renewal Permit Applications dated January 26, 1979.)

4. Development Document for Effluent Limitations Guidelines and Standards for the Iron and Steel Manufacturing Point Source Category, Vol. II. Draft Report. EPA-440/1-70-024a. October 1979. pp. 18-19. (Reliability No. 4.)

5. ARMCO's Coke Batteries Scheduled for Mid-1976 Start-Up. Iron & Steel Engineer. September 1975. pp. 61-62. (Reliability No. 4.)

6. COG Desulfurization: The Standard Tightens. Thirty-Three Metal Producing Magazine. November 1980. Vol. 11. McGraw-Hill Publications. pp. 44-45. (Reliability No. 4.)

7. EPA Region V Files. (Permit Application for Coke By-Product Plant, dated August 3, 1978 by B. Steiner of ARMCO, Inc.)

8. Technical Support Document for the Recommended Lowest Achievable Emission Rate for SO_2 Emissions from Coke-Oven Gas Combustion. U.S. Environmental Protection Agency, Division of Stationary Source Enforcement. January 1977. (Reliability No. 2.)

9. Telephone conversations. Bernard Bloom, U.S. Environmental Protection Agency, Division of Stationary Source Enforcement to Michael Jasinski, GCA/Technology Division. December 1980. (Reliability No. 2.)

10. Telephone conversation and letter response. Bill Nuver, Pennsylvania Department of Environmental Resources to Sandy Beaton, GCA/Technology Division. November 1981.

11. Mossey, Michael J., and Robert W. Dunlap. Economics and Alternatives for Sulfur Removal from Coke Oven Gas. JAPCA. 25(10):1019-1027. October 1975. (Reliability No. 4.)

12. Telephone conversation. Bernard Bloom, U.S. Environmental Protection Agency, to Michael Jasinski, GCA/Technology Division. February 1981. (Reliability No. 2.)

13. Cost Effectiveness Model for Pollution Control of Coke Facilities. EPA-600/2-79-185. August 1979. Table 8. (Reliability No. 4.)

14. Petroccia, M., et al. Field Inspection Report. Bethlehem Steel Corporation, Burns Harbor, Coke Batteries 1 and 2, Chesterton, Indiana. GCA/Technology Division Draft Final Report No. TR-80-56-G. Prepared for U.S. Environmental Protection Agency. July 1980. (Reliability No. 1.)

15. Hombeig, Otto A., and Alan H. Singleton. Claus Plant Performance and Problems. Preprint of Paper No. 74-186 for presentation at the Air Pollution Control Association 1974 Annual Meeting. (Reliability No. 4.)

16. Telephone conversation. Andy Sutherland, State of Indiana, Air Pollution Control to Sandy Beaton, GCA/Technology Division. February 1981. (Reliability No. 2.)

17. Telephone conversation. Henry Sandoto, New York State Department of Environmental Conservation to William Farino, GCA/Technology Division. February 1981. (Reliability No. 2.)

18. Telephone conversation. Jack Hausrath, Erie County Department of Health to Gene Bergson, GCA/Technology Division. February 17, 1981. (Reliability No. 2.)

19. Letter response. Richard Craig, U.S. Environmental Protection Agency, Region II to William Farino, GCA/Technology Division. December 1981. (Reliability No. 1.)

20. Telephone conversation. Mark Sylvester, Maryland Department of Health and Mental Hygiene to Michael Jasinski, GCA/Technology Division. February 13, 1981. (Reliability No. 2.)

21. Telephone conversation. Ralph Hall, State of Maryland, Department of Health and Mental Hygiene to Michael Jasinski, GCA/Technology Division. October 1981. (Reliability No. 2.)

22. Letter from J. W. Colberg, General Manager of BSC/Sparrows Point Plant, Sparrows Point, Maryland to Stephen Wassersug, Director of Enforcement Division, U.S. Environmental Protection Agency, Region III. Re: Information Request subsequent to EPA inspection of Sparrows Point's Air Pollution Control Systems on March 17, 18, and 27, 1975. Letter dated April 11, 1975. JACA Inc. Files. (Reliability No. 3.)

23. EPA Region V Files (August 1981 letter from Inland to EPA).

24. Telephone conversation. Ken Bowman, Pennsylvania Department of Environmental Resources to Gene Bergson, GCA/Technology Division. February 18, 1981. (Reliability No. 2.)

25. Telephone conversation. Arthur Witt, Pennsylvania Department of Environmental Resources to Sandy Beaton, GCA/Technology Division. November 17, 1981. (Reliability No. 2.)

26. Petroccia, M., et al. Field Inspection Report. J&L Steel Corporation/ Aliquippa Works, May 1981. GCA Final Report TR-81-57-G. Prepared for U.S. Environmental Protection Agency. July 1981. (Reliability No. 1.)

27. Telephone conversation. S. Banninthaya, Allegheny County Health Department to Gene Bergson, GCA/Technology Division. February 12, 1981. (Reliability No. 2.)

28. Spawn, P. and Ramon Li. Field Inspection Report. Kaiser Steel Corporation, Fontana Works Coke Plant, Fontana, California. GCA/Technology Division Draft Final Report No. TR-79-53-G. Prepared for U.S. Environmental Protection Agency. February 1980. (Reliability No. 1.)

29. Telephone conversation. Lois Green, U.S. Environmental Protection Agency, Region IX to Michael Jasinski, GCA/Technology Division. November 1981. (Reliability No. 2.)

30. Telephone conversation. John Raggi, West Virginia Air Pollution Control to Gene Bergson, GCA/Technology Division. February 17, 1981. (Reliability No. 2.)

31. Spawn, P., et al. National Steel Corporation, Weirton Steel Division Plant Inspection, August 1981. GCA/Technology Division Draft Final Report No. TR-81-118-G. Prepared for U.S. Environmental Protection Agency. November 1981. (Reliability No. 1.)

32. Summary Sheets compiled by PEDCo from stack tests at regional EPA offices. Provided to JACA, Inc. for Steel Library by Tom Maslany, EPA Region III. (Reliability No. 1.)

33. EPA Region V Files. (Report on RSC/Chicago new coke battery, 1978.)

34. Hall, Robert R., et al. Evaluations of the Technological Feasibility and Cost of Selected Control Alternatives Necessary to Meet the Ohio SO Regulations. Republic Steel Corporation/Cleveland District Plant. Volume III. GCA/Technology Division Final Report. Prepared for U.S. Environmental Protection Agency. April 1977. (Reliability No. 2.)

35. Telephone conversation. Mr. Habib, City of Cleveland Air Pollution Control to Sandy Beaton, GCA/Technology Division. October 1981. (Reliability No. 2.)

36. EPA Region V Files. (Trip report dated February 20, 1980.)

37. Telephone conversation. Ted Davis, Northeast District Ohio EPA to Gene Bergson, GCA/Technology Division. February 27, 1981. (Reliability No. 2.)

38. Spawn, P., et al. Field Inspection Report. USSC Clairton Works Coke Plant, Clairton, Pennsylvania. GCA/Technology Division, Draft Final Report No. TR-80-30-G. Prepared for U.S. Environmental Protection Agency. April 1980. (Reliability No. 1.)

39. Source Sheet on USSC Clairton Coke Battery #7. RACT-500478. (Reliability No. 1.)

40. Source Sheet on USSC Clairton Coke Battery #8. RACT-500484. (Reliability No. 1.)

41. Source Sheet on USSC Clairton Coke Battery #9. RACT-500490. (Reliability No. 1.)

42. Computer Printout. Prepared by PEDCo Environmental Inc., for U.S. Environmental Protection Agency, Washington, D.C. Coke Battery data compilation of the United States. 1979. (Reliability No. 4.)

43. Source Sheet on USSC Clairton Coke Battery No. 15. RACT-500526. (Reliability No. 1.)

44. Source Sheet on USSC Clairton Coke Battery No. 16. RACT-500528. (Reliability No. 1.)

45. Source Sheet on USSC Clairton Coke Battery No. 17. RACT-500541. (Reliability No. 1.)

46. Source Sheet on USSC Clairton Coke Battery No. 19. RACT-500553. (Reliability No. 1.)

47. Source Sheet on USSC Clairton Coke Battery No. 20. RACT-500562. (Reliability No. 1.)

48. Source Sheet on USSC Clairton Coke Battery No. 21. RACT-500569. (Reliability No. 1.)

49. Source Sheet on USSC Clairton Coke Battery No. 22. RACT-500581. (Reliability No. 1.)

50. Telephone conversation and letter from John Raggi, West Virginia APC to Michael Jasinski, GCA/Technology Division. November 1981. (Reliability No. 2.)

51. Letter from Jim Dills, Kentucky State to Michael Jasinski, GCA/Technology Division. November 19, 1981. (Reliability No. 1.)

52. Emissions Test Report Submitted to Allied Chemical Company, Semet-Solvay Division, Ashland, Kentucky, for the Minister Stein System. York Research Corp. Report No. 1-9868-04. June 7, 1979. (Reliability No. 1.)

53. Letter from James W. Dills, Department for Natural Resources and Environmental Protection to Michael Jasinski, GCA/Technology Division. February 26, 1981. (Reliability No. 2.)

54. RACT Box No. 503715-503716. (Reliability No. 1.)

55. RACT No. 503715-503716. (Reliability No. 2.)

56. Telephone conversation. Larry Wonders, Pennsylvania Department of Environmental Resources to Gene Bergson, GCA/Technology Division. February 17, 1981. (Reliability No. 2.)

MATERIAL IN THIS SECTION SUBJECT TO CONFIDENTIALITY
REVIEW AND IS NOT RELEASABLE AS OF FEBRUARY 1, 1982.
FOR INFORMATION, CONTACT L. KESARI, U.S. ENVIRONMENTAL
PROTECTION AGENCY, DIVISION OF STATIONARY SOURCE ENFORCEMENT.

TABLE 1. ARMCO INC./ASHLAND WORKS IN ASHLAND, KY

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

STRAND DESIGNATION:	No. 1[1]
STARTUP DATE:	1958[2]
STRAND WIDTH (in.):	96[1]
GRATE AREA (ft^2):	807;[2] 824[1]
NO. OF WINDBOXES:	15[1]
TYPE OF IGNITION FUEL:	Natural Gas[2]
SINTER PRODUCTION:	
RATED TONS/DAY:	2,640;[1] 2,400[3]
AVERAGE TONS/DAY (1976):	1,647[3]
WINDBOX EMISSION CONTROL SYSTEM:	Flooded disc scrubber[1,4]
MANUFACTURER:	Research-Cottrell[1]
DATE INSTALLED:	1972;[4] 1975[1]
SYSTEM DESCRIPTION:	• Exhaust flow rate = 150,000 dscfm ± 5,000 (nominal)[1] • Δp (scrubber) = 48 in. W.C. (design)[1] • <u>Test Data (1975):</u>[5] Flow = 216,700 acfm at 130°F Δp = 40-50 in. H_2O

ADDITIONAL COMMENTS:

TABLE 2. ARMCO INC./HOUSTON WORKS IN HOUSTON, TX

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

STRAND DESIGNATION:	No. 1[2]
STARTUP DATE:	1957[2]
STRAND WIDTH (in.):	72[2]
GRATE AREA (ft^2):	536[2]
NO. OF WINDBOXES:	14[6]
TYPE OF IGNITION FUEL:	Natural Gas;[7] COG[2]
SINTER PRODUCTION:	
RATED TONS/DAY:	1,360[3]
AVERAGE TONS/DAY (1976):	1,078[3]
WINDBOX EMISSION CONTROL SYSTEM:	Steam-Hydro Scrubber System[8]
MANUFACTURER:	Hydrosonics/Lone Star[9]
DATE INSTALLED:	1975[7,9]
SYSTEM DESCRIPTION:	

- System consists of six parallel units (two stacks per unit); of which five operate at one time[7,9]
- Each unit consists of, (1) combination steam-waste nozzle, (2) mixing tube, and (3) twin cyclonic separators[7,9]
- System fan capacity = 135,000 acfm at 300°F[7,9]
- Design L/G ratio = 2.74:1 (at 370 gpm-scrubber water) and Δp = 30 in. H_2O[2,6]
- Test Data (1976-inlet):[11]
  162,700-170,900 acfm (range)
  155-193°F (range)
- Test Data (1975-inlet):[10]
  181,300-195,400 acfm (range)
  191-230°F (range)

DISCHARGE END EMISSION CONTROL SYSTEM:[a]	Baghouse controls discharge end and breaker[12,13]

(continued)

TABLE 2 (continued)

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

MANUFACTURER:	
DATE INSTALLED:	
SYSTEM DESCRIPTION:	• Test Data (1975):[14] 124,000-136,800 acfm (range) 300-363°F (range)

ADDITIONAL COMMENTS:

[a]A new baghouse will replace the existing baghouse in 1982. New baghouse will control similar emission points plus additional pick-up points.[12]

TABLE 3. ARMCO INC./MIDDLETOWN WORKS IN MIDDLETOWN, OH

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

STRAND DESIGNATION:	
STARTUP DATE:	1974[2]
STRAND WIDTH (in.):	96[2,15]
GRATE AREA (ft^2):	768[2,15]
NO. OF WINDBOXES:	12[15]
TYPE OF IGNITION FUEL:	Natural Gas[15]
SINTER PRODUCTION:	
RATED TONS/DAY:	2,640[3]
AVERAGE TONS/DAY (1976):	1,875[3]
WINDBOX EMISSION CONTROL SYSTEM:	High-energy variable throat venturi scrubber, with adjustable plug[16,17]
MANUFACTURER:	Koch[18]
DATE INSTALLED:	1976[16,17]
SYSTEM DESCRIPTION:	• In series:[15,17] Primary and secondary cyclones, two I.D. fans, scrubbers, cyclonic mist eliminator, stub stack[a] • 304,500 acfm at 150°F[17] • Δp of venturi = 45 in. W.C.[17] • L/G = 5.91 gpm/1,000 acfm[17] • Test Data (1976):[15] Flow = 194,400-209,300 dscfm; Temperature = 129-133°F
DISCHARGE END EMISSION CONTROL SYSTEM:[b]	Baghouse[19]
MANUFACTURER:	Buell[18]
DATE INSTALLED:	1974[18]
SYSTEM DESCRIPTION:	

ADDITIONAL COMMENTS:

[a]325 gpm (mist eliminator blow-down) sent to blast furnace sludge ponds; 400 gpm used for mist eliminator makeup water.[17]

[b]Cold screens controlled by AAF baghouse installed in 1975; mixing drum and pellet screens controlled by individual "Environeering" scrubbers installed in 1974; and bin building controlled by Flex Klean baghouse installed in 1975.[18]

TABLE 4. BETHLEHEM STEEL CORP./BETHLEHEM PLANT IN BETHLEHEM, PA

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

STRAND DESIGNATION:	No. 1[20]	No. 2[20]	No. 3[20]	No. 4[20]
STARTUP DATE:	1930[2]	1930[2]	1942[2]	1950[2]
STRAND WIDTH (in.):	72[2,21]	72[2,21]	72[2,21]	72[2,21]
GRATE AREA (ft^2):	497[2]	497[2]	497[2]	497[2]
NO. OF WINDBOXES:	13[20]		13[20]	13[20]
TYPE OF IGNITION FUEL:	Natural Gas;[22] COG[20] (all four strands)			
SINTER PRODUCTION:				
RATED TONS/DAY: TYPICAL TONS/DAY:	6,145 (all four strands combined)[3]			
WINDBOX EMISSION CONTROL SYSTEM:[a]	Strand Nos. 1 and 2 controlled by cyclones and No. 1-WET ESP[b,20,23]		Strand Nos. 3 and 4 controlled by cyclones and No. 2-WET ESP[c,20,23]	
MANUFACTURER:	Buell (cyclones);[20] Research Cottrell (ESP)[20]		Buell and Sirrocco (cyclones);[20] Research Cottrell (ESP)[21]	
DATE INSTALLED:	1970[24]		1970[24]	
SYSTEM DESCRIPTION:	• Each windbox drawn to two parallel sets of 3 cyclones in series with one ID fan, common manifold to ESP No. 1[20] • ID fan rated at 385,000 acfm @ 245°F[20,21]		• No. 3 strand discharges to 2 Sirrocco cyclones in series, ID fan, common duct to ESP No. 2[20] • No. 4 strand same cyclone arrangement as Nos. 1 & 2 strands but shares ID fan with No. 3[20]	

(continued)

TABLE 4 (continued)

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

	• Each set of cyclones rated at 150,000 acfm @ 250°F[21] • Water sprays to ESP = 7.5-27 gpm[20] • Test data 1979:[25] 238,000 acfm @ 190°F • Test data (1979):[20] 195,000 dscfm	• ESP contains 3 sections, total of 1,600 wires; 600 wires in each first 2 sections, 400 wires in last section[26] • Water sprays to ESP = 0-30 gpm[20] • Test data (1979):[26] 221,000 acfm @ 182°F • Test data (1977):[26] 269,000-320,000 acfm @ 223-259°F

DISCHARGE END EMISSION CONTROL SYSTEM: Baghouse[21,27]

MANUFACTURER: Wheelabrator[21]
DATE INSTALLED: 1961[24]
SYSTEM DESCRIPTION:

- Baghouse controls hopper, sinter breaker, and hot screens from all four strands; all emission points ducted to an ID fan, baghouse, and twin exhaust stacks.[21,27]
- 16 compartments, 72 bags per compartment[21]
- 240,000 acfm @ 350°F (design)[21]
- A/C = 2.44 ft/min[21]
- Reverse air cleaning @ 20 minute cycles.[21]

COLD SCREENS EMISSION CONTROL SYSTEM: Baghouse[21]

MANUFACTURER: Wheelabrator[28]
DATE INSTALLED: 1961[24]
SYSTEM DESCRIPTION:

- Baghouse controls cold screens from all four strands.[21]

ADDITIONAL COMMENTS:

[a]Effluent from cyclones is preconditioned with water to a temperature of 210°F.[20]

[b]No. 1 ESP upgraded in 1979 by replacing 600 plain wires (center section) and adding three additional transformer rectifier units.[25]

[c]No. 2 ESP upgraded in 1977 (similar to upgrading of NO. 1 ESP).[26]

TABLE 5. BETHLEHEM STEEL CORP./BURNS HARBOR PLANT IN CHESTERTON, IN

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

STRAND DESIGNATION:	
STARTUP DATE:	1975[2]
STRAND WIDTH (in.):	157.5[2,29]
GRATE AREA (ft^2):	2,494;[29] 2,020[2]
NO. OF WINDBOXES:	12 (two collector mains)[29,30]
TYPE OF IGNITION FUEL:	Gas[2]
SINTER PRODUCTION:	
RATED TONS/DAY:	6,070;[3] 6,000[31]
AVERAGE TONS/DAY (1976):	5,100[3]
WINDBOX EMISSION CONTROL SYSTEM:	Venturi Scrubber[a,30]
MANUFACTURER:	B. B. Barefoot Co.[31]
DATE INSTALLED:	
SYSTEM DESCRIPTION:	

- In Series: multiclones, two ID fans, scrubber[30]
- Design flow rate = 561,000 acfm at 425°F (inlet); 380,000 scfm (outlet)[31,32]
- Δp = 65 in. W.C. (max.); 60 in. H_2O (normal)[31,32]
- Fans = 9,000 hp (each)[31]
- Scrubber water flow (design) = 4,400 gpm[31]
- Test data (1976):[31] 267,222-289,694 dscfm

DISCHARGE END EMISSION CONTROL SYSTEM:	Baghouse[b,30,33]
MANUFACTURER:	Industrial Clean Air Corp.[33]
DATE INSTALLED:	
SYSTEM DESCRIPTION:	

- Design flow rate = 193, 750 scfm[33]
- Δp = 8.7-9.5 in H_2O (during tests)[33]
- Net A/C = 2.67:1[30]
- Fan rated at 900-hp[33]

(continued)

TABLE 5 (continued)

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

- Negative pressure--8 compartments, 512 graphite impregnated silicone bags (total)[33]
- Reverse air or shaker cleaning (75-hp reverse air fan)[33]

ADDITIONAL COMMENTS:

[a]Replaced adjustable disc throat and elbow mist eliminator with stainless steel in 1980.[30]

[b]Total of 65 collection points including discharge end, screens, cooler and pickup points.[29]

TABLE 6. BETHLEHEM STEEL CORP./LACKAWANNA PLANT IN LACKAWANNA, NY

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

STRAND DESIGNATION:	East[34]	West[34]
STARTUP DATE:	1950[2]	1950[2]
STRAND WIDTH (in.):	72[2]	72[2]
GRATE AREA (ft^2):	612;[2] 696[35]	612;[2] 696[35]
NO. OF WINDBOXES:		
TYPE OF IGNITION FUEL:	COG[22]	COG[22]
SINTER PRODUCTION:		
RATED TONS/DAY:	4,000 (both strands combined)[3]	
AVERAGE TONS/DAY (1976):	3,779 (both strands combined)[3]	
WINDBOX EMISSION CONTROL SYSTEM:[a]	Separate, but identical wet ESP's serve each strand[34,35]	
MANUFACTURER:	Koppers (both ESP's)[35]	
DATE INSTALLED:	1968[35]	
SYSTEM DESCRIPTION:	• Design flow rate = 130,000 scfm (each)[35] • Exit temperature = 250°F[35] • Horsepower = 1,500 (each system)[35]	
DISCHARGE END EMISSION CONTROL SYSTEM:[b]		

ADDITIONAL COMMENTS:

[a]Two wet scrubbers, manufactured by AAF, for windbox emission control (Type F high energy venturi's) being installed (1981) following existing ESP's on each sinter strand. Each scrubber will handle 137,000 dscfm of preconditioned gases.[35,36]

[b]"East" and "West" transfer points controlled by individual Ducon scrubbers. Sinter cooler transfer points and screening operation controlled by individual Ducon scrubbers.[35]

TABLE 7. BETHLEHEM STEEL CORP./SPARROWS POINT PLANT IN SPARROWS POINT, MD

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

STRAND DESIGNATION:	No. 7[37]
STARTUP DATE:	1975[2]
STRAND WIDTH (in.):	133[2]
GRATE AREA (ft^2):	3,800[2]
NO. OF WINDBOXES:	22[37]
TYPE OF IGNITION FUEL:	COG[37]
SINTER PRODUCTION:	
RATED TONS/DAY:	12,200[3,37]
AVERAGE TONS/DAY (1976):	8,260[3]
WINDBOX EMISSION CONTROL SYSTEM:	2 cyclone-venturi scrubber systems[37]
MANUFACTURER:	Koch (scrubbers);[a,37] Buell (cyclones)[37]
DATE INSTALLED:	1975[37]
SYSTEM DESCRIPTION:	

- Two systems in parallel identified North and South:[37] Each with 30 cyclones, 1 I.D. fan, 1 F.D. fan, venturi throat scrubber, mist eliminator, and wastewater treatment system
- Scrubber capacity = 456,163-547,677 acfm (each)[37]
- Inlet temperature = 350-450°F (design)[39]
- Δp = 30-60 in. W.G. (design)[37]
- L/G = 4.57-7.67 (design)[37]
- Scrubber water pH = 4.5 (design)[37]
- Scrubber water temperature = 55-72°F (design)[37]
- Test Data (1979):[b,37]

North Scrubber--	South Scrubber--
Inlet temperature = 410-455°F	Inlet temperature = 370-418°F
Δp = 34-35.5 in. H_2O	Δp = 35-37 in. H_2O
Water flow = 2,600-2,750 gpm	Water flow = 3,400-3,500 gpm
L/G = 4.75-6.03	L/G = 6.21-7.67

- Test Data (1976):[37]
  272,200 dscfm
  Δp (throat) = 31 in. W.G.
  Water flow (throat) = 3,250 gpm (average)

(continued)

TABLE 7 (continued)

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

DISCHARGE END EMISSION CONTROL SYSTEM:	Baghouse for discharge end and transfer points[37,39]
MANUFACTURER:	Indus. Clean Air Corp.[37,39]
DATE INSTALLED:	1975[40]
SYSTEM DESCRIPTION:	• Baghouse controls sinter breaker, raw burden feeder, hot screen, and primary and secondary cold screens[37] • 14 compartments; 2 modules per compartment; 64 fiberglass cloth bags per module[37,39] • Baghouse has a total of 65 to 70 inlet locations[41] • Flow = 400,000 acfm at 550°F; Δp = 25 in. W.G.[37,39] • A/C = 30:1 (maximum)[37,39] • Negative pressure design; reverse air cleaning at 26,000 acfm and Δp = 20 in. W.G.[38,39]
SINTER COOLER EMISSION CONTROL SYSTEM:	Multiclones[37,39]
MANUFACTURER:	Zurn Industries[38,39]
DATE INSTALLED:	1975[40]
SYSTEM DESCRIPTION:	• One I.D. fan with inlet capacity = 640,000 acfm @ 600°F[37,39] • Δp = 7 in. W.G.[37,39]

ADDITIONAL COMMENTS:

[a]High-energy venturi scrubbers with adjustable plugs.

[b]Actual production rate during 1979 test was 10,200 tons/day.

TABLE 8. CF&I STEEL CORP./PUEBLO PLANT IN PUEBLO, CO

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

STRAND DESIGNATION:	No. 1[42]	No. 2[42]
STARTUP DATE:[a]	1943[2]	1943[2]
STRAND WIDTH (in.):	72[2]	72[2]
GRATE AREA (ft^2):	612[2]	612[2]
NO. OF WINDBOXES:	16[43]	16[43]
TYPE OF IGNITION FUEL:	COG[2,44]	COG[2,44]
SINTER PRODUCTION:		
RATED TONS/DAY:	3,300 (both strands combined)[43]	
TYPICAL TONS/DAY:		
WINDBOX EMISSION CONTROL SYSTEM:	Common ESP serves both strands[43,44]	
MANUFACTURER:		
DATE INSTALLED:	1968	
SYSTEM DESCRIPTION:	• Each strand ducted to separate multiclones, then combined into common ESP and two outlet stacks[45] • Multiclones each consist of 299 tubes, designed at 180,000 acfm at 250°F per strand[43] • ESP rated at 420,000 acfm at 320°F[45] • System uses two fans operated in parallel with 1250-hp each[43] • Test Data (1975):[45] North stack--194,401 acfm South stack--186,084 acfm	
DISCHARGE END EMISSION CONTROL SYSTEM:	Baghouse[46]	
MANUFACTURER:		
DATE INSTALLED:	1974[42]	
SYSTEM DESCRIPTION:	• Rated at 200,000 acfm[47]	

ADDITIONAL COMMENTS:

[a]This facility was shut down in mid-June 1981; not scheduled to operate unless new controls are installed.

TABLE 9. INLAND STEEL CO./INDIANA HARBOR WORKS IN E. CHICAGO, IN

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

STRAND DESIGNATION:	No. 3[48]
STARTUP DATE:	1959[2,48]
STRAND WIDTH (in.):	96[2]
GRATE AREA (ft^2):	1,344[2,48]
NO. OF WINDBOXES:	21[51]
TYPE OF IGNITION FUEL:	COG[48]
SINTER PRODUCTION:	
RATED TONS/DAY:	4,000[48]
AVERAGE TONS/DAY (1976):	4,000[3]
WINDBOX EMISSION CONTROL SYSTEM:	Multiclones, dry ESP and baghouse[48]
MANUFACTURER:	Western Precipitator[48] (multiclones); McDowell, Inc.[48] (ESP); Carborundum[48] (baghouse)
DATE INSTALLED:	1959[48]; 1959[48]; 1975[48]
SYSTEM DESCRIPTION:	• In Series:[48] Multiclones, ESP, 1 F.D. fan, baghouse, 1 I.D. fan, stack • Multiclones:[48] Design flow rate = 440,000 cfm at 140-180°F Δp = 2.4 in. H_2O 840-9 in. diameter tubes • ESP:[48] Design flow rate = 440,000 cfm at 140-180°F Consists of 2 sides, West No. 1 outlet and East No. 2[a] inlet (operating in series) 136 plates; plate size = 7.5 ft x 24 ft (includes openings of unknown size) spaced at 8.5 in. apart Rapper frequency = every 2 seconds

(continued)

TABLE 9 (continued)

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

	• Baghouse:[48] Design flow rate = 440,000 cfm at 100-300°F Δp = 2 in. H_2O (after cleaning) and 7 in. H_2O (before cleaning)--across each compartment Reverse air cleaning; 2 of 20 compartments cleaned at once A/C = 1.5:1 7,040 woven acrylic homopolymer bags total 2,000 hp windbox F.D. fan--negative pressure • Test Data (1976):[49] Flow rate = 491,500-506,500 acfm Outlet temperature = 214-240°F
DISCHARGE END EMISSION CONTROL SYSTEM:	Baghouse[b,48]
MANUFACTURER:	AAF[48]
DATE INSTALLED:	1976[48]
SYSTEM DESCRIPTION:	• 146,000 cfm at 100 to 300°F[48] • Δp = 1.8-2.0 in. H_2O (across baghouse)[48] • A/C = 1.99:1[48] • Five compartments--2,080 acrylic bags (total)[48] • One, 150-hp I.D. fan[48] • Shaker cleaning • Test Data (1975):[50] 145,500-148,800 acfm Outlet temperature = 167-170°F

ADDITIONAL COMMENTS:

[a]ESP, East No. 2 contained plates that were worn out; were to be fixed by 9/79.[48]

[b]Baghouse controls: sinter breaker, vibrating conveyor, hot fines conveyor, rotary sinter cooler, dust surge bin, and transfer points along burden conveyor.[48]

TABLE 10. JONES & LAUGHLIN STEEL CORP./INDIANA HARBOR WORKS IN E. CHICAGO, IN

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

STRAND DESIGNATION:	
STARTUP DATE:	1959[2]
STRAND WIDTH (in.):	96[2]
GRATE AREA (ft^2):	1,344[2]
NO. OF WINDBOXES:	
TYPE OF IGNITION FUEL:	Gas[51]
SINTER PRODUCTION:	
RATED TONS/DAY:	4,000[3]
AVERAGE TONS/DAY (1976):	3,204[3]
WINDBOX EMISSION CONTROL SYSTEM:	Multiclones, dry ESP and venturi scrubber in series[52,53]
MANUFACTURER:	AAF (scrubber)[52,54]
DATE INSTALLED:	1979[53]
SYSTEM DESCRIPTION:	• 375,000 cfm (rated)[52] • Δp = 50 in. H_2O[54] • Test Data (1981):[55] 377,000-404,000 acfm (range) Temperature = 109-119°F (range)
DISCHARGE END EMISSION CONTROL SYSTEM:	Venturi scrubber[53,56]
MANUFACTURER:	
DATE INSTALLED:	
SYSTEM DESCRIPTION:	• Rated at 66,670 scfm[56]

ADDITIONAL COMMENTS:

TABLE 11. KAISER STEEL CORP. IN FONTANA, CA

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

STRAND DESIGNATION:	No. 1[57]	No. 2[58]
STARTUP DATE:	1943[2]	1953[2]
STRAND WIDTH (in.):	72[2,51]	72[2,51]
GRATE AREA (ft^2):	612[2,51]	612[2,51]
NO. OF WINDBOXES:		16[58]
TYPE OF IGNITION FUEL:	COG[2,51]	COG[2,51]
SINTER PRODUCTION:		
RATED TONS/DAY:		
TYPICAL TONS/DAY:		
WINDBOX EMISSION CONTROL SYSTEM:	Baghouse[57]	Baghouse[57,58]
MANUFACTURER:	Carborundum[58]	Carborundum[58]
DATE INSTALLED:	1971[59]	1971[59]
SYSTEM DESCRIPTION:	• Rated at 180,000 acfm using 1,100-hp F.D. fan and 900-hp I.D. fan[57] • 7 compartments--1,288 (total) silicone, graphite, teflon-coated, fiberglass bags[57] • Reverse air cleaning with 150-hp fan and 24,900 cfm[57] • <u>Test Data (1974-Inlet):</u>[60,61] 138,500 scfm at 170°F 149,000 scfm (wet) at 233°F	• Rated at 180,000 acfm at 275°F[58] • 7 compartments--1,288 (total) silicone, graphite, teflon-coated, fiberglass bags[57] • A/C (design) = 1.47:1[58] • <u>Test Data (1974-Inlet):</u>[60] 132,000 scfm at 270°F

(continued)

TABLE 11 (continued)

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

	• Both baghouses ducted to common exhaust stack[60] • Test Data (1975-Outlet):[58] 205,170-222,392 acfm (range) 285-320°F (range)	
DISCHARGE END EMISSION CONTROL SYSTEM:		• No. 2 strand discharge-breaker end ducted to windbox control system baghouse (see above description)[57,58]

ADDITIONAL COMMENTS:

TABLE 12. LONE STAR STEEL IN LONE STAR, TX

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

STRAND DESIGNATION:[a]

STARTUP DATE:

STRAND WIDTH (in.):

GRATE AREA (ft^2):

NO. OF WINDBOXES:

TYPE OF IGNITION FUEL:

SINTER PRODUCTION:

RATED TONS/DAY:
TYPICAL TONS/DAY:

WINDBOX EMISSION CONTROL SYSTEM:

MANUFACTURER:
DATE INSTALLED:
SYSTEM DESCRIPTION:

DISCHARGE END EMISSION CONTROL SYSTEM:

MANUFACTURER:
DATE INSTALLED:
SYSTEM DESCRIPTION:

ADDITIONAL COMMENTS:

[a]Original sinter plant (rated at 1,900 tons/day) was shut down in 1977-1978.[12]

TABLE 13. NATIONAL STEEL CORP./GREAT LAKES STEEL DIVISION IN ECORSE, MI

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

STRAND DESIGNATION:	No. 2[62]
STARTUP DATE:	1958[2]
STRAND WIDTH (in.):	144[2,51]
GRATE AREA (ft^2):	2,400[2,51]
NO. OF WINDBOXES:	
TYPE OF IGNITION FUEL:	COG[22]
SINTER PRODUCTION:	
RATED TONS/DAY:	4,850;[2] 4,600;[3] 5,500[62]
TYPICAL TONS/DAY:	
WINDBOX EMISSION CONTROL SYSTEM:	Gas recycle gravel bed filter[2,63]
MANUFACTURER:	Combustion Power Co.[64]
DATE INSTALLED:	1978[63]
SYSTEM DESCRIPTION:	• Total inlet maximum flow rate = 780,000 acfm at 180°F[27] • System Δp = 7-10 in. H_2O[27] • Two waste gas fans rated at 340,000 and 344,000 cfm[2] • Gravel bed system is essentially a dry scrubber unit filled with a filter media[27]
DISCHARGE END EMISSION CONTROL SYSTEM:[a]	Multiclones[62]
MANUFACTURER:	Zurn[65]
DATE INSTALLED:	1976[65]
SYSTEM DESCRIPTION:	• Total of four multiclones[62] • Breaker and hot screens ducted to two multiclones each[62] • Exhaust gases from multiclones recycled back into sinter machine[62]

ADDITIONAL COMMENTS:

[a]Includes breaker and hot screens.[62]

TABLE 14. NATIONAL STEEL CORP./GRANITE CITY STEEL DIVISION IN GRANITE CITY, IL

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

STRAND DESIGNATION:	No. 1
STARTUP DATE:	1958[2,27]
STRAND WIDTH (in.):	76[2,51]
GRATE AREA (ft^2):	1,024[2,51]
NO. OF WINDBOXES:	
TYPE OF IGNITION FUEL:	COG and Natural gas;[2,51] Gas or oil[66]
SINTER PRODUCTION:	
RATED TONS/DAY:	2,500;[2] 3,800[3]
AVERAGE TONS/DAY (1976):	2,486[31]
WINDBOX EMISSION CONTROL SYSTEM:	Cyclones and high-energy venturi scrubber[66]
MANUFACTURER:	Buell;[66] AAF[66,67]
DATE INSTALLED:	1973[66]
SYSTEM DESCRIPTION:	• In series:[66] Cyclones (4 in parallel), main windbox fan, venturi scrubber, scrubber fan • Fan capacity = 240,000-280,000 cfm[2] • Inlet scrubber design flow rate = 180,000 dscfm at 300°F[66] • Outlet mist eliminator flow rate = 289,700 acfm at 118°F[66] • Design Δp = 55 in. W.G. (across venturi throat)[66] • Test Data (1975):[66] Outlet flow rate = 199,000 dscfm (avg) Gas temperature at outlet = 149°F (avg) Δp (actual) = 51 in. W.G.

(continued)

TABLE 14 (continued)

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

DISCHARGE END EMISSION CONTROL SYSTEM:[a]	Baghouse[b,68,69]
MANUFACTURER:	Carborundum[68]
DATE INSTALLED:	1981[68]
SYSTEM DESCRIPTION:	• Rated at 90,000 cfm[69] • Test Data (1981):[68] 111,600-114,600 acfm (range) 110-145°F (range)

ADDITIONAL COMMENTS:

[a]Discharge end; including sinter breaker, hot fines screen and transfer points.[68]

[b]Baghouse replaced an existing fabric filter (and cyclones) in 1981, which exhausted ~40,000 cfm.[69]

TABLE 15. NATIONAL STEEL CORP./WEIRTON STEEL DIVISION IN WEIRTON, WV

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

STRAND DESIGNATION:[a]	No. 2[70]
STARTUP DATE:	1958[2]
STRAND WIDTH (in.):	144[2,70]
GRATE AREA (ft^2):	1,764[2,70]
NO. OF WINDBOXES:	14 (dual arrangement)[70]
TYPE OF IGNITION FUEL:	COG[71]
SINTER PRODUCTION:	
RATED TONS/DAY:	5,200;[71] 4,850[2]
AVERAGE TONS/DAY (1976):	4,750[3]
WINDBOX EMISSION CONTROL SYSTEM:[b]	Gas recycle, gravel bed filter[70,71]
MANUFACTURER:	Weirton Steel Division[73]
DATE INSTALLED:	1976[70,73]
SYSTEM DESCRIPTION:	

- Two parallel waste gas mains (east and west) transport 50% of windbox effluent to series of four cyclones, effluent recombines in plenum to two I.D. fans (each rated at 393,000 acfm at 382°F, 50.8 in. W.C., and 4,500 bhp), waste gas fan handles 50% of total volume for the gravel bed filter, recycle fan is designed to recirculate 39% of total gas volume back to machine via six distribution ducts, remaining flow from recirc. fan goes to bed filter.[70]
- Gravel Bed Filter Consists of:[70] 20 filter modules, assembled in groups of four, modules have upper and lower filter bed, each bed includes 22 ft^3 of garnet or steel grit filter media at depth of 3.5-4 in., 22 modules operate at one time, system designed to handle a flux rate of 120 cfm/ft^2 of bed area at a Δp 13 in. W.C. (flange to flange).
- Backflushing of the two down modules is done with externally preheated air (using COG) of 300°F.[70]
- Rated at 600,000-700,000 scfm.[72]

ADDITIONAL COMMENTS:

[a]Strand No. 1 (installed in 1955) was shut down in 1975.[71,73]
[b]Control system was originally designed for the smaller No. 1 sinter strand; at present control system is not operating.[73]

TABLE 16. REPUBLIC STEEL CORP./SOUTHERN DISTRICT, GULFSTEEL WORKS IN GADSDEN, AL

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

STRAND DESIGNATION:	
STARTUP DATE:	1936[2]
STRAND WIDTH (in.):	72[2,51]
GRATE AREA (ft^2):	569[2,51]
NO. OF WINDBOXES:	
TYPE OF IGNITION FUEL:	COG, Natural Gas, and oil[2,51]
SINTER PRODUCTION:	
RATED TONS/DAY:	1,800;[74] 1,500[3]
TYPICAL TONS/DAY:	
WINDBOX EMISSION CONTROL SYSTEM:	Cyclones and baghouse (in series)[74,75]
MANUFACTURER:	Fly Ash Arrestor Corp. and Wheelabrator-Frye, respectively[74]
DATE INSTALLED:	1976[74]
SYSTEM DESCRIPTION:	
• Cyclones:[74] 345 collector tubes Design flow rate = 219,870 acfm at 260°F Δp (design) = 2.95 in. W.G.	• Baghouse:[a,74] 14 compartments with a total of 2,520 felted Dacron bags (sized finish) A/C = 5.95:1 (design) Δp = 5 in. W.G. (normal-design) Negative pressure baghouse with pulse jet cleaning Fan (design) = radial blade; 1,800-hp; 210,000 acfm at 250°F and 36.2 in. W.G.
DISCHARGE END EMISSION CONTROL SYSTEM:	Cyclones and baghouse (in series)[74]
MANUFACTURER:	Fly Ash Arrestor Corp. and Wheelabrator-Frye, respectively[74]
DATE INSTALLED:	1976[76]

(continued)

TABLE 16 (continued)

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

SYSTEM DESCRIPTION:

- Hoods from the four sinter screens, a discharge end hood, and hoods over the feed and discharge end of pug mills are ducted to a common flue, cyclones, and baghouse[74]
- <u>Cyclones</u>:[74]
  2 collectors with 154 tubes per collector
  Design flow = 92,700 acfm at 195°F and Δp = 2.4 in. W.G.
- <u>Baghouse</u>:[74]
  14 compartments with a total of 2,520 Nomex felt bags
  A/C = 7.37:1 (design)
  Δp = 5 in. W.G. (normal-design)
  Positive pressure baghouse with pulse jet cleaning
  Fan (design) = radial blade, 1,200-hp; 260,000 acfm at 275°F and 18 in. W.G.

ADDITIONAL COMMENTS:

[a]March 1977--All compartments rebagged with felted Dacron bags having a smoother or singed finish; October 1978--baghouse rebagged; 12 compartments with Dacron bags and 2 compartments with Teflon and Nomex bags (experimental testing).[74]

TABLE 17. REPUBLIC STEEL CORP./MAHONING VALLEY DISTRICT IN WARREN, OH

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

STRAND DESIGNATION:	No. 1[77]
STARTUP DATE:[a]	1943[2]
STRAND WIDTH (in.):	72[2,51]
GRATE AREA (ft^2):	432[2,51]
NO. OF WINDBOXES/STRAND	
TYPE OF IGNITION FUEL:	COG[2,51]
SINTER PRODUCTION:	
RATED TONS/DAY:	600[3]
TYPICAL TONS/DAY:	
WINDBOX EMISSION CONTROL SYSTEM:	Multiclone[77]
MANUFACTURER:	
DATE INSTALLED:	1979[77]
SYSTEM DESCRIPTION:	• Single centrifugal dust collector[2,51]
DISCHARGE END EMISSION CONTROL SYSTEM:	

ADDITIONAL COMMENTS:

[a]Plant will shutdown on December 31, 1981.[77]

TABLE 18. REPUBLIC STEEL CORP./MAHONING VALLEY DISTRICT IN YOUNGSTOWN, OH[a]

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

STRAND DESIGNATION:	No. 2[78]
STARTUP DATE:	1958[2]
STRAND WIDTH (in.):	96[2]
GRATE AREA (ft^2):	1,344[2]
NO. OF WINDBOXES:	
TYPE OF IGNITION FUEL:	Gas[2]
SINTER PRODUCTION:	
RATED TONS/DAY:	5,000[78]
TYPICAL TONS/DAY:	
WINDBOX EMISSION CONTROL SYSTEM:	ESP[78]
MANUFACTURER:	Koppers[78]
DATE INSTALLED:	1958[78]
SYSTEM DESCRIPTION:	• Design flow rate = 345,000 scfm and maximum gas temperature = 200°F[18] • Two cells--three fields[79] • One fan[78]
DISCHARGE END EMISSION CONTROL SYSTEM:	Cyclones[79]
MANUFACTURER:	Western Precipitator[79]
DATE INSTALLED:	
SYSTEM DESCRIPTION:	• 4 cyclones total[79] • 70,000 acfm[79]

ADDITIONAL COMMENTS:

[a]Sinter plant sold by U.S. Steel Corp. to Republic Steel Corp. in 1980.[80]

TABLE 19. UNITED STATES STEEL CORP./SOUTH WORKS IN CHICAGO, IL

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

STRAND DESIGNATION:	No. 2[81]
STARTUP DATE:	1958[2]
STRAND WIDTH (in.):	96[2,51]
GRATE AREA (ft^2):	1,344[2,51]
NO. OF WINDBOXES:	21[81]
TYPE OF IGNITION FUEL:	Natural Gas;[2,51] (COG)[81]
SINTER PRODUCTION:	
RATED TONS/DAY:	5,000[3]
TYPICAL TONS/DAY:	
WINDBOX EMISSION CONTROL SYSTEM:	Cyclones, ESP's, Electro-Dynamics (EDV) Scrubbers (in series)[81]
MANUFACTURER:	Chemico (EDV)[81]
DATE INSTALLED:	1980 (EDV)[81]
SYSTEM DESCRIPTION:	

- 1 fan rated at 375,000 scfm located between the ESP and EDV[81]
- Cyclones[6] and ESPs[2] (original control system) reduce loading to EDVs(2)[81]
- Cyclone catch is recycled[81]
- 2 EDVs operate in parallel; each has 16 venturis and 16 electrodes[81]
- System handles approximately 420,000 acfm (total for both EDVs)[82]
- Water flow (each EDV) = 880 gpm; 55 gpm per nozzle delivered at 53 psig[81]
- Test Data (1981):[83,84,85]
  EDV inlet flow (avg.) = 360,909 acfm; temperature = 197°F (avg.)
  EDV outlet flow (avg.) = 336,213 acfm; temperature = 108°F (avg.)
  Water flow = 835 gpm (per EDV)

DISCHARGE END EMISSION CONTROL SYSTEM:	Baghouse[30,86]
MANUFACTURER:	
DATE INSTALLED:	

(continued)

TABLE 19 (continued)

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

SYSTEM DESCRIPTION:

- Controls emissions from discharge end, hot screens, sinter breaker, and surge bins[86]
- 10 module baghouse[81]
- Baghouse exhaust gases are partially recycled back to strand (via east and west return ducts) to provide preheated combustion air to the windboxes[81]
- Common outlet (4 ft x 14 ft); east and west duct--5 ft diameter each[50]
- Test Data (1981):[50]
  East duct flow = 20,377 acfm (avg.); temperature = 134°F (avg.)
  West duct flow = 53,896 acfm (avg.); temperature = 133°F (avg.)
  Baghouse outlet = 148,800 acfm (avg.); temperature = 135°F (avg.)

ADDITIONAL COMMENTS:

TABLE 20. UNITED STATES STEEL CORP./FAIRFIELD WORKS IN FAIRFIELD, AL

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

STRAND DESIGNATION:[a]	No. 1[87]	No. 2[87]	No. 3[87]	No. 4[87]
STARTUP DATE:	1940[87]	1940[87]	1940[87]	1961[87]
STRAND WIDTH (in.):	72[2,51]	72[2,51]	72[2,51]	96[2,51]
GRATE AREA (ft^2):	1,760 (total for Nos. 1, 2, and 3 combined)[2,51]			1,344[2,51]
NO. OF WINDBOXES:				
TYPE OF IGNITION FUEL:	Natural gas (all four strands)[2,51]			
SINTER PRODUCTION:				
RATED TONS/DAY:	7,783 (all 4 strands combined)[3]			
AVERAGE TONS/DAY (1976):	6,306 (all 4 strands combined)[3]			
WINDBOX EMISSION CONTROL SYSTEM:	ESP[88]	ESP[88]	ESP[88]	ESP (dry)[63,88]
MANUFACTURER:				
DATE INSTALLED:				1979[63]
SYSTEM DESCRIPTION:				

ADDITIONAL COMMENTS:

[a]Strand Nos. 1, 2 and 3 in one shop; Strand No. 4 in another shop.[87]

TABLE 21. UNITED STATES STEEL CORP./FAIRLESS WORKS IN FAIRLESS HILLS, PA

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

STRAND DESIGNATION:	No. 1[89]	No. 2[89]
STARTUP DATE:	1956[2]	1960[90]
STRAND WIDTH (in.):	96[2,90]	96[2,90]
GRATE AREA (ft^2):	1,472[89,90]	1,344[90,91]
NO. OF WINDBOXES:		
TYPE OF IGNITION FUEL:	Mixed or Natural Gas[2,90]	Mixed, or COG and Natural Gas[2,90]
SINTER PRODUCTION:		
RATED TONS/DAY:	7,400;[90] 7,200[3] (both strands combined)	
AVERAGE TONS/DAY (1976):	6,711[3] (both strands combined)	
WINDBOX EMISSION CONTROL SYSTEM:[a]	Cyclones[92]	Cyclones[89,92]
MANUFACTURER:	Buell[92]	Buell[89,92]
DATE INSTALLED:		
SYSTEM DESCRIPTION:	• Fan rated at 440,000 acfm at 300°F[90]	• Fan rated at 440,000 acfm at 300°F[90]
DISCHARGE END EMISSION CONTROL SYSTEM:	Rotoclone No. 5[89] (Type N)	Rotoclone No. 3[92]
MANUFACTURER:	AAF[92]	AAF[92]
DATE INSTALLED:		
SYSTEM DESCRIPTION:	• Controls discharge end and sinter breaker[89] • Hood covers approximately last 15 ft of sinter line and sinter breaker[89]	• Controls discharge end, transfer points after rotary cooler, and a belt transfer point[91] • Exhaust fan rated at 40,000 cfm[91]

(continued)

TABLE 21 (continued)

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

	• Rotoclone is a low draft loss scrubber with fan rate at 40,000 cfm[89] • Test Data (1977):[89] 12,300-12,600 scfm Temperature = 92-100°F (avg.)	
ADDITIONAL CONTROL SYSTEMS:	Rotoclone No. 6[89] (Type N)	Rotoclone No. 4[91,92]
MANUFACTURER:	AAF[92]	AAF[92]
DATA INSTALLED:		
SYSTEM DESCRIPTION:	• Controls hot sources and screen discharge to cooler[89] • Hoods ducted to rotoclone by a fan rated at 38,000 cfm[89] • Test Data (1977):[89] Flow (range) = 12,300-13,000 scfm Temp. (range) = 94-96°F (avg.)	• Controls sinter breaker[91] • Exhaust fan rated at 400,000 cfm[91]
ADDITIONAL CONTROL SYSTEMS:	Multiclone[89,92]	Rotoclone Nos. 1 and 2[91,92]
MANUFACTURER:	Buell[89,92]	AAF[92]
DATE INSTALLED:		

(continued)

TABLE 21 (continued)

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

SYSTEM DESCRIPTION:	• Controls two transfer points-cooler discharge and hot fumes surge bin discharge[89] • Emission from both transfer points are ducted together and exhausted through control by a fan rated at 75,000 cfm[93] • Test Data (1974):[93] 46,100 dscfm; temp. = 152°F (avg.) • Test Data (1977):[89] 53,300-54,100 scfm Temp. = 136-144°F	• Controls hot sinter screen and discharge points between screens and cooler[91] • Common manifold ducted to both rotoclones[91] • Exhaust fan for each collector rated at 38,000 cfm[91]

ADDITIONAL COMMENTS:

[a]Windbox emissions (No. 1 and No. 2) will be controlled by an ESP for each strand by December 1982.[92]

TABLE 22. UNITED STATES STEEL CORP./GARY WORKS IN GARY, IN

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

STRAND DESIGNATION:[a]	No. 1[94]	No. 2[94]	No. 3[94]
STARTUP DATE:	1958[2,95]	1958;[2] 1959[95]	1958;[2] 1959[95]
STRAND WIDTH (in.):	99[2,95]	99[2,95]	99[2,95]
GRATE AREA (ft^2):	1,293[95,96]	1,293[95,96]	1,293[95,96]
NO. OF WINDBOXES:			
TYPE OF IGNITION FUEL:	Natural Gas;[2,51] COG[95]	Natural Gas;[2,51] COG[95]	Natural Gas;[2,51] COG[95]
SINTER PRODUCTION:			
RATED TONS/DAY:	5,000[97]	5,000[97]	5,000[97]
NORMAL TONS/DAY:	4,000[97]	4,000[97]	4,000[97]
WINDBOX EMISSION CONTROL SYSTEM:[b,c]	ESP[94]	ESP[94]	ESP[94]
MANUFACTURER:	Western Precipitator (all 3 ESPs)[82]		
DATE INSTALLED:	Before 1972 (all 3 ESPs)[94]		
SYSTEM DESCRIPTION:			
DISCHARGE END EMISSION CONTROL SYSTEM:	3 baghouses (one for each strand)[95,96]		
MANUFACTURER:	U.S. Steel/Gary (all three baghouses)[97]		
DATE INSTALLED:	No. 1--1966;[95,96] No. 2--1968;[95,96] No. 3--1968;[96] 1969[95]		
SYSTEM DESCRIPTION:	(All three baghouses are similar, except where noted)		

- Controls emissions from the discharge end, hot sinter conveyor, hot screens, and sinter cooler inlet (controls 21 pickup points)[95,96]
- 10 compartments; 880 silicone treated fiberglass bags (total)[96,97]

(continued)

TABLE 22 (continued)

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

- Design flow rate = 171,550 scfm at 260°F[97]
- I.D. fan (design) = 162,000 cfm at 225°F[96]
- A/C (normal) = 2.17:1; A/C (during cleaning cycle) = 2.41:1[96]
- Reverse air cleaning[97]

ADDITIONAL COMMENTS:

[a]All strands located at the No. 3 sinter shop.[94]

[b]An electro-dynamic venturi (EDV) scrubber system is presently being installed.[94]

[c]EDV system will handle a total flow of 1,260,800 acfm.[82]

TABLE 23. UNITED STATES STEEL CORP./GENEVA WORKS IN PROVO, UT

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

STRAND DESIGNATION:	North[98]	South[98]
STARTUP DATE:	1944[2]	1944[2]
STRAND WIDTH (in.):	72[2,51]	72[2,51]
GRATE AREA (ft^2):	612[2,51]	612[2,51]
NO. OF WINDBOXES:	10[99]	10[99]
TYPE OF IGNITION FUEL:	Natural Gas and/or mixed gas (both strands)[2,51]	
SINTER PRODUCTION:		
RATED TONS/DAY:	3,000;[100] 2,910[3] (both strands combined)	
AVERAGE TONS/DAY (1976):	1,373[3] (both strands combined)	
WINDBOX EMISSION CONTROL SYSTEM:	Separate identical partial-orifice plate type wet scrubber per strand[100]	
MANUFACTURER:	U.S. Steel[100]	
DATE INSTALLED:[a]	1962 (upgraded-1975)[100]	
SYSTEM DESCRIPTION:	• Each scrubber designed for 180,000 scfm, 200°F, Δp = 2-3 in. W.G., and 700 gpm of scrubber water (L/G approximately 3.1:1)[100] • Separate exhaust stack per strand[98]	
	• Test Data (1978):[98] 249,210-278,600 acfm (range) 97-107°F (range)	• Test Data (1978):[98] 246,460-250,665 acfm (range) 102-109°F (range)
DISCHARGE END EMISSION CONTROL SYSTEM:[b]	Rotoclones per strand control discharge end, and conveying systems[99]	
MANUFACTURER:		
DATE INSTALLED:	1981[99]	
SYSTEM DESCRIPTION:		

ADDITIONAL COMMENTS:

[a]Both scrubbers were modified in 1975 by relocating the internal sprays.[100]
[b]Rotoclones replaced a common ring-orifice scrubber (installed approximately 1962) which controlled only the discharge end of both strands.[99]

TABLE 24. UNITED STATES STEEL CORP./HOMESTEAD WORKS IN SAXONBURG, PA

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

STRAND DESIGNATION:	No. 1[101]	No. 2[102]	No. 3[102]
STARTUP DATE:	1958[a,32]	1958[b,32]	1959[b,32]
STRAND WIDTH (in.):	98[103,104]	98[104]	98[104,105]
GRATE AREA (ft^2):	1,293[51,104]	1,293[51,104]	1,293[51,104]
NO. OF WINDBOXES:	24[103,107]	24[106,107]	24[105,107]
TYPE OF IGNITION FUEL:	Natural Gas[44,51]	Natural Gas[44,51]	Natural Gas[44,51]
SINTER PRODUCTION:			
RATED TONS/DAY:	15,000;[3] 12,900[104] (all three strands combined)		
TYPICAL TONS/DAY:			
WINDBOX EMISSION CONTROL SYSTEM:	Dry ESP per strand[c,104]		
MANUFACTURER:	Koppers (all 3 ESPs)		
DATE INSTALLED:	No. 1--1958;[d,32] No. 2--1958;[3,32] No. 3--1959[e,32]		
SYSTEM DESCRIPTION:	(All ESPs are similar, except where noted) • 4 compartment ESP[103] • Design Data:[32] 234,000-284,000 scfm at 70°F Collection area = 41,500 sq ft • SCA (calculated) = 138 sq ft/1000 cfm[104] • I.D. fan rated at 300,000 acfm at 275°F[104] • A gas recycle system (exhausting from windbox Nos. 16-21) using cyclones and a fan rated at 110,000 acfm at 350°F has been installed recently[104,108] • Test Data (1979):[110] Flow (range) = 294,000-338,500 dscfm Temperature (range) = 166-194°F • Test Data (1976):[103,105,106] ESP No. 1--223,600 dscfm ESP No. 2--231,700 dscfm ESP No. 3--287,000 dscfm		

(continued)

TABLE 24 (continued)

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

	• Test Data (1972):[102,105] ESP No. 1--Flow (range) = 265,000-267,000 scfm Temperature (range) = 239-278°F ESP No. 2--Flow (range) = 243,000-270,000 scfm Temperature (range) = 269-277°F • Test Data (1971):[109] ESP No. 3--377,000 scfm at 244°F	
DISCHARGE END EMISSION CONTROL SYSTEM:	Baghouse per strand[111]	
MANUFACTURER:		
DATE INSTALLED:	No. 1--1969;[32] No. 2--1969;[32] No. 3--1970[32]	
SYSTEM DESCRIPTION:	(All baghouses are similar, except where noted) • Controls emissions from discharge end, transfer of sinter at breaker, hot screens, and other sinter transfer points[111] • 168,000 scfm at 70°F, 29.92 in. Hg[32] • Δp = 6 in. W.C.[32] • A/C = 1.94:1[32]	
ADDITIONAL CONTROL SYSTEM:	Baghouse for cold screen Nos. 3 and 4 on sinter line No. 1[111]	Baghouse for cold screen Nos. 1 and 2 on sinter line Nos. 2 and 3[111]
MANUFACTURER:		
DATE INSTALLED:	1972[32]	1972[32]
SYSTEM DESCRIPTION:	• Combined effluent from screen Nos. 3 and 4 pass through multiclone[111]	• Combined effluent from screen Nos. 1 and 2 pass through multiclone[111]

(continued)

TABLE 24 (continued)

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

	• Design Data:[32] 70,000 scfm fan at 100°F Δp = 5.25 in. W.C. A/C = 2.0:1 • I.D. fan rated at 60,000 cfm discharges to stack No. 2--South[32] • Test Data (1971):[1,11] 46,100 cfm	• Design Data:[32] (similar to baghouse on strand No. 1) • I.D. fan rated at 60,000 cfm discharges to stack No. 1--North[32]
ADDITIONAL CONTROL SYSTEM:	Baghouse per strand controlling sinter feed ends[32]	
MANUFACTURER:		
DATE INSTALLED:	1967 (all three baghouses)[32]	
SYSTEM DESCRIPTION:	(All baghouses are similar, except where noted) • 12,400 acfm at ambient[32] • Δp = 16 in. W.C.[32] • A/C = 2.01:1[32]	
ADDITIONAL CONTROL SYSTEM:	Baghouse for bin building[32]	
MANUFACTURER:		
DATE INSTALLED:		
SYSTEM DESCRIPTION:	• 24,400 scfm at ambient[32] • Δp = 16 in. W.C.[32] • A/C = 1.78:1[32]	
ADDITIONAL CONTROL SYSTEM:	Baghouse for sinter sizing operation[32]	
MANUFACTURER:		
DATE INSTALLED:		

(continued)

TABLE 24 (continued)

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

SYSTEM DESCRIPTION:	• 110,000 scfm at 180°F[32] • Δp = 12.4 in. W.C.[32] • A/C = 1.97:1[32]

ADDITIONAL COMMENTS:

[a]Strand No. 1 remodeled in 1972.[32]

[b]Strand Nos. 2 and 3 remodeled in 1972[32]

[c]A second ESP will be installed by the end of 1981 at the outlet of the existing No. 1 windbox ESP and will have the following specifications: flow = 310,000 acfm at 225°F; SCA = 451 sq ft/1,000 cfm; 3 fields and 40 gas passages (12-in. wide). Similar systems will be installed on the Nos. 2 and 3 strands in the future.[108]

[d]ESP rehabilitated in 1972.[32]

[e]ESP rehabilitated in 1971.[32]

[f]Only cold screen No. 3 was operating during 1971 stack tests.[111]

TABLE 25. WHEELING-PITTSBURGH STEEL CORP./MON VALLEY PLANT IN MONESSEN, PA

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

STRAND DESIGNATION:	
STARTUP DATE:	1966[112]
STRAND WIDTH (in.):	72[2,51]
GRATE AREA (ft^2):	612[2,51]
NO. OF WINDBOXES:	16[113]
TYPE OF IGNITION FUEL:	COG[113]
SINTER PRODUCTION:	
RATED TONS/DAY:	1,000[3]
AVERAGE TONS/DAY (1976):	869[3]
WINDBOX EMISSION CONTROL SYSTEM:	Wet ESP[a,112,114]
MANUFACTURER:	Western Precipitator[114]
DATE INSTALLED:	1981[112,114]
SYSTEM DESCRIPTION:	• Design flow rate = 190,000 acfm at 155°F[112,114] • System uses 3 F.D. fans[112]
DISCHARGE END EMISSION CONTROL SYSTEM:[b]	Hooded area ducted to a scrubber[113]
MANUFACTURER:	Ducon[113]
DATE INSTALLED:	1966[114]
SYSTEM DESCRIPTION:	• In Series: hood, I.D. fan, scrubber, demister, and stack[113] • Design flow = 38,000 scfm[114] • Wet I.D. fan rated at 41,000 acfm at 110°F[113] • Water supply to fan/scrubber = 85-100 gpm[113] • Test Data (1977):[113] 24,500 dscfm with temperature = 107°F (avg.) 34,700 dscfm with temperature = 106°F (avg.)

ADDITIONAL COMMENTS:

[a]This new ESP replaced the original ESP which was installed in 1966.[112,114]
[b]Controls emissions from discharge end, crusher and hot screens.[113]

TABLE 26. WHEELING-PITTSBURGH STEEL CORP./STEUBENVILLE PLANT IN EAST STEUBENVILLE, WV

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

STRAND DESIGNATION:	No. 1[73]
STARTUP DATE:	1944[2]
STRAND WIDTH (in.):	72[2,51]
GRATE AREA (ft^2):	535;[2] 540[51]
NO. OF WINDBOXES:	10[115]
TYPE OF IGNITION FUEL:	COG;[115] Gas[2,51]
SINTER PRODUCTION:	
RATED TONS/DAY:	1,500[3]
AVERAGE TONS/DAY (1976):	1,130
WINDBOX EMISSION CONTROL SYSTEM:	High-efficiency venturi scrubber[115]
MANUFACTURER:	AAF[72,73]
DATE INSTALLED:	1973[a,115]
SYSTEM DESCRIPTION:	• In Series:[115] 2 cyclones, 2 fans (one fan for windbox draft, one fan for venturi pressure control), venturi scrubber, cyclone separator, stack[115] • Scrubber rated at 135,000 scfm[115] • Δp = 42 in. H_2O (operation)[115] • 2,000 gpm scrubber water used[115] • Test Data (1978):[115] Δp = 38-44 in. H_2O
DISCHARGE END EMISSION CONTROL SYSTEM:[b]	Baghouse[73]
MANUFACTURER:	Baumco[73]
DATE INSTALLED:	1981[73]
SYSTEM DESCRIPTION:	• 2 units rated at 40,000 acfm at 200°F (total)[73]

(continued)

TABLE 26 (continued)

SINTER PLANT PROCESS AND EMISSION CONTROL DATA

	• Total cloth area = 8,900 sq ft[73] • A/C = 4.5:1[73] • Nomex bags, with pulse-jet cleaning[73]

ADDITIONAL COMMENTS:

[a]Scrubber rebuilt in 1975.[73]

[b]Discharge end previously controlled by a venturi scrubber prior to 1976; was uncontrolled from 1976 to 1981.[115]

MATERIAL IN THIS SECTION SUBJECT TO CONFIDENTIALITY
REVIEW AND IS NOT RELEASABLE AS OF FEBRUARY 1, 1982.
FOR INFORMATION, CONTACT L. KESARI, U.S. ENVIRONMENTAL
PROTECTION AGENCY, DIVISION OF STATIONARY SOURCE ENFORCEMENT.

REFERENCES

SINTER PLANTS

1. Letter response. James Dills, Commonwealth of Kentucky Department for Natural Resources and Environmental Protection to Michael Jasinski, GCA/Technology Division. November 19, 1981. (Reliability No. 1.)

2. World Steel Industry Data Handbook: Volume I. The United States. McGraw Hill Magazine. 1978. pp. 12 and 13. (Reliability No. 4.)

3. Development Document for Proposed Effluent Limitations Guidelines and Standards for the Iron and Steel Manufacturing Point Source Category, Volume III. EPA-440/1-79-024a. Draft Report. U.S. Environmental Protection Agency, Research Triangle Park, NC. October 1979. pp. 8-9. (Reliability No. 4.)

4. The Wet Scrubber Newsletter. McIlvaine Co. March 31, 1978. Volume No. 45, pp. 1. (Reliability No. 4.)

5. Telephone conversation. Gerald Shicker, Kentucky Air Pollution Control Division to Michael Jasinski, GCA/Technology Division. February 23, 1981. (Reliability No. 2.)

6. Steel in Texas. Iron & Steel Engineer. 48(4): T-3 through T-14. April 1971. (Reliability No. 3.)

7. Steiner, B. A., and R. J. Thompson. Wet Scrubbing Experience for Steel Mill Applications. ARMCO Steel Corp. in Middletown, Ohio. JAPCA. 27(11):1071. (Reliability No. 3.)

8. Iron & Steel Engineer. Industry News. May 1979. p. 91. (Reliability No. 4.)

9. Carpenter, B. H., et al. Pollution Effects of Abnormal Operations in Iron & Steel Making--Volume II, Sintering, Manual of Practice. EPA 600/2-78-118b. U.S. Environmental Protection Agency, Research Triangle Park, NC. June 1978. pp. 33, 35. (Reliability No. 3.)

10. Letter report from Southwestern Laboratories Testing Engineers to C. Wright, Lone Star Steel Co./Lone Star, Texas. Stack sampling of Lone Star Steel's Steam--Hydro units. RACT Box No. 400541-400584. (Reliability No. 1.)

11. Southwestern Labs. Sampling and Analysis of Particulate Emissions from the ARMCO Steel, Sintering Plant Steam--Hydro Cleaning System at Houston, Texas. February 24-26, 1976. JACA Inc. Library. (Reliability No. 1.)

12. Telephone conversation. John Hepola, U.S. Environmental Protection Agency Region VI to Michael Jasinski, GCA/Technology Division. November 1981. (Reliability No. 2.)

13. Telephone conversation. Lawrence Pewitt, Texas Air Control Board to Sandy Beaton, GCA/Technology Division. November 1981. (Reliability No. 2.)

14. Sampling and Analysis of Particulate Emissions from the Sintering Plant Cooler Stack at ARMCO Steel Corporation/Houston, Texas. January 9-11, 1975. JACA Inc. Library. (Reliability No. 1.)

15. Letter report from T. E. Power, Senior Research Chemist, Environmental Research & Technology, Inc., Inc., to Mr. B. A. Steiner, ARMCO Steel Inc. RACT Box No. 400635-400658. (Reliability No. 2.)

16. Steiner, B. A., and R. J. Thompson. Metallurgical Applications. JAPCA. 27(11): 1074. November 1977. (Reliability No. 3.)

17. Carpenter, B. H., et al. Pollution Effects of Abnormal Operations in Iron and Steelmaking--Vol. II. Sintering, Manual of Practice. EPA-600/2-78-1186. June 1978. p. 34. (Reliability No. 3.)

18. Telephone conversation. Ed Luebering, SW District Ohio EPA to Gene Bergson, GCA/Technology Division. March 9, 1981. (Reliability No. 2.)

19. Telephone conversation. Mr. Lemkuhl, Southwest Ohio APC Agency to Gene Bergson, GCA/Technology Division. October 27, 1980. (Reliability No. 2.)

20. RACT Box No. 400709-400728. (Reliability No. 1.)

21. Air Pollution Emission Test at Bethlehem Steel, Bethlehem, Pennsylvania Sinter Plant. York Research Corp. Final Report No. 75-SIN-1. December 22, 1975. RACT Box No. 400763. (Reliability No. 1.)

22. U.S. Steel Industry APC Equipment Manual. The McIlvaine Co. July 1980. p. ST-28. (Reliability No. 4.)

23. Test Plan for Sampling and Analysis of Total Particulates and SO_2 from the Sinter Plant at Bethlehem Steel Corp./Sparrows Point Works. GCA/Technology Division, Bedford, Massachusetts. September 1979. (Reliability No. 1.)

24. Letter response. J. McGrogan, PADER--Reading, PA to Sandy Beaton, GCA/Technology Division. November 1981. (Reliability No. 1.)

38. Bethlehem Steel Corporation, Sparrows Pt., Maryland, No. 7 Sinter Strand Scrubber Outlet Tests performed by BSC. Letter to L. Kertcher, Bureau of Air Quality and Noise Control in Baltimore, Maryland. July 14, 1976. RACT Box No. 400389-400392. (Reliability No. 1.)

39. Letter to Robert McCrillis, U.S. Environmental Protection Agency, from GCA/Technology Division, Bedford, Massachusetts. (Reliability No. 3.)

40. Telephone conversation. Mark Sylvester. Maryland State Department of Health and Mental Hygiene to Michael Jasinski, GCA/Technology Division. February 13, 1981. (Reliability No. 2.)

41. Gronberg, S. Pretest Survey of Bethlehem Steel Corporation/Sparrows Point Plant. GCA/Technology Division, January 1979. (Reliability No. 1.)

42. Telephone conversation. Dennis Myers, Colorado State Department of Health to Stephen Piper, GCA/Technology Division. February 1981. (Reliability No. 2.)

43. Egley, B. D., Selection of Gas Cleaning Equipment for an Ore Preparation Plant. Iron & Steel Engineer. 47(11):111-113. November 1970. (Reliability No. 3.)

44. Electrostatic Precipitator Manual. The McIlvaine Company. 1977. (Reliability No. 4.)

45. CF&I, Pueblo, Colorado, Air Pollution Emissions Test, June 1975. U.S. Environmental Protection Agency, Emissions Measurements Branch, OAQPS Report No. 75-SIN-5. February 1976. JACA Library. (Reliability No. 1.)

46. The Fabric Filter Manual. The McIlvaine Co. p. 165.7. (Reliability No. 4.)

47. Telephone conversation. Dennis Myers, Colorado State Department of Health to Michael Jasinski, GCA/Technology Division. November 1981. (Reliability No. 2.)

48. Nunno, T., et al. Assessment of Air Emissions from Steel Plant Operations. Inland Steel Corp./Indiana Harbor Works, No. 3 Sinter Plant. GCA/Technology Division Final Report No. TR-79-65-G. Prepared for U.S. EPA. March 1980. (Reliability No. 3.)

49. Report of Emission Tests for Inland Steel Co. at the Sinter Plant Main Stack Baghouse. Clean Air Engineering, Inc. February 27, 1976. RACT Box No. 400423-400456. (Reliability No. 1.)

50. Report of Emissions Test for Inland Steel Company at the No. 3 Sinter Plant. Clean Air Engineering, Inc. July 30, 1975. JACA Library. (Reliability No. 1.)

51. American Iron and Steel Institute. Directory of Iron and Steel Works of the U.S. and Canada. Thirty-fourth edition. 1977. (Reliability No. 4.)

52. Iron and Steel Engineer. Editor's Notes. December 1978. p. 13. (Reliability No. 3.)

53. Telephone conversation. Ed Wojciechowski, U.S. Environmental Protection Agency Region V to Gene Bergson, GCA/Technology Division. February 4, 1981. (Reliability No. 2.)

54. Telephone conversation. Bernard Bloom. U.S. Environmental Protection Agency, Washington, DC to Michael Jasinski, GCA/Technology Division. November 1980. (Reliability No. 2.)

55. Region V files. (J&L letter to EPA, 1981.)

56. Region V files. (J&L letter to EPA, 1976.)

57. Carpenter, B. H., et al. Pollution Effects of Abnormal Operations in Iron and Steelmaking--Volume II; Sintering Manual of Practice. EPA-600/2-78-118b, U.S. Environmental Protection Agency, Research Triangle Park, NC. pp. 28-31. (Reliability No. 4.)

58. Bryan, R. J. Emissions Source Test from a Baghouse Serving an Iron and Steel Sintering Plant at Kaiser Steel Corp., Fontana, CA. Project No. 75-SIN-3. Pacific Environmental Services, Inc. November 19, 1975. RACT Box No. 400659-400690. (Reliability No. 1.)

59. Letter from R. J. Hilovsky, Senior Engineer, San Bernadino County APC District to J. Kunz, U.S. Environmental Protection Agency Region III, Philadelphia, PA. May 12, 1976. RACT Box No. 400415-400422. (Reliability No. 1.)

60. Schneider, R. C., Jr. Report of Source Test Conducted at Kaiser Steel Corp. Sinter Plant. March 11, 1974. Report No. 74-16. RACT Box No. 400409-400414. (Reliability No. 1.)

61. Report of Source Test Conducted at Kaiser Steel Corp., Fontana, CA. January 25, 1974. JACA Steel Library. (Reliability No. 1.)

62. EPA Region V files. (March 1979 Litigation Report NSC/GLS).

63. Telephone conversation. Bernard Bloom, U.S. Environmental Protection Agency, Washington, DC to Michael Jasinski, GCA/Technology Division. February 1981. (Reliability No. 2.)

64. EPA Region V files. (November 1975 Permit Application to Wayne County by NSC).

65. EPA Region V files. (June 1977 Permit Application to Wayne County by NSC).

66. Loch, T. A. Air Pollution Test, Sinter Plant, Granite City Steel Division, National Steel Division, Granite City, IL. EMB No. 75-SIN-4. RACT Box No. 400243-400340. (Reliability No. 1.)

67. Telephone conversation. Anton Telford. Illinois State Environmental Protection Agency to Sandy Beaton, GCA/Technology Division. October 1981. (Reliability No. 2.)

68. EPA Region V files. (Stack Test Report on NSC/G.C. Sinter Plant, 1981.)

69. EPA Region V files. (Memo from EPA V to Illinois EPA, 1979.)

70. Current, G.P. Sinter Plant Windbox Recirculation and Gravel Bed Filter Demonstration: Phase 2; Construction, Operation, and Evaluation. EPA-600/2-79-203, U.S. Environmental Protection Agency, Research Triangle Park, NC. November 1979. pp. 7, 9-11, 13-18. (Reliability No. 3.)

71. Spawn, P. D., et al. National Steel Corporation/Weirton Steel Division Plant Inspection, August 1981. GCA/Technology Division Draft Final Report No. TR-81-118-G. Prepared for U.S. EPA. November 1981. (Reliability No. 1.)

72. Telephone conversation. John Raggi, West Virginia Air Pollution Control Commission to Gene Bergson, GCA/Technology Division. February 17, 1981. (Reliability No. 2.)

73. Letter response from John Raggi, Regional Engineer in West Virginia to Michael Jasinski, GCA/Technology Division. November 1981. (Reliability No. 1.)

74. Coy, D. M. Report of Process Observations on Sinter Plant/Windbox Baghouse at RSC, Gadsden Plant. RTI/1371/09-045. Research Triangle Institute, Research Triangle Park, NC. January 4, 1979. RACT Box No. 400187-400242. (Reliability No. 1.)

75. Schiff, H. F. RSC/Gadsden Plant: Windbox Exhaust System Particulate Emission Quantification and Baghouse Efficiency Determination. GCA/Technology Division Draft Final Report GCA-TR-79-20-G. July 1979. Prepared for U.S. EPA. Appendix D. RACT Box No. 400115-400186a. (Reliability No. 1.)

76. Telephone conversation. Sue Robertson, State of Alabama Air Pollution Control Commission to Gene Bergson, GCA/Technology Division. February 25, 1981. (Reliability No. 2.)

77. Telephone conversation. Ted Davis, Ohio Northeast District Air Pollution Control to Gene Bergson, GCA/Technology Division. February 27, 1981. (Reliability No. 2.)

78. EPA Region V files. (Permits--U.S. Youngstown.)

79. EPA Region V files. (NEIC Report dated January 1979. U.S./Youngstown Sinter Plant.)

80. Telephone conversation. Dennis Bush, NE District--Ohio Environmental Protection Agency to Sandy Beaton, GCA/Technology Division. January 1982. (Reliability No. 2.)

81. Nunno, T. J. Letter Report to EPA Region V regarding process observations of the U.S. Steel/South Works Sinter Plant EDV tests. GCA/Technology Division. January 1982. (Reliability No. 1.)

82. The Wet Scrubber Newsletter. The McIlvaine Co. 49:1,2. July 31, 1978. (Reliability No. 3.)

83. Particulate Emision Test on EDV at U.S. Steel's South Works, Chicago, IL. CH2M Hill. June 1981. (Reliability No. 1.)

84. Kaufman, Peter W. and Virginia A. Barkus. Particulate Emission Test, Wet Electrostatic Precipitator Inlet. U.S. Steel Corporation/South Works Sinter Plant. Source Evaluation and Analyses, Inc. (SEA). SEA/HH Technical Report TR-81-66. May 1981. (Reliability No. 1.)

85. Kaufman, Peter W., and Virginia A. Barkus. Particulate Emission Tests Baghouse-Breaker End of Sinter Plant. U.S. Steel Corporation, South Works. Source Evaluation and Analyses, Inc. (SEA). SEA/HH Technical Report TR-81-72. June 1981. (Reliability No. 1.)

86. Telephone conversation. J. Solkorowski, City of Chicago Department of Inspectional Services to Marc Grant, GCA/Technology Division. March 5, 1981. (Reliability No. 2.)

87. Letter response. Paul Pate, Director of Jefferson County Department of Health to Michael Jasinski, GCA/Technology Division. December 1981. (Reliability No. 1.)

88. Telephone conversation. J. Carroll, Jefferson County Department of Health to Gene Bergson, GCA/Technology Division. February 1980. (Reliability No. 2.)

89. PADER, Inc. Stack Test Report on Sinter Plant at U.S. Steel Corporation, Fairless Hills Works, Fairless Hills, PA. November 1 and 2, 1977. JACA Library. (Reliability No. 1.)

90. Samways, N. L. Fairless Works Faces the 1980's--A Look at the Plant Today. Iron & Steel Engineer. April 1980. p. F-1. (Reliability No. 4.)

91. Stack Test Report on U.S. Steel Corporation, Fairless Works Sinter Plant. July 29-30, 1974. JACA Library. (Reliability No. 1.)

92. Telephone conversation and letter response. Tom McGinley, PADER--Morristown, PA to Sandy Beaton, GCA/Technology Division. November 1981. (Reliability No. 2.)

93. Stack Test Report on U.S. Steel Corporation, Fairless Works Sinter Plant. July 23, 1974. JACA Library. (Reliability No. 1.)

94. Telephone conversation. Roland Elrambuena, City of Gary Air Pollution Control Division to Gene Bergson, GCA/Technology Division. March 4, 1981. (Reliability No. 2.)

95. EPA Region files. (May 1979 Gary response to EPA interogatory.)

96. Gary Steel Works Experience with TT Type Dust Collectors at No. 3 Sinter Plant. Paper presented at the Eastern States Blast Furnace and Coke Oven Association, Pittsburgh, PA. February 4, 1977. RACT Box No. 401427-401440. (Reliability No. 2-3.)

97. Westbrook, C. W. Level 1 Assessment of Uncontrolled Sinter Plant Emissions. EPA-600/2-79-112. U.S. Environmental Protection Agency, Research Triangle Park, NC. May 1979. pp. 7-10. (Reliability No. 3.)

98. Report of Stack Test at U.S. Steel, Geneva Works Sinter Plant. RTI/1371/13-035. September 5, 1978. JACA Library. (Reliability No. 1.)

99. Telephone conversation. Dave Kopta, Utah State Division of Environmental Health to Michael Jasinski, GCA/Technology Division. November 1981. (Reliability No. 2.)

100. Impact of Particulate Matter Emissions on Ambient Air Quality U.S. Steel Corporation--Geneva Works. Appendix II--Source Identification. EPA-330/2-77-005b. February 1977. pp. 53, 56. (Reliability No. 4.)

101. Ten Eyck, P. U.S. Steel Corporation Saxonburg Sintering Operation LIne No. 1. Stack Tests by Apollo Chemical, Inc. July 13, 1978 through August 2, 1978. JACA Library. (Reliability No. 1.)

102. Letter from J. G. Donelson, U.S. Steel Corporation/Director--Research, to S. P. Curtis, USS/V.P. of Design and Construction, Re: Gas sampling and testing, Saxonburg Sintering Plant. April 27, 1972. JACA Library. (Reliability No. 1.)

103. Stack Test Report on U.S. Steel Corporation/Saxonburg, PA Sinter Plant. Test No. 3376. October 14, 1976. JACA Library. (Reliability No. 1.)

104. Letter response. Arthur Witt, PADER--Pittsburg, PA to Sandy Beaton, GCA/Technology Division. November 1981. (Reliability No. 1.)

105. PADER, Inc. Stack Test Report on U.S. Steel Corporation/Saxonburg, PA Plant. Test Nos. 2376 A and B. August 3, 1976. JACA Library. (Reliability No. 1.)

106. Stack Test Report at U.S. Steel Corporation/Saxonburg, PA Sinter Plant. PADER Test No. 3476. October 15, 1976. JACA Library. (Reliability No. 1.)

107. Telephone conversation. Ken Bowman, Pennsylvania Department of Environmental Resources to Michael Jasinski, GCA/Technology Division. February 18, 1981. (Reliability No. 2.)

108. Electrostatic Precipitator Newsletter. McIlvaine, Inc. July 20, 1981. (Reliability No. 3.)

109. Letter from B. J. Dunsmore, Director--Environmental Control for U.S. Steel Corporation to Nicholas Pazuchanics, Air Pollution Control Engineer for PADER. Re: USSC/Saxonburg Sintering Plant. Letter dated September 1971. JACA Library. (Reliability No. 1.)

110. Black, A. W. Stack Emissions from ESP No. 1, USSC/Saxonburg, PA Sinter Plant. Testing by Henen Associates. March 28, 1979. JACA Library. (Reliability No. 1.)

111. Stack Test Report at USSC/Saxonburg, PA Sinter Plant. Test No. 171. January 21, 1971. JACA Library. (Reliability No. 1.)

112. Letter response. Richard Thomas, PADER--Greensburg, PA to Sandy Beaton, GCA/Technology Division. December 1981. (Reliability No. 1.)

113. RACT Box No. 401141-401170. (Reliability No. 1.)

114. Telephone conversation. Tony Johnson, Pennsylvania Department of Environmental Conservation to Gene Bergson, GCA/Technology Division. February 26, 1981. (Reliability No. 2.)

115. Bareford, P., et al. Wheeling-Pittsburgh Steel Corporation Follansbee, West Virginia Sinter Plant, Particulate Emission Quantification. GCA Draft Final Report No. TR-79-47-G. Prepared for U.S. EPA. September 1979. (Reliability No. 1.)

MATERIAL IN THIS SECTION SUBJECT TO CONFIDENTIALITY
REVIEW AND IS NOT RELEASABLE AS OF FEBRUARY 1, 1982.
FOR INFORMATION, CONTACT L. KESARI, U.S. ENVIRONMENTAL
PROTECTION AGENCY, DIVISION OF STATIONARY SOURCE ENFORCEMENT.

TABLE 1. ARMCO INC./ASHLAND WORKS IN ASHLAND, KY

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	Amanda[1]	Bellefonte[1]
STARTUP DATE:	1963[1]	1942[1]
RECENT RELINE (REBUILD) DATE:		
HEARTH DIAMETER (ft-in.):	33-5[1]	28-9[1]
WORKING VOLUME (ft^3):	72,000[1]	52,438[1]
NO. OF TAPHOLES/FURNACE:	2[1]	1[1]
NO. OF CASTHOUSES/FURNACE:		
IRON PRODUCTION:		
RATED TONS/DAY:	3,600[2]	2,000[2]
AVERAGE TONS/DAY (1976):	3,561[2]	2,188[2]
CASTHOUSE EMISSION CONTROL SYSTEM:[a]		

ADDITIONAL COMMENTS:

[a]No commitment to install controls as of February 1981.[3]

TABLE 2. ARMCO INC./HAMILTON PLANT IN HAMILTON, OH

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 1 [1]	No. 2 [1]
STARTUP DATE:	1928[2]	1928[2]
RECENT RELINE (REBUILD) DATE:	1975[1]	1976[2]
HEARTH DIAMETER (ft-in.):	18-6[1]	19-6[1]
WORKING VOLUME (ft^3):	22,839[1]	27,515[1]
NO. OF TAPHOLES/FURNACE:	1[1]	1[1]
NO. OF CASTHOUSES/FURNACE:	1[4]	1[4]
IRON PRODUCTION:		
RATED TONS/DAY:	1,160[2]	1,400[2]
AVERAGE TONS/DAY (1976):	1,220[2]	817[2]
CASTHOUSE EMISSION CONTROL SYSTEM:[a]		

ADDITIONAL COMMENTS:

[a]No commitment to install controls as of February 1981.[3]

TABLE 3. ARMCO INC./HOUSTON WORKS IN HOUSTON, TX

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 1 [1]
STARTUP DATE:	1944[2]
RECENT RELINE (REBUILD) DATE:	1976[1]
HEARTH DIAMETER (ft-in.):	27-3[1]
WORKING VOLUME (ft^3):	52,301[1]
NO. OF TAPHOLES/FURNACE:	1[1]
NO. OF CASTHOUSES/FURNACE:	1[5]
IRON PRODUCTION:	
RATED TONS/DAY:	2,200[2]
AVERAGE TONS/DAY (1976):	1,665[2]
CASTHOUSE EMISSION CONTROL SYSTEM:[a]	

ADDITIONAL COMMENTS:

[a]No commitment to install controls as of February 1981.[3]

TABLE 4. ARMCO INC./MIDDLETOWN WORKS IN MIDDLETOWN, OH

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 3[1]
STARTUP DATE:	1953[2]
RECENT RELINE (REBUILD) DATE:	1976[1]
HEARTH DIAMETER (ft-in.):	29-6[1]
WORKING VOLUME (ft^3):	55,324[1]
NO. OF TAPHOLES/FURNACE:	2[1]
NO. OF CASTHOUSES/FURNACE:	2[4]
IRON PRODUCTION:	
RATED TONS/DAY:	4,730[2]
AVERAGE TONS/DAY (1976):	3,598[2]
CASTHOUSE EMISSION CONTROL SYSTEM:[a]	

ADDITIONAL COMMENTS:

[a]No controls scheduled for installation; facility under "Bubble" regulation.[6]

TABLE 5. BETHLEHEM STEEL CORP./BETHLEHEM PLANT IN BETHLEHEM, PA

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	B[1]	C[1]	D[1]	E[1]
STARTUP DATE:	1955[2]	1943[2]	1953[2]	1960[2]
RECENT RELINE (REBUILD) DATE:	1973[2]	1972[2]	1975[2]	1976[2]
HEARTH DIAMETER (ft-in.):	30-0[1]	27-11[1]	30-0[1]	24-0[1]
WORKING VOLUME (ft^3):	54,431[1]	49,748[1]	54,834[1]	41,254[1]
NO. OF TAPHOLES/FURNACE:	1[7]	1[7]	1[7]	1[7]
NO. OF CASTHOUSES/FURNACE:	1[7]	1[7]	1[7]	1[7]
IRON PRODUCTION:				
RATED TONS/DAY:	3,000[2]	2,600[2]	3,000[2]	2,000[2]
AVERAGE TONS/DAY (1976):	2,790[2]		2,436[2]	1,696[2]

CASTHOUSE EMISSION CONTROL SYSTEM:	Partial evacuation system via canopy hood for each casthouse ducted to common baghouse[7]
MANUFACTURER:	Mikropul[8]
DATE INSTALLED:	1980[7]
SYSTEM DESCRIPTION:	• System can control 2 of 4 casthouses simultaneously[7,8] • Flow capacity = 660,000 acfm @ <150°F; flow per casthouse = 330,000 acfm[7,8] • A/C = 4.9:1 (minimum for 1 casthouse); 9.7:1 (maximum for 2 casthouses)[7,8] • Felted polyester bags[7,8]

ADDITIONAL COMMENTS:

TABLE 6. BETHLEHEM STEEL CORP./BURNS HARBOR PLANT IN CHESTERTON, IN

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	C[1]	D[1]
STARTUP DATE:	1972[2]	1969[2]
RECENT RELINE (REBUILD) DATE:		
HEARTH DIAMETER (ft-in.):	38-3[1]	35-0[1]
WORKING VOLUME (ft^3):	89,423;[9] 89,204[1]	86,646;[10] 85,750[10]
NO. OF TAPHOLES/FURNACE:	2[11]	2[11]
NO. OF CASTHOUSES/FURNACE:		2[10]
IRON PRODUCTION:		
RATED TONS/DAY:	5,500[2]	5,000[2]
AVERAGE TONS/DAY (1976):	4,943[2]	5,465;[2] 4,650 (1971 avg.)[9]
CASTHOUSE EMISSION CONTROL SYSTEM:[a]		

ADDITIONAL COMMENTS:

[a]No commitment to install controls as of February 1981.[3]

TABLE 7. BETHLEHEM STEEL CORP./LACKAWANNA PLANT IN LACKAWANNA, NY

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:[a]	H[1]	J[1]
STARTUP DATE:	1905[12]	1953[12]
RECENT RELINE (REBUILD) DATE:	1979[12]	1977[12]
HEARTH DIAMETER (ft-in.):	29-0[1]	29-11[1]
WORKING VOLUME (ft^3):	51,009;[1] 51,886[12]	55,107;[1] 55,112[12]
NO. OF TAPHOLES/FURNACE:	1[12]	1[12]
NO. OF CASTHOUSES/FURNACE:	1[12]	1[12]
IRON PRODUCTION:		
RATED TONS/DAY:	2,500[2]	2,750[2]
AVERAGE TONS/DAY (1976):	2,211[2]	2,657[2]
CASTHOUSE EMISSION CONTROL SYSTEM:[b]		

ADDITIONAL COMMENTS:

[a]Blast furnace designation	Date shutdown
A	prior to 1973 - (dismantled)
B	1973
C	1979
F	1981
G	1977

[b]Local hooding committed by State Order for 1982.[3]

TABLE 8. BETHLEHEM STEEL CORP./SPARROWS POINT PLANT IN SPARROWS POINT, MD

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:[a]	G[1]	H[1]	J[1]
STARTUP DATE:			
RECENT RELINE (REBUILD) DATE:			
HEARTH DIAMETER (ft-in.):	28-0[1]	30-0[1]	30-0[1]
WORKING VOLUME (ft^3):	47,156[1]	54,792[1]	54,505[1]
NO. OF TAPHOLES/FURNACE:			
NO. OF CASTHOUSES/FURNACE:			
IRON PRODUCTION:			
RATED TONS/DAY:			
AVERAGE TONS/DAY ( ):			
CASTHOUSE EMISSION CONTROL SYSTEM:[b]			

(continued)

TABLE 8 (continued)

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:[a]	K[1]	L[1]
STARTUP DATE:		1978[13]
RECENT RELINE (REBUILD) DATE:		
HEARTH DIAMETER (ft-in.):	30-0[1]	44-6[1]
WORKING VOLUME (ft^3):	54,610[1]	130,399[1]
NO. OF TAPHOLES/FURNACE:		4[1]
NO. OF CASTHOUSES/FURNACE:		2[13]
IRON PRODUCTION:		
RATED TONS/DAY:		8,000[13]
AVERAGE TONS/DAY ( ):		
CASTHOUSE EMISSION CONTROL SYSTEM:		Local hoods ducted to baghouse[13]
MANUFACTURER:		Wheelabrator-Frye[13]
DATE INSTALLED:		1978[3]
SYSTEM DESCRIPTION:		• Local hoods located on each taphole, iron pool, tilting iron runner, and slag spoon.[13] • 312,000 acfm @ 140°F[13] • 5 cell baghouse; one cell in cleaning mode[13] • A/C = 2.5:1 (4 cells operating)[13] • Shaker cleaning mechanism[13] • Test Data (1981):[7] 320,000 acfm @ 184°F (avg.)

ADDITIONAL COMMENTS:

[a]Blast furnaces A,B,C,D,E, and F were shut down in 1979 by state order.[11,13]

[b]Partial casthouse evacuation control system for blast furnaces G,H,J, and K or shutdown committed for 1982 by state order.[11]

TABLE 9. CF&I STEEL CORP./PUEBLO PLANT IN PUEBLO, CO

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	A[1]	D[1]	E[1]	F[1]
STARTUP DATE:	1950[14]	1903[14]	1904[14]	1940[14]
RECENT RELINE (REBUILD) DATE:	1980[14]	1974[14]	1974[14]	1971[14]
HEARTH DIAMETER (ft-in.):	22-9[1]	21-0[1]	21-6[1]	21-9[1]
WORKING VOLUME (ft^3):	32,000[1]	30,700[1]	24,656[1]	31,310[1]
NO. OF TAPHOLES/FURNACE:	1[14]	1[14]	1[14]	1[14]
NO. OF CASTHOUSES/FURNACE:	1[14]	1[14]	1[14]	1[14]
IRON PRODUCTION:				
RATED TONS/DAY:	900[14]	900[14]	900[14]	900[14]
AVERAGE TONS/DAY ( ):				
CASTHOUSE EMISSION CONTROL SYSTEM:[a]				

ADDITIONAL COMMENTS:

[a]No commitment to install controls of Feb. 1981.[3]

TABLE 10. FORD MOTOR CO./RIVER ROUGE PLANT IN DEARBORN, MI

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	A[1]	B[1]	C[1]
STARTUP DATE:	1920[1]	1922[1]	1948[1]
RECENT RELINE (REBUILD) DATE:			
HEARTH DIAMETER (ft-in.):	20-0[1]	20-0[1]	20-0[1]
WORKING VOLUME (ft^3):	28,058[1]	27,509[1]	54,987[1]
NO. OF TAPHOLES/FURNACE:	1[1]	1[1]	1[1]
NO. OF CASTHOUSES/FURNACE:	1[6]	1[6]	1[6]
IRON PRODUCTION:			
RATED TONS/DAY:	1,699[15]	1,699[15]	3,150[15]
AVERAGE TONS/DAY (1976):	1,625[2]	1,638[2]	3,007[2]
CASTHOUSE EMISSION CONTROL SYSTEM:[a]			

ADDITIONAL COMMENTS:

[a]Stretchout Act application for blast furnaces A and B, with conversion to noncapture control technology by 1985; local hoods were completed in Oct. 1981 for Furnace B but the baghouse was still under construction.[16]

TABLE 11. INLAND STEEL CO./INDIANA HARBOR WORKS IN E. CHICAGO, IN

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 1[1]	No. 2[1]	No. 3[1]
STARTUP DATE:	1907[2]	1909[2]	1917[2]
RECENT RELINE (REBUILD) DATE:	1975[1]	1975[1]	1978[1]
HEARTH DIAMETER (ft-in.):	21-6[1]	29-10[1]	21-6[1]
WORKING VOLUME (ft^3):	32,179[1]	25,689[1]	30,793[1]
NO. OF TAPHOLES/FURNACE:	1[1]	1[1]	1[1]
NO. OF CASTHOUSES/FURNACE:	1[17]	1[17]	1[17]
IRON PRODUCTION:			
RATED TONS/DAY:	2,150[2]	2,100[2]	2,300[2]
AVERAGE TONS/DAY (1976):	1,613[2]	1,655[2]	1,767[2]
CASTHOUSE EMISSION CONTROL SYSTEM:[a]			

(continued)

TABLE 11 (continued)

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 4[1]	No. 5[1]	No. 6[1]
STARTUP DATE:	1926[2]	1939[2]	1942[2]
RECENT RELINE (REBUILD) DATE:	1977[1]	1974[1]	1976[1]
HEARTH DIAMETER (ft-in.):	20-10[1]	26-6[1]	26-6[1]
WORKING VOLUME (ft^3):	29,585[1]	48,218[1]	48,097[1]
NO. OF TAPHOLES/FURNACE:	1[1]	1[1]	1[1]
NO. OF CASTHOUSES/FURNACE:	1[17]	1[17]	1[17]
IRON PRODUCTION:			
RATED TONS/DAY:	2,350[2]	3,250[2]	3,250[2]
AVERAGE TONS/DAY (1976):	1,689[2]	2,461[2]	2,319[2]
CASTHOUSE EMISSION CONTROL SYSTEM:[a]			

(continued)

TABLE 11 (continued)

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 7[1]	A[1]	B[1]
STARTUP DATE:	1980[18]	1947[2]	1943[2]
RECENT RELINE (REBUILD) DATE:		1977[1]	1975[1]
HEARTH DIAMETER (ft-in.):	45-0[1]	26-6[1]	26-6[1]
WORKING VOLUME (ft^3):	123,897[1]	48,042[1]	48,182[1]
NO. OF TAPHOLES/FURNACE:	4[1]	1[1]	1[1]
NO. OF CASTHOUSES/FURNACE:	2[19]	1[17]	1[17]
IRON PRODUCTION:			
RATED TONS/DAY:	7,000[18]	3,400	3,400
AVERAGE TONS/DAY (1976):		2,374	2,477
CASTHOUSE EMISSION CONTROL SYSTEM:	Local hoods to common baghouse[18]	a	a
MANUFACTURER:	Cadre & Koppers[8]		
DATE INSTALLED:	1980[18]		
SYSTEM DESCRIPTION:	• Local hoods at tapholes and tilting iron runners.[19] • 300,000 acfm at 140°F[8,18] • A/C = 1.95:1[8] • 9 chambers; 1,729 Dacron polyester bags.[8] • Test Data (1981):[19] 225,000 acfm at 115°F (avg.)		

ADDITIONAL COMMENTS:

[a]No commitment to install controls as of February 1981.[3]

TABLE 12. INTERLAKE INC./RIVERDALE PLANT IN CHICAGO, IL

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	A[1]	B[a,1]
STARTUP DATE:	1907[2]	1909[2]
RECENT RELINE (REBUILD) DATE:	1963[2]	1965[2]
HEARTH DIAMETER (ft-in.):	25-3[1]	19-8[1]
WORKING VOLUME (ft^3):	41,448[1]	27,027[1]
NO. OF TAPHOLES/FURNACE:	1[6]	1[6]
NO. OF CASTHOUSES/FURNACE:	1[6]	1[6]
IRON PRODUCTION:		
RATED TONS/DAY:	2,100[2]	1,300[2]
AVERAGE TONS/DAY (1976):	1,852[2]	1,005[2]
CASTHOUSE EMISSION CONTROL SYSTEM:[b]		

ADDITIONAL COMMENTS:

[a]Blast furnace "B" was shut down hot in 1980.[20]

[b]No commitment to install controls as of Feb. 1981.[3]

TABLE 13. JONES & LAUGHLIN STEEL CORP./ALIQUIPPA WORKS IN ALIQUIPPA, PA

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	A-1[1]	A-2[1]	A-4[1]
STARTUP DATE:	1909[1]	1910[1]	1912[1]
RECENT RELINE (REBUILD) DATE:	1969[2]	1970[2]	1966[2]
HEARTH DIAMETER (ft-in.):	28-6[1]	29-0[1]	29-0[1]
WORKING VOLUME (ft^3):	43,892[1]	54,000[1]	54,400[1]
NO. OF TAPHOLES/FURNACE:	1[1]	1[1]	1[1]
NO. OF CASTHOUSES/FURNACE:	1[21]	1[21]	1[21]
IRON PRODUCTION:			
RATED TONS/DAY:	2,000;[2] 2,200[1]	3,500;[2] 3,200[1]	2,500;[2] 2,400[1]
AVERAGE TONS/DAY (1976):		3,057[2]	
CASTHOUSE EMISSION CONTROL SYSTEM:[b,c]			

ADDITIONAL COMMENTS:

[a]Blast furnaces A-3 (1,600 tons/day) and A-5 (1,500 tons/day) are shut down.[21]

[b]Noncapture controls or local hooding committed for 1982.[1]

[c]Blast furnace A-4 will have a permanent noncapture control system in the near future.[7]

TABLE 14. JONES AND LAUGHLIN STEEL CORP./CLEVELAND WORKS IN CLEVELAND, OH

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	C-1[1]	C-3[1]
STARTUP DATE:	1952[2]	1963;[2] 1969[22]
RECENT RELINE (REBUILD) DATE:	1972[2]	1978[22]
HEARTH DIAMETER (ft-in.):	27-6[1]	30-6[1]
WORKING VOLUME (ft^3):	46,647[1]	57,234[1]
NO. OF TAPHOLES/FURNACE:	1[1]	2[1]
NO. OF CASTHOUSES/FURNACE:	1[23]	1[22]
IRON PRODUCTION:		
RATED TONS/DAY:	2,227[2]	3,140;[2] 3,850[22]
AVERAGE TONS/DAY (1976):	2,374[2]	2,732[2]
CASTHOUSE EMISSION CONTROL SYSTEM:[a,b]		

ADDITIONAL COMMENTS:

[a]Noncapture techniques or local hooding committed in negotiations for 1982.[11,24]

[b]Blast furnace C-3--currently installing permanent noncapture casthouse controls.[7]

TABLE 15. JONES & LAUGHLIN STEEL CORP./INDIANA HARBOR WORKS IN E. CHICAGO, IN

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 1;[1] H-1[25]	No. 2;[1] H-2[25,a]
STARTUP DATE:	1917[1]	1925[1]
RECENT RELINE (REBUILD) DATE:	1948[2]	
HEARTH DIAMETER (ft-in.):	27-6[1]	22-0[1]
WORKING VOLUME (ft^3):	48, 191[1]	28,532[1]
NO. OF TAPHOLES/FURNACE:	1[6]	1[6]
NO. OF CASTHOUSES/FURNACE:	1[26]	1[26]
IRON PRODUCTION:		
RATED TONS/DAY:	2,500[2]	1,400[2]
AVERAGE TONS/DAY ( ):		
CASTHOUSE EMISSION CONTROL SYSTEM:[b]		

(continued)

TABLE 15 (continued)

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 3;[1] H-3[25]	Ellen;[1] H-4[25]
STARTUP DATE:	1953[2]	1967[2]
RECENT RELINE (REBUILD) DATE:		
HEARTH DIAMETER (ft-in.):	29-6[1]	32-0[1]
WORKING VOLUME (ft^3):	52,000[1]	64,230[1]
NO. OF TAPHOLES/FURNACE:	1[6]	2[6]
NO. OF CASTHOUSES/FURNACE:	1[26]	1[26]
IRON PRODUCTION:		
RATED TONS/DAY:	2,800[2]	4,000[2]
AVERAGE TONS/DAY (1976):	2,526[2]	4,108[2]
CASTHOUSE EMISSION CONTROL SYSTEM:	Noncapture technique[25]	c
MANUFACTURER:	Jones & Laughlin Steel Corp.	
DATE INSTALLED:	1981[25]	
SYSTEM DESCRIPTION:	• System uses no fans or gas cleaning equipment.[25]	

ADDITIONAL COMMENTS:

[a]Blast furnace No. 2 to be shut down permanently in future.[25]

[b]Noncapture controls (by Consent Decree) to be installed by 1985.[25]

[c]Noncapture controls (by Consent Decree) to be installed by 1984.[25]

TABLE 16. KAISER STEEL CORP./FONTANA WORKS IN FONTANA, CA

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 1[1]	No. 2[1]	No. 3[1]	No. 4[1]
STARTUP DATE:	1942[2]	1949[2]	1953[2]	1959[2]
RECENT RELINE (REBUILD) DATE:		1979[27]		1981[28]
HEARTH DIAMETER (ft-in.):	27-0[1]	27-0[1]	27-0[1]	29-6[1]
WORKING VOLUME (ft^3):	40,531[1]	40,086[1]	40,531[1]	50,916[1]
NO. OF TAPHOLES/FURNACE:	1[29]	1[29]	1[29]	1[29]
NO. OF CASTHOUSES/FURNACE:	1[29]	1[29]	1[29]	1[29]
IRON PRODUCTION:				
RATED TONS/DAY:	2,220;[30] 1,675[2]	2,370;[30] 1,675[2]	2,130;[30] 1,675[2]	2,980;[30] 2,175[2]
AVERAGE TONS/DAY (1976):	1,575[2]	1,661[2]	1,389[2]	2,085[2]
CASTHOUSE EMISSION CONTROL SYSTEM:[a]				

ADDITIONAL COMMENTS:

[a]No commitment to install controls as of Feb. 1981.[3]

TABLE 17. LONE STAR STEEL IN LONE STAR, TX

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 1[1] (Flossie Belle)[1]
STARTUP DATE:	1947[2]
RECENT RELINE (REBUILD) DATE:	
HEARTH DIAMETER (ft-in.):	27-0[1]
WORKING VOLUME (ft^3):	44,403[1]
NO. OF TAPHOLES/FURNACE:	1[5]
NO. OF CASTHOUSES/FURNACE:	1[5]
IRON PRODUCTION:	
RATED TONS/DAY:	1,200[2]
AVERAGE TONS/DAY (1976):	1,540[2]
CASTHOUSE EMISSION CONTROL SYSTEM:[a]	

ADDITIONAL COMMENTS:

[a]No commitment to install controls as of Feb. 1981.[3]

TABLE 18. MCLOUTH STEEL CORP./TRENTON WORKS IN TRENTON, MI

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 1[1]	No. 2[1]
STARTUP DATE:	1954[2]	1958[2]
RECENT RELINE (REBUILD) DATE:		
HEARTH DIAMETER (ft-in.):	30-0[1]	30-0[1]
WORKING VOLUME (ft^3):	57,238[1]	57,238[1]
NO. OF TAPHOLES/FURNACE:	1[6]	1[6]
NO. OF CASTHOUSES/FURNACE:	1[31]	1[31]
IRON PRODUCTION:		
RATED TONS/DAY:	2,500[2,31]	2,500[2,31]
AVERAGE TONS/DAY (1976):	2,457[2]	2,546[2]
CASTHOUSE EMISSION CONTROL SYSTEM:[a]		

ADDITIONAL COMMENTS:

[a]No commitment to install controls as of Feb. 1981.[3,6]

TABLE 19. HANNA FURNACE CORP./SUBSIDIARY OF NATIONAL STEEL IN BUFFALO, NY

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:[a]	No. 4[1]
STARTUP DATE:	1911;[2] 1912[1]
RECENT RELINE (REBUILD) DATE:	1980[32]
HEARTH DIAMETER (ft-in.):	19-11[1]
WORKING VOLUME (ft^3):	29,918[1]
NO. OF TAPHOLES/FURNACE:	1[1]
NO. OF CASTHOUSES/FURNACE:	1[32]
IRON PRODUCTION:	
RATED TONS/DAY:	980[2]
AVERAGE TONS/DAY (1976):	998[2]
CASTHOUSE EMISSION CONTROL SYSTEM:[b]	

ADDITIONAL COMMENTS:

[a]Blast furnace No. 1 shut down in July 1977; blast furnace No. 3 shut down in summer of 1979.[32]

[b]Local hoods committed by state order for 1982.[3]

TABLE 20. NATIONAL STEEL CORP./GREAT LAKES STEEL DIV. IN ECORSE, MI

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	A;[1] A-1[33]	B;[1] A-2[33]
STARTUP DATE:	1954;[1] 1955[2]	1941;[2] 1951[1]
RECENT RELINE (REBUILD) DATE:		
HEARTH DIAMETER (ft-in.):	30-6[1]	29-0[1]
WORKING VOLUME (ft^3):	62,434[1]	55,468[1]
NO. OF TAPHOLES/FURNACE:	1[1]	1[1]
NO. OF CASTHOUSES/FURNACE:	1[33]	1[33]
IRON PRODUCTION:		
RATED TONS/DAY:	3,120[33]	2,760[33]
AVERAGE TONS/DAY (1976):	2,954[2]	2,605[2]
CASTHOUSE EMISSION CONTROL SYSTEM:[a]		

(continued)

TABLE 20 (continued)

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	C;[1] C-3[33]	D;[1] D-4[33]
STARTUP DATE:	1938[1,2]	1952[1,2]
RECENT RELINE (REBUILD) DATE:	1978-79[33]	
HEARTH DIAMETER (ft-in.):	28-3[1]	28-0
WORKING VOLUME (ft^3):	50,605[1]	53,252[1]
NO. OF TAPHOLES/FURNACE:	1[1]	1[1]
NO. OF CASTHOUSES/FURNACE:	1[33]	1[33]
IRON PRODUCTION:		
RATED TONS/DAY:	2,760[33]	2,880[33]
AVERAGE TONS/DAY (1976):	2,487[2]	2,620[2]
CASTHOUSE EMISSION CONTROL SYSTEM:[a]		

ADDITIONAL COMMENTS:

[a]National Steel is negotiating to regulate the blast furnaces under the "Bubble" concept and install no controls.[6]

TABLE 21. NATIONAL STEEL CORP./GRANITE CITY STEEL DIVISION IN GRANITE CITY, IL

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	A[1]	B[1]
STARTUP DATE:	1956[1]	1961[1]
RECENT RELINE (REBUILD) DATE:		1980[34]
HEARTH DIAMETER (ft-in.):	27-3[1]	27-3[1]
WORKING VOLUME (ft^3):	50,659[1]	50,646[34]
NO. OF TAPHOLES/FURNACE:	1[1]	1[1]
NO. OF CASTHOUSES/FURNACE:	Shared casthouse[35]	
IRON PRODUCTION:		
RATED TONS/DAY:	2,600[2]	2,600[2]
AVERAGE TONS/DAY (1976):	2,099[2]	2,288[2]
CASTHOUSE EMISSION CONTROL SYSTEM:[a]		

ADDITIONAL COMMENTS:

[a]Local hooding by Consent Decree to be installed by 1982; National Steel is proposing to regulate the casthouses under the "Bubble" concept.[3,6]

TABLE 22. NATIONAL STEEL CORP./WEIRTON STEEL DIVISION IN WEIRTON, WV

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:[a]	No. 1[1]	No. 2[1]	No. 4[1]
STARTUP DATE:	1917[1]	1928[1]	1952[1]
RECENT RELINE (REBUILD) DATE:	1971[2]	1976[2]	1977[2]
HEARTH DIAMETER (ft-in.):	27-0[1]	27-0[1]	26-3[1]
WORKING VOLUME (ft^3):	54,048[1]	45,960[1]	46,670[1]
NO. OF TAPHOLES/FURNACE:	1[1]	1[1]	1[1]
NO. OF CASTHOUSES/FURNACE:	1[36]	1[36]	1[36]
IRON PRODUCTION:			
RATED TONS/DAY:	2,700[1]	2,300[1]	2,350[1]
AVERAGE TONS/DAY (1976):	2,715[2]	1,854[2]	1,948[2]
CASTHOUSE EMISSION CONTROL SYSTEM:[c]			

ADDITIONAL COMMENTS:

[a]Blast furnace No. 3 (originally installed 1941, rated at 2,350 tons/day) shut down indefinitely in Oct. 1981.[37]

[b]Casthouses for blast furnace Nos. 2 and 3 are structurally joined, essentially forming one casthouse.[36]

[c]Local hooding committed for 1982 by Federal Consent Decree.[11]

TABLE 23. REPUBLIC STEEL CORP./BUFFALO DISTRICT IN BUFFALO, NY

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 2[1]
STARTUP DATE:	1906[2]
RECENT RELINE (REBUILD) DATE:	1981[38]
HEARTH DIAMETER (ft-in.):	23-6[38]
WORKING VOLUME (ft^3):[b]	35,213[38]
NO. OF TAPHOLES/FURNACE:	1[38]
NO. OF CASTHOUSES/FURNACE:	1[38]
IRON PRODUCTION:	
RATED TONS/DAY:[b]	2,000[38]
AVERAGE TONS/DAY (1976):	1,754[2]
CASTHOUSE EMISSION CONTROL SYSTEM:[c]	

ADDITIONAL COMMENTS:

[a]Blast furnace No. 1 was shut down in 1976.[11]

[b]After 1981 reline.[38]

[c]Local hood control system committed for 1982 by state order.[38]

TABLE 24. REPUBLIC STEEL CORP./CENTRAL ALLOY DISTRICT IN CANTON, OH

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 1[1]
STARTUP DATE:	
RECENT RELINE (REBUILD) DATE:	
HEARTH DIAMETER (ft-in.):	18-4[1]
WORKING VOLUME (ft^3):	21,600[1]
NO. OF TAPHOLES/FURNACE:	
NO. OF CASTHOUSES/FURNACE:	
IRON PRODUCTION:	
RATED TONS/DAY:	
AVERAGE TONS/DAY ( ):	
CASTHOUSE EMISSION CONTROL SYSTEM:	

ADDITIONAL COMMENTS:

TABLE 25. REPUBLIC STEEL CORP./CHICAGO DISTRICT IN CHICAGO, IL

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 1[1]
STARTUP DATE:	1943[2]
RECENT RELINE (REBUILD) DATE:	
HEARTH DIAMETER (ft-in.):	28-0[1]
WORKING VOLUME (ft^3):	54,400[1]
NO. OF TAPHOLES/FURNACE:	1[39]
NO. OF CASTHOUSES/FURNACE:	1[39]
IRON PRODUCTION:	
RATED TONS/DAY:	2,870[2]
AVERAGE TONS/DAY (1976):	2,532[2]
CASTHOUSE EMISSION CONTROL SYSTEM:[a]	

ADDITIONAL COMMENTS:

[a]Local hood control by Federal Consent Decree to be installed by 1981.[3]

TABLE 26. REPUBLIC STEEL CORP./CLEVELAND DISTRICT IN CLEVELAND, OH

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:[a]	No. 1[1]	No. 4[1]	No. 5[1]	No. 6[1]
STARTUP DATE:	1940[40]	1937[40]	1953[40]	1952[40]
RECENT RELINE (REBUILD) DATE:				
HEARTH DIAMETER (ft-in.):	27-0[1]	27-0[1]	29-6[1]	29-6[1]
WORKING VOLUME (ft^3):	44,900[1]	43,300[1]	56,100[1]	56,100[1]
NO. OF TAPHOLES/FURNACE:	1[41]	1[41]	1[41]	1[41]
NO. OF CASTHOUSES/FURNACE:	1[41]	1[41]	1[41]	1[41]
IRON PRODUCTION:				
RATED TONS/DAY:				
AVERAGE TONS/YEAR (1977):	646,200[40]	588,300[40]	783,600[40]	782,300[40]
CASTHOUSE EMISSION CONTROL SYSTEM:[b]				

ADDITIONAL COMMENTS:

[a]Blast furnace No. 3 was shut down between 1969-1970.

[b]No commitments to install casthouse controls as of February 1981.

TABLE 27. REPUBLIC STEEL CORP./SOUTHERN DISTRICT, GULFSTEEL WORKS IN GADSDEN, AL

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 1[1]	No. 2[1]
STARTUP DATE:	1918[2]	1942[2]
RECENT RELINE (REBUILD) DATE:		
HEARTH DIAMETER (ft-in.):	17-0[1]	26-0[1]
WORKING VOLUME (ft^3):	19,700[1]	45,600[1]
NO. OF TAPHOLES/FURNACE:	1[42]	1[42]
NO. OF CASTHOUSES/FURNACE:	1[42]	1[42]
IRON PRODUCTION:		
RATED TONS/DAY:	800[2]	1,500[2]
AVERAGE TONS/DAY (1976):	916[2]	1,784[2]
CASTHOUSE EMISSION CONTROL SYSTEM:[a]		

ADDITIONAL COMMENTS:

[a]No commitment to install controls as of Feb. 1981.[3]

TABLE 28. REPUBLIC STEEL CORP./MAHONING VALLEY DISTRICT IN WARREN, OH

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 1[1]
STARTUP DATE:	1921[2]
RECENT RELINE (REBUILD) DATE:	
HEARTH DIAMETER (ft-in.):	28-0[1]
WORKING VOLUME (ft^3):	53,200[1]
NO. OF TAPHOLES/FURNACE:	1[a,4]
NO. OF CASTHOUSES/FURNACE:	1[a,4]
IRON PRODUCTION:	
RATED TONS/DAY:	2,800[2]
AVERAGE TONS/DAY (1976):	2,565[2]
CASTHOUSE EMISSION CONTROL SYSTEM:[b]	

ADDITIONAL COMMENTS:

[a]By December 1981 the No. 1 blast furnace will contain two tapholes and two casthouses.[4]

[b]A casthouse emission control system will be installed in December 1981 including a baghouse with the following specifications:[4]
A/C = 2.56-2.98:1
Total cloth area = 125,440 ft^2
Flow rate = 320,000-375,000 cfm
Seven compartments
Shaker cleaning mechanism

TABLE 29. REPUBLIC STEEL CORP./MAHONING VALLEY DISTRICT IN YOUNGSTOWN, OH

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 1[1]	No. 2[a,1]	No. 3[1]
STARTUP DATE:	1942[43,44]	1926[43,44]	1938[43,44]
RECENT RELINE (REBUILD) DATE:	1980[44]		
HEARTH DIAMETER (ft-in.):	26-3[1]	25-3[1]	26-3[1]
WORKING VOLUME (ft^3):	42,700[1]	35,200[1]	46,500[1]
NO. OF TAPHOLES/FURNACE:	1[43]	1[43]	1[43]
NO. OF CASTHOUSES/FURNACE:	1[43]	1[43]	1[43]
IRON PRODUCTION:			
RATED TONS/DAY:			
AVERAGE TONS/DAY:	1,594[43]	1,428[43]	1,558[43]
CASTHOUSE EMISSION CONTROL SYSTEM:[b]			

ADDITIONAL COMMENTS:

[a]Blast furnace No. 2 has not operated for several years.[44]

[b]Shutdown scheduled by Federal Consent Decree by 1982; Republic currently wants to operate blast furnaces past 1982 shutdown date and install controls.[3,44]

TABLE 30. SHARON STEEL CORP./STEEL DIVISION IN FARRELL, PA

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 2[1]	No. 3[1]
STARTUP DATE:	1902[2]	1902[2]
RECENT RELINE (REBUILD) DATE:		
HEARTH DIAMETER (ft-in.):	23-1[1]	23-1[1]
WORKING VOLUME (ft^3):	30,850[1]	31,550[1]
NO. OF TAPHOLES/FURNACE:	1[1]	1[1]
NO. OF CASTHOUSES/FURNACE:	Both furnaces share a common casthouse.[45]	
IRON PRODUCTION:		
RATED TONS/DAY:	1,400[2]	1,400[2]
AVERAGE TONS/DAY (1976):	1,177[2]	1,433[2]
CASTHOUSE EMISSION CONTROL SYSTEM:[a,b]		

ADDITIONAL COMMENTS:

[a]Partial evacuation or local hooding committed by negotiations for 1982.[3]

[b]A local hood system with a Fuller baghouse (300,000 acfm) to be completed by Dec. 1982.[45]

TABLE 31. UNITED STATES STEEL CORP./EDGAR THOMSON-IRVIN WORKS IN BRADDOCK, PA

BLAST FURNACE—CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:[a]	No. 1[1]	No. 2[1]	No. 3[1]
STARTUP DATE:	1943[2]	1943[2]	1883[2]
RECENT RELINE (REBUILD) DATE:	1977[2]		1981[46]
HEARTH DIAMETER (ft-in.):	28-10[1]	28-10[1]	26-0[1]
WORKING VOLUME (ft^3):	57,218[1]	48,094[1]	38,837[1]
NO. OF TAPHOLES/FURNACE:	1[7]	1[7]	1[46]
NO. OF CASTHOUSES/FURNACE:	1[7]	1[7]	1[46]
IRON PRODUCTION:			
RATED TONS/DAY:	2,500[2]	2,300[2]	1,800[2]
AVERAGE TONS/DAY (1976):	1,511[2]	2,016[2]	1,729[2]
CASTHOUSE EMISSION CONTROL SYSTEM:	Local hoods ducted to a baghouse with noncapture controls[7,46]	Noncapture technique[7,46]	b,c
MANUFACTURER:	Wheelabrator-Frye[8,46]		
DATE INSTALLED:	1981[7,46]		
SYSTEM DESCRIPTION:	• Iron trough hood--16 ft long covers 60% of trough area[7] • 4 compartment baghouse[46] • 140,000 acfm (rated)[7,46] • Pulse-jet cleaning[46]	• Entire cast-house floor is fitted with noncapture controls[7,45]	

ADDITIONAL COMMENTS:

[a]Blast furnace No. 6 shut down in 1979;[3] blast furnace No. 5 is presently not operating, and will shut down in 1982.[11,46]

[b]Local hoods and noncapture controls by Federal Consent Decree committed for 1982.[11]

[c]Blast furnace No. 3 scheduled for local hoods and noncapture controls and will share baghouse with furnace No. 1 (nonsimultaneous casting)[46]

TABLE 32. UNITED STATES STEEL CORP./SOUTH WORKS IN CHICAGO, IL

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:[a]	No. 8[1]	No. 11[b]	No. 12[1]
STARTUP DATE:	1970[47]	1948[47]	1948[47]
RECENT RELINE (REBUILD) DATE:			
HEARTH DIAMETER (ft-in.):	32-0[1]	29-0[1]	29-0[1]
WORKING VOLUME (ft^3):	63,370[1]	51,004[1]	51,004[1]
NO. OF TAPHOLES/FURNACE:	2[6,48]	1[6,48]	1[6,48]
NO. OF CASTHOUSES/FURNACE:	1[6]	1[6]	1[6]
IRON PRODUCTION:			
RATED TONS/DAY:	4,000[48,49]	2,400[48,49]	2,400;[48] 2,200[49]
AVERAGE TONS/DAY:	3,044 (1980 avg.)[49]	1,431 (1977 avg.)[49]	898 (1980 avg.)[49]
CASTHOUSE EMISSION CONTROL SYSTEM:[c]			

ADDITIONAL COMMENTS:

[a]Blast furnace No. 10 (blown-in 1906) has been permanently dismantled.[6]

[b]Blast furnace No. 11 did not operate in 1980.[49]

[c]No commitment to install controls as of Feb. 1981.[3]

TABLE 33. UNITED STATES STEEL CORP./NATIONAL-DUQUESNE WORKS IN DUQUESNE, PA

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 1[b,1]	No. 2[b,1]	No. 6[1]
STARTUP DATE:	1896[2]	1897[2]	1963[2]
RECENT RELINE (REBUILD) DATE:			
HEARTH DIAMETER (ft-in.):	20-0[1]	23-0[1]	28-0[1]
WORKING VOLUME (ft^3):	25,909[1]	32,713[1]	58,045[1]
NO. OF TAPHOLES/FURNACE:	1[46]	1[46]	2[11]
NO. OF CASTHOUSES/FURNACE:	1[46]	1[46]	1[46]
IRON PRODUCTION:			
RATED TONS/DAY:	1,000[2]	1,250[2]	3,000[2]
AVERAGE TONS/DAY (1976):		1,100[2]	2,843[2]
CASTHOUSE EMISSION CONTROL SYSTEM:	c	c	d,e

ADDITIONAL COMMENTS:

[a]Blast furnace No. 4 shut down in 1979 by Federal Consent Decree.[4]

[b]Blast furnace Nos. 1 and 2 used only as a backup to blast furnace No. 6.[46]

[c]Furnace Nos. 1 and 2 are to shut down or install local hood control system in 1982 by Federal Consent Decree.[3,46]

[d]Total evacuation, local hooding, or noncapture technique committed for 1982 by Federal Consent Decree.[3].

[e]Noncapture controls to be installed by 1982, but company has applied for a stretch-out to 1985.[46]

TABLE 34. UNITED STATES STEEL CORP./FAIRFIELD WORKS IN FAIRFIELD, AL

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:[a]	No. 7[1]	No. 8[50]
STARTUP DATE:	1941[b,2]	
RECENT RELINE (REBUILD) DATE:		1981[51]
HEARTH DIAMETER (ft-in.):	28-9[1]	32-0[50]
WORKING VOLUME (ft^3):	52,070[1]	77,520[51]
NO. OF TAPHOLES/FURNACE:	2[51]	2[50,51]
NO. OF CASTHOUSES/FURNACE:	2[51]	2[51]
IRON PRODUCTION:		
RATED TONS/DAY:	2,300[2]	
AVERAGE TONS/DAY (1976):	1,728[2]	
CASTHOUSE EMISSION CONTROL SYSTEM:	c	d

ADDITIONAL COMMENTS:

[a]Blast furnace Nos. 1,2,3, and 4 were shut down between Nov. 1978 and Jan. 1979; blast furnace Nos. 5 and 6 are also shut down.[51]

[b]Blast furnace No. 7 was shut down from 1978-1980; back on-line Nov. 1981.[51]

[c]No commitment to install controls as of Feb. 1981.[3]

[d]AAF has received a turnkey order for casthouse emissions control on furnace No. 8. Control system design includes localized hoods and runner covers, XLC FABRI-pulse fabric collector system with 2,400 polyester felt bags handling 300,000 cfm.[52]

TABLE 35. UNITED STATES STEEL CORP./FAIRLESS WORKS IN FAIRLESS, PA

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 1[1]	No. 2[1]	No. 3[1]
STARTUP DATE:	1952[2]	1953[2]	1957[2]
RECENT RELINE (REBUILD) DATE:			
HEARTH DIAMETER (ft-in.):	29-6;[1] (30-0)[50]	30-10[1]	30-10[1]
WORKING VOLUME (ft^3):	55,651[1]	58,940[1]	58,940[1]
NO. OF TAPHOLES/FURNACE:	1[50,53]	1[53]	1[53]
NO. OF CASTHOUSES/FURNACE:	1[53]	1[53]	1[53]
IRON PRODUCTION:			
RATED TONS/DAY:	2,607[2]	2,820[2]	2,779[2]
AVERAGE TONS/DAY (1976):	2,700[2]	2,776[2]	2,872[2]
CASTHOUSE EMISSION CONTROL SYSTEM:[a]			

ADDITIONAL COMMENTS:

[a]Local hoods or noncapture technique committed by negotiations for 1983 (No. 1), 1984 (No. 2), and 1985 (No. 3).[11]

TABLE 36. UNITED STATES STEEL CORP./GARY WORKS IN GARY, IN

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:[a]	No. 4[1]	No. 6[1]	No. 7[1]
STARTUP DATE:	1917[2]	1910[2]	1909[2]
RECENT RELINE (REBUILD) DATE:			
HEARTH DIAMETER (ft-in.):	28-3[1]	28-0[1]	28-0[1]
WORKING VOLUME (ft^3):	47,563[1]	47,550[1]	42,106[1]
NO. OF TAPHOLES/FURNACE:	1[54]	1[54]	1[54]
NO. OF CASTHOUSES/FURNACE:	1[54]	1[54]	1[54]
IRON PRODUCTION:			
RATED TONS/DAY:	1,959[2]	1,980[2]	1,981[2]
AVERAGE TONS/DAY (1976):	2,337[2]	1,485[2]	1,708[2]
CASTHOUSE EMISSION CONTROL SYSTEM:[b]			

(continued)

TABLE 36 (continued)

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:[a]	No. 8[1]	No. 9[1]	No. 10[1]
STARTUP DATE:	1909[2]	1909[2]	1909[2]
RECENT RELINE (REBUILD) DATE:			
HEARTH DIAMETER (ft-in.):	26-6[1]	23-0[1]	27-0[1]
WORKING VOLUME (ft^3):	41,017[1]	28,827[1]	42,680[1]
NO. OF TAPHOLES/FURNACE:	1[54]	1[54]	1[54]
NO. OF CASTHOUSES/FURNACE:	1[54]	1[54]	1[54]
IRON PRODUCTION:			
RATED TONS/DAY:	1,721[2]	980[2]	1,818[2]
AVERAGE TONS/DAY (1976):	1,910[2]	564[2]	1,903[2]
CASTHOUSE EMISSION CONTROL SYSTEM:[b]			

(continued)

TABLE 36 (continued)

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:[a]	No. 11[1]	No. 12[1]	No. 13[1]
STARTUP DATE:	1908[2]	1908[2]	1974[2]
RECENT RELINE (REBUILD) DATE:			
HEARTH DIAMETER (ft-in.):	25-0[1]	25-0[1]	40-0[1]
WORKING VOLUME (ft^3):	39,256[1]	39,256[1]	100,100[1]
NO. OF TAPHOLES/FURNACE:	1[54]	1[54]	
NO. OF CASTHOUSES/FURNACE:	1[54]	1[54]	
IRON PRODUCTION:			
RATED TONS/DAY:	1,105[2]	1,137[2]	6,148[2]
AVERAGE TONS/DAY (1976):	1,247[2]	1,360[2]	5,022[2]
CASTHOUSE EMISSION CONTROL SYSTEM:	c	c	b

ADDITIONAL COMMENTS:

[a]Furnace Nos. 1 and 2 shut down in 1975, No. 3 shut down in 1979, No. 5 shut down in 1977.[2,3]

[b]Noncapture controls--commitment in negotiations.[3]

[c]Shutdown scheduled--commitment in negotiation.[3]

TABLE 37. UNITED STATES STEEL CORP./LORAIN--CUYAHOGA WORKS IN LORAIN, OH

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:[a]	No. 1[1]	No. 2[1]	No. 3[1]	No. 4[1]
STARTUP DATE:	1898[2]	1899[2]		
RECENT RELINE (REBUILD) DATE:	1926[55]	1937[55]	1941[55]	1942[55]
HEARTH DIAMETER (ft-in.):	23-0[1]	23-3[1]	28-6[1]	29-0[1]
WORKING VOLUME (ft^3):	28,628[1]	28,973[1]	48,505[1]	49,196[1]
NO. OF TAPHOLES/FURNACE:	1[43]	1[43]	1[43]	1[43]
NO. OF CASTHOUSES/FURNACE:	1[43]	1[43]	1[43]	1[43]
IRON PRODUCTION:				
RATED TONS/DAY:	1,399[56]	1,412[56]	2,184[56]	2,222[56]
AVERAGE TONS/DAY (1976):		1,346[2]	2,718[2]	2,326[2]
CASTHOUSE EMISSION CONTROL SYSTEM:[b]				

ADDITIONAL COMMENTS:

[a]Blast furnace No. 5 (built in 1907) dismantled in 1979.[55]

[b]Noncapture controls to be installed by 1982,[43] 1985.[6]

TABLE 38. UNITED STATES STEEL CORP./NATIONAL-DUQUESNE WORKS IN McKEESPORT, PA

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 1[1]
STARTUP DATE:	
RECENT RELINE (REBUILD) DATE:	
HEARTH DIAMETER (ft-in.):	24-0[1]
WORKING VOLUME (ft^3):	30,613[1]
NO. OF TAPHOLES/FURNACE:	1[46]
NO. OF CASTHOUSES/FURNACE:	1[46]
IRON PRODUCTION:	
RATED TONS/DAY:	
AVERAGE TONS/DAY ( ):	
CASTHOUSE EMISSION CONTROL SYSTEM:	

ADDITIONAL COMMENTS:

[a]Blast furnace Nos. 2 and 3 were shut down in 1979.[3]

TABLE 39. UNITED STATES STEEL CORP./GENEVA WORKS IN PROVO, UT

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:[a]	No. 1[1]	No. 2[1]	No. 3[1]
STARTUP DATE:	1944[2]	1944[2]	1944[2]
RECENT RELINE (REBUILD) DATE:	1981[56]		
HEARTH DIAMETER (ft-in.):	26-6[1]	26-6[1]	26-6[1]
WORKING VOLUME (ft^3):	43,897[1]	43,897[1]	43,897[1]
NO. OF TAPHOLES/FURNACE:	1[57]	1[57]	1[57]
NO. OF CASTHOUSES/FURNACE:	1[58]	Furnace Nos. 2 and 3 share common casthouse[58]	
IRON PRODUCTION:			
RATED TONS/DAY:[b]	1,900;[2], 1,800[59] (for each furnace)		
AVERAGE TONS/DAY (1976):	1,344[2] (for each furnace)		
CASTHOUSE EMISSION CONTROL SYSTEM:[c,d]			

ADDITIONAL COMMENTS:

[a]Currently, two out of three furnaces operate at any one time.[57]

[b]Furnace production capacities can be increased to 2,200-2,400 tons per day when feed material is predominantly ore, and no sinter is used.[59]

[c]Local hooding or noncapture controls committed for 1982 by Federal Consent Decree.[3]

[d]Experimentation with noncapture suppression techniques that differ from the J&L technology underway in 1981 on blast furnace No. 2.

TABLE 40. UNITED STATES STEEL CORP./HOMESTEAD WORKS IN RANKIN, PA

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:[a]	No. 3[1]	No. 4[1]
STARTUP DATE:		
RECENT RELINE (REBUILD) DATE:		
HEARTH DIAMETER (ft-in.):	29-6[1]	29-6[1]
WORKING VOLUME (ft^3):	51,281[1]	51,281[1]
NO. OF TAPHOLES/FURNACE:		
NO. OF CASTHOUSES/FURNACE:		
IRON PRODUCTION:		
RATED TONS/DAY:		
AVERAGE TONS/DAY ( ):		
CASTHOUSE EMISSION CONTROL SYSTEM:[b]		

ADDITIONAL COMMENTS:

[a]Blast furnace Nos. 6 and 7 are permanently shut down.[46]

[b]Total evacuation, local hoods, or noncapture controls committed for 1982 by Federal Consent Decree.[11]

TABLE 41. WHEELING-PITTSBURGH STEEL CORP./MON VALLEY PLANT IN MONESSEN, PA

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:[a]	No. 1[1]	No. 3[7,60] ("Jane")[1]
STARTUP DATE:	1913[2]	1948[2]
RECENT RELINE (REBUILD) DATE:		
HEARTH DIAMETER (ft-in.):	19-0[1]	28-0[1]
WORKING VOLUME (ft^3):	24,661[1]	46,596[1]
NO. OF TAPHOLES/FURNACE:	1[60]	1[60]
NO. OF CASTHOUSES/FURNACE:	1[60]	1[60]
IRON PRODUCTION:		
RATED TONS/DAY:	1,000[2]	2,400[2]
AVERAGE TONS/DAY (1976):	973[2]	2,192[2]
CASTHOUSE EMISSION CONTROL SYSTEM:	b	Local hoods over taphole and three hot metal cars ducted to a baghouse[60]
MANUFACTURER:		
DATE INSTALLED:		1980[60]
SYSTEM DESCRIPTION:		• Design flow rate = 130,000 acfm[60] • 10 modules, positive pressure design[60] • Pulse-jet cleaning, A/C = 6:1[39] • Trough hood ~27 ft long extending 4 ft past dam.[39]

ADDITIONAL COMMENTS:

[a]Blast furnace No. 2 permanently shut down in Jan. 1980.[60]

[b]Local hood controls on blast furnace No. 1 committed for 1982 by Federal Consent Decree.[11,60]

TABLE 42. WHEELING-PITTSBURGH STEEL CORP./STEUBENVILLE PLANT IN STEUBENVILLE, OH

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:[a]	No. 1[1]	No. 2[1]
STARTUP DATE:	1903[2]	1904[2]
RECENT RELINE (REBUILD) DATE:	1976[2]	1969[2]
HEARTH DIAMETER (ft-in.):	25-0[1]	23-10[1]
WORKING VOLUME (ft^3):	37,161[1]	35,415[1]
NO. OF TAPHOLES/FURNACE:	1[61]	1[61]
NO. OF CASTHOUSES/FURNACE:	Share common casthouse[61]	
IRON PRODUCTION:		
RATED TONS/DAY:	1,550[2]	1,550[2]
AVERAGE TONS/DAY (1976):	1,482[2]	1,279[2]
CASTHOUSE EMISSION CONTROL SYSTEM:[b,c]		

ADDITIONAL COMMENTS:

[a]Blast furnace Nos. 1 and 2 are located in the North Plant.[6]

[b]Local hood with baghouse for all furnaces to be installed in 1982 by Federal Consent Decree.[6,11]

[c]Company applied for Stretch-out until Dec. 1985 for furnace Nos. 1 and 2.[6]

TABLE 43. WHEELING-PITTSBURGH STEEL CORP./STEUBENVILLE IN MINGO JUNCTION, OH

BLAST FURNACE--CASTHOUSE PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:[a]	No. 3[1]	No. 4[1]	No. 5[1]
STARTUP DATE:	1948[2]	1950[2]	1948[2]
RECENT RELINE (REBUILD) DATE:			1977[62]
HEARTH DIAMETER (ft-in.):	24-0[1]	21-5[1]	24-9[1]
WORKING VOLUME (ft^3):	33,771[1]	27,639[1]	40,536[1]
NO. OF TAPHOLES/FURNACE:	1[61]	1[61]	1[61]
NO. OF CASTHOUSES/FURNACE:	1[61]	1[61]	1[61]
IRON PRODUCTION:			
RATED TONS/DAY:	1,500[2]	900[2]	1,800[2]
AVERAGE TONS/DAY (1976):	1,502[2]		1,850[2]
CASTHOUSE EMISSION CONTROL SYSTEM:[b]			

ADDITIONAL COMMENTS:

[a]Blast furnace Nos. 3, 4, and 5 are located in the South Plant.[6]

[b]Local hood-baghouse control on all furnaces to be installed in 1982 by Federal Consent Decree.[6,11]

MATERIAL IN THIS SECTION SUBJECT TO CONFIDENTIALITY REVIEW AND IS NOT RELEASABLE AS OF FEBRUARY 1, 1982. FOR INFORMATION, CONTACT L. KESARI, U.S. ENVIRONMENTAL PROTECTION AGENCY, DIVISION OF STATIONARY SOURCE ENFORCEMENT.

REFERENCES

BLAST FURNACE CASTHOUSE

1. World Steel Industry Data Handbook. Volume I. The United States. McGraw-Hill Magazine. 1978. pp. 40. (Reliability No. 4.)

2. Development Document for Proposed Effluent Limitations Guidelines and Standards for the Iron and Steel Manufacturing Point Source Category. Vol. III. Draft Report. EPA 440/1-79-024a. October 1979. pp. 151. (Reliability No. 4.)

3. Maslany, T. U.S. EPA, Region III. Memo on Blast Furnace Casthouse Controls and Commitments. February 1981. (Reliability No. 1.)

4. Telephone conversation. Steve Samorgin, SW District-Ohio Environmental Protection Agency to Sandy Beaton, GCA/Technology Division. October 1981. (Reliability No. 2.)

5. Telephone conversation. John Hepola, U.S. EPA Region VI to Michael Jasinski, GCA/Technology Division. November 1981. (Reliability No. 2.)

6. EPA Region V Engineers comments to GCA questionnaire. December 1981.

7. Spawn, P. D. and T. J. Maslany. Blast Furnace Casthouse Control Technology and Recent Emissions Test Data. JACA. 31(10): 1060. October 1981. (Reliability No. 1.)

8. Estimation of Particulate Emission Concentrations from Blast Furnace Casthouse Fabric Filters. Midwest Research Institute. Draft Final Report. Project No. 4310-L, Task 18. July 1980. RACT Box No. 100507-100564. (Reliability No. 1.)

9. Franch, G. L. At Burns Harbor: Operating Experience with Large Blast Furnaces. Iron and Steel Engineer. 49(9): 57-63. September 1972. (Reliability No. 3.)

10. Greenwald, R. A. Burns Harbor "D" - Lady on Lake Michigan. Iron and Steel Engineer. 48(11): 24-78. November 1971. (Reliability No. 3.)

11. Information supplied to P. Spawn, GCA/Technology Division by T. Maslany, U.S. EPA Region III. (Reliability No. 2.)

12. Farino W., P. Spawn, and M. Jasinski. Analysis of Control Options for Blast Furnace in EPA Region II. Bethlehem Steel Corporation/Lackawanna Plant. GCA/Technology Division. Draft Final Report No. TR-81-120-G. Prepared for U.S. EPA. December 1981. (Reliability No. 2.)

13. Letter report. Bethlehem Steel Corp./Sparrows Point L Blast Furnace Inspection. GCA/Technology Division to U.S. EPA. April 1981. (Reliability No. 2.)

14. Spawn, P. D. and S. G. Piper. Evaluation of Control Options and Costs for CF&I Steel Corporation Blast Furnace Casthouse. GCA/Technology Division. Final Report No. TR-80-104-G. Prepared for U.S. EPA. June 1981. (Reliability No. 1.)

15. EPA Region V files. (Ford response to EPA questionnaire dated February 2, 1978.)

16. EPA Region V files. (Ford 3rd qt. progress report to EPA dated October 16, 1981.)

17. Telephone conversation. Phil Pekron, U.S. EPA Region V to Sandy Beaton, GCA/Technology Division. October 1981. (Reliability No. 2.)

18. Samivays, N. L. No. 7 Blast Furnace Completes Inland's $1 Billion Expansion. Iron and Steel Engineer. December 1980. pp. 64-68. (Reliability No. 4.)

19. GCA/Technology Division letter report to U.S. EPA Region III on testing at Inland Steel's No. 7 Blast Furnace Casthouse, February 1981. (Reliability No. 1.)

20. EPA Region V files. (Trip report at Interlake dated June 1980.)

21. Telephone conversation. Arthur Witt, Pennsylvania Department of Environmental Resources to Sandy Beaton, GCA/Technology Division. November 17, 1981. (Reliability No. 2.)

22. Spawn, P. D., et al. Assessment of Air Emissions from Steel Plant Sources. J&L Steel Corp./Cleveland Works Blast Furnace. GCA Draft Final Report No. TR-81-75-G. Prepared for U.S. EPA. July 1981. (Reliability No. 1.)

23. Telephone conversation. Greg Trovasso, City of Cleveland Air Pollution Control to Sandy Beaton, GCA/Technology Division. October 1981. (Reliability No. 2.)

24. EPA Region V files. (J&L letter.)

25. EPA Region V files. (Letter from J&L to EPA, 1981.)

26. Telephone conversation. Don Kuh, State of Indiana Air Pollution Control to Sandy Beaton, GCA/Technology Division. October 1981. (Reliability No. 2.)

27. Iron and Steel Engineer. Editor's Note. 56(11): November 1979. (Reliability No. 4.)

28. Telephone conversation. Robert Bean, South Coast Air Quality Management District to Michael Jasinski, GCA/Technology Division. November 1981. (Reliability No. 2.)

29. Telephone conversation. Lois Green, U.S. EPA Region IX to Michael Jasinski, GCA/Technology Division. October 1981. (Reliability No. 2.)

30. Cost Estimates and Construction Schedules for the Control of Visible Emissions from the Blast Furnace Casthouse at Kaiser Steel Corporation, Fontana, California. PCM Report. August 1980. (Reliability No. 1.)

31. EPA Region V files. (March 14, 1981, EPA Inspection at McLouth.)

32. Farino, W. F., et al. Analysis of Control Options for Blast Furnaces in EPA Region II. Hanna Furnace Corporation, Buffalo, NY. GCA/Technology Division Report No. TR-81-84-G. Prepared for U.S. Environmental Protection Agency. August 1981. (Reliability No. 1.)

33. EPA Region V files. (March 1979 Litigation Report on NSC/GLS.)

34. Fornadley, R. J. Granite City--Bold Modernization of an Integrated Steel Plant. Iron & Steel Engineer. August 1980. pp. SL-67 through SL-80. (Reliability No. 3.)

35. Telephone conversation. Anton Telford, State of Illinois Environmental Protection Agency to Sandy Beaton, GCA/Technology Division. October 1981. (Reliability No. 2.)

36. Spawn, P. D., et al. National Steel Corporation/Weirton Steel Division Plant Inspection in August 1981. GCA/Technology Division Draft Final Report No. TR-81-118-G. Prepared for U.S. Environmental Protection Agency. November 1981. (Reliability No. 1.)

37. Iron & Steel Engineer. Industry News. November 1981. (Reliability No. 4.)

38. Farino, W., et al. Analysis of Control Options for Blast Furnaces in EPA Region II. Republic Steel Corporation/Buffalo, NY. GCA/Technology Division Draft Final Report No. TR-81-93-G. Prepared for U.S. Environmental Protection Agency. October 1981. (Reliability No. 1.)

39. EPA Region V files. (Acurex Report on RSC/Chicago Blast Furnace dated 1980.)

40. EPA Region V files. (RSC/Cleveland A.P. Emission Report dated 1978.)

41. Telephone conversation. Ike Habib, City of Cleveland Air Pollution Control to Sandy Beaton, GCA/Technology Division. October 1981. (Reliability No. 2.)

42. Telephone conversation. Sue Robertson. Alabama State Air Pollution Control Agency to Michael Jasinski, GCA/Technology Division. October 1981. (Reliability No. 2.)

43. Letter response. Dennis Bush, Ohio Environmental Protection Agency to Sandy Beaton, GCA/Technology Division. November 1981. (Reliability No. 2.)

44. EPA Region V files. (1974 permits.)

45. Telephone conversation. Bill Charleton, PADER--Meadsville, PA to Sandy Beaton, GCA/Technology Division. October 11, 1981. (Reliability No. 2.)

46. Telephone conversation. Bob Felt, Allegheny County Department of Health to Sandy Beaton, GCA/Technology Division. November 3, 1981. (Reliability No. 2.)

47. EPA Region V files. (Air Pollution Emission Inventory prepared in 1977 regarding U.S. Steel Corp./Chicago Works.)

48. Memo regarding, Casthouse Emission Control Facilities for U.S. Steel Corp./South Works. June 23, 1980. RACT No. 101293. (Reliability No. 2.)

49. EPA Region V files. (Letter from U.S. Steel/South Works to EPA Region V dated January 1981.)

50. U.S. Steel Corporation. Memorandum from D. G. Wilson in reference to Blast Furnace Casthouse Emission Control Facilities. RACT No. 101298. (Reliability No. 2.)

51. Letter response. Paul Pate, Director of Jefferson County Department of Health to Michael Jasinski, GCA/Technology Division. December 1981. (Reliability No. 1.)

52. Iron & Steel Engineer. 57(11):90. November 1980. (Reliability No. 3.)

53. Telephone conversation and letter response. Tom McGinley, PADER--Morristown, PA to Sandy Beaton, GCA/Technology Division. November 1981. (Reliability No. 1.)

54. Telephone conversation. Roland Elrambuena, City of Gary Air Pollution Control Division to Eugene Bergson, GCA/Technology Division. March 4, 1981. (Reliability No. 2.)

55. EPA Region V files. (1974 permits.)

56. EPA Region V files. (1972 permits.)

57. Telephone conversation. Dave Kopta, Utah State Department of Health to Michael Jasinski, GCA/Technology Division. November 1981. (Reliability No. 2.)

58. USS Memorandum: Geneva Blast Furnaces Casthouse Emission Control Facilities. Notes of Meeting. RACT No. 101413-101417. (Reliability No. 2.)

59. National Enforcement Investigation Center. Report on Plant Inspection at U.S. Steel Corp./Geneva Works. 1977. (Reliability No. 2.)

60. Letter response. Richard Thomas, PADER--Greensburg, PA to Sandy Beaton, GCA/Technology Division. October 1981. (Reliability No. 2.)

61. Letter response. Harold Strohmeyer, North Ohio Valley Air Authority to Sandy Beaton, GCA/Technology Division. October 1981. (Reliability No. 2.)

62. EPA Region V files. (Blueprints.)

MATERIAL IN THIS SECTION SUBJECT TO CONFIDENTIALITY REVIEW AND IS NOT RELEASABLE AS OF FEBRUARY 1, 1982. FOR INFORMATION, CONTACT L. KESARI, U.S. ENVIRONMENTAL PROTECTION AGENCY, DIVISION OF STATIONARY SOURCE ENFORCEMENT.

EXTERNAL IRON
DESULF. STATIONS

TABLE 1. ARMCO INC./ASHLAND WORKS IN ASHLAND, KY

EXTERNAL DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

STARTUP DATE:	1978[1]
TYPE OF DESULFURIZATION PROCESS:	Lance injection[a,3,4]
TYPE OF DESULFURIZATION COMPOUND(S) USED:	Magnesium/lime mixture[3,4]
TYPE OF CARRIER GAS USED:	Nitrogen[2]
NO. OF TORPEDO CARS DESULFURIZED AT ONCE:[b]	2[4]; 1[2]
TYPE OF EMISSION CONTROL SYSTEM:	Hood ducted to a baghouse[2,4]
MANUFACTURER:	
DATE INSTALLED:	1978[1]
SYSTEM DESCRIPTION:	• Rated capacity = 40,000 acfm @ 120°F[1] • A/C (design) = 6:1[1] • Test Data (1980):[2] 20,400-24,200 scfm @ 101-154°F

ADDITIONAL COMMENTS:

[a]Desulfurization station contains 2 units designated A and B.[2]

[b]Each torpedo car contains 200 tons of hot metal.[4]

TABLE 2. ARMCO INC./MIDDLETOWN WORKS IN MIDDLETOWN, OH

EXTERNAL DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

STARTUP DATE:	1979[5]
TYPE OF DESULFURIZATION PROCESS:	Injection[3]
TYPE OF DESULFURIZATION COMPOUND(S) USED:	
TYPE OF CARRIER GAS USED:	
NO. OF TORPEDO CARS DESULFURIZED AT ONCE:	2[5]
TYPE OF EMISSION CONTROL SYSTEM:	Baghouse[6]
MANUFACTURER:	Standard Havens[6]
DATE INSTALLED:	1978;[6] 1979[5]
SYSTEM DESCRIPTION:	

ADDITIONAL COMMENTS:

TABLE 3. CF&I STEEL CORP./PUEBLO PLANT IN PUEBLO, CO

EXTERNAL DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

STARTUP DATE:	1981[7]
TYPE OF DESULFURIZATION PROCESS:	Lancing[7]
TYPE OF DESULFURIZATION COMPOUND(S) USED:	
TYPE OF CARRIER GAS USED:	
NO. OF TORPEDO CARS DESULFURIZED AT ONCE:	
TYPE OF EMISSION CONTROL SYSTEM:[a]	Baghouse[7]
MANUFACTURER:	
DATE INSTALLED:	1981[7]
SYSTEM DESCRIPTION:	

ADDITIONAL COMMENTS:

[a]Prior to the baghouse installation, an unevacuated enclosure was used to contain emissions.[8]

TABLE 4. JONES & LAUGHLIN STEEL CORP./ALIQUIPPA WORKS IN ALIQUIPPA, PA

EXTERNAL DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

STARTUP DATE:	1975[9]
TYPE OF DESULFURIZATION PROCESS:	Injection[10]
TYPE OF DESULFURIZATION COMPOUND(S) USED:	Magnesium carbide[1]
TYPE OF CARRIER GAS USED:	
NO. OF TORPEDO CARS DESULFURIZED AT ONCE:	2[a,9]
TYPE OF EMISSION CONTROL SYSTEM:	Baghouse[b,10,11]
MANUFACTURER:	Buell, Inc.[10,11]
DATE INSTALLED:	1981[10,11]
SYSTEM DESCRIPTION:	• 100,000 acfm (rated)[11] • A/C = 3:1 (design)[11] • 7 compartments; 120 bags per compartment[11]

ADDITIONAL COMMENTS:

[a]Station can handle 8,000-9,000 tons/day of hot metal.[9]

[b]Baghouse replaced Ducon scrubber, originally used, in 1981.[10,11]

TABLE 5. JONES & LAUGHLIN STEEL CORP./CLEVELAND WORKS IN CLEVELAND, OH

EXTERNAL DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

STARTUP DATE:[a]	
TYPE OF DESULFURIZATION PROCESS:	Lancing[b,12]
TYPE OF DESULFURIZATION COMPOUND(S) USED:	Lime-magnesium mixture[12]
TYPE OF CARRIER GAS USED:	
NO. OF TORPEDO CARS DESULFURIZED AT ONCE:	
TYPE OF EMISSION CONTROL SYSTEM:[b]	
MANUFACTURER:	
DATE INSTALLED:	
SYSTEM DESCRIPTION:	

ADDITIONAL COMMENTS:

[a]Process is located in the abandoned open hearth shop.[12]

[b]Single-unit, experimental treatment station desulfurizing 50 to 60 percent of hot metal produced. No emissions controls are used.[9,12]

TABLE 6. KAISER STEEL IN FONTANA, CA

EXTERNAL DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

STARTUP DATE:	1978[13]
TYPE OF DESULFURIZATION PROCESS:	Injection[13]
TYPE OF DESULFURIZATION COMPOUND(S) USED:	Calcium carbide and calcium carbonate[13]
TYPE OF CARRIER GAS USED:	Nitrogen (200 cfm at 30-40 psi)[13]
NO. OF TORPEDO CARS DESULFURIZED AT ONCE:	Up to three[13]
TYPE OF EMISSION CONTROL SYSTEM:	Baghouse[14]
MANUFACTURER:	Wheelabrator-Frye[13]
DATE INSTALLED:	1979[14]
SYSTEM DESCRIPTION:	• 100,000 scfm, positive pressure[13] • 6 compartments - 1728 total Dacron bags - 6 exhaust stacks[13] • A/C = 3:1 at ΔP = 7-8 in. W.G.[13] • Mechanical shakers[13]

ADDITIONAL COMMENTS:

TABLE 7. NATIONAL STEEL CORP./GRANITE CITY STEEL DIV. IN GRANITE CITY, IL

EXTERNAL DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

STARTUP DATE:	1980[5]
TYPE OF DESULFURIZATION PROCESS:	Injection[15,16]
TYPE OF DESULFURIZATION COMPOUND(S) USED:	Calcium carbide[a,15,16]
TYPE OF CARRIER GAS USED:	Nitrogen[5,16]
NO. OF TORPEDO CARS DESULFURIZED AT ONCE:	1[b,5]
TYPE OF EMISSION CONTROL SYSTEM:[c]	Baghouse[5,15,16]
MANUFACTURER:	Carborundum[16]
DATE INSTALLED:	1978[15]
SYSTEM DESCRIPTION:	• 100,000 acfm[16] • 8 compartments, Nomex bags and a total cloth area of 93,356 sq. ft.[16]

ADDITIONAL COMMENTS:

[a]Replaced the soda-ash desulfurization process.[16]

[b]Station capacity is 5,500 tons/day;[15] (300 tons/day).[16]

[c]Emissions collected by a 9 x 11 ft hood, located 2 ft above hot metal car. Emissions ducted to same baghouse used for controlling the hot metal transfer station.[5,15,16]

TABLE 8. REPUBLIC STEEL CORP./CHICAGO DISTRICT IN CHICAGO, IL

EXTERNAL DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

STARTUP DATE:

TYPE OF DESULFURIZATION PROCESS:[a]

TYPE OF DESULFURIZATION COMPOUND(S) USED:

TYPE OF CARRIER GAS USED:

NO. OF TORPEDO CARS DESULFURIZED AT ONCE:

TYPE OF EMISSION CONTROL SYSTEM:

MANUFACTURER:
DATE INSTALLED:
SYSTEM DESCRIPTION:

ADDITIONAL COMMENTS:

[a]Scheduled startup in Spring of 1981 of a Takahax desulfurization process supplied by Envirotech/Chemico Corp.[17]

TABLE 9. REPUBLIC STEEL CORP./SOUTHERN DISTRICT, GULFSTEEL WORKS IN GADSDEN, AL

EXTERNAL DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

STARTUP DATE:[a]

TYPE OF DESULFURIZATION PROCESS:

TYPE OF DESULFURIZATION COMPOUND(S) USED:

TYPE OF CARRIER GAS USED:

NO. OF TORPEDO CARS DESULFURIZED AT ONCE:[b]

TYPE OF EMISSION CONTROL SYSTEM:[c]

MANUFACTURER:
DATE INSTALLED:
SYSTEM DESCRIPTION:

ADDITIONAL COMMENTS:

[a]Station not completed as of Oct. 1981.[18]

[b]Two torpedo-ladle stations to be built.[9,19]

[c]Desulfurization will be within BOF Shop, with a baghouse for control.[19]

TABLE 10. REPUBLIC STEEL CORP./MAHONING VALLEY DISTRICT IN WARREN, OH

EXTERNAL DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

STARTUP DATE:

TYPE OF DESULFURIZATION PROCESS:

TYPE OF DESULFURIZATION COMPOUND(S) USED:

TYPE OF CARRIER GAS USED:

NO. OF TORPEDO CARS DESULFURIZED AT ONCE:

TYPE OF EMISSION CONTROL SYSTEM:[a]

MANUFACTURER:
DATE INSTALLED:
SYSTEM DESCRIPTION:

ADDITIONAL COMMENTS:

[a]No controls are presently used.[20]

TABLE 11. UNITED STATES STEEL CORP./NATIONAL-DUQUESNE WORKS IN DUQUESNE, PA

EXTERNAL DESULFURIZATION PROCESS AND EMISSION CONTROL DATA

STARTUP DATE:	1980[9]
TYPE OF DESULFURIZATION PROCESS:	ATH[3]
TYPE OF DESULFURIZATION COMPOUND(S) USED:	Calcium carbide[3]
TYPE OF CARRIER GAS USED:	Nitrogen[21]
NO. OF TORPEDO CARS DESULFURIZED AT ONCE:	
TYPE OF EMISSION CONTROL SYSTEM:	Baghouse[21]
MANUFACTURER:	
DATE INSTALLED:	1980[21]
SYSTEM DESCRIPTION:	• 4 compartments[21] • Flow rate = 40,000 cfm[21]

ADDITIONAL COMMENTS:

MATERIAL IN THIS SECTION SUBJECT TO CONFIDENTIALITY REVIEW AND IS NOT RELEASABLE AS OF FEBRUARY 1, 1982. FOR INFORMATION, CONTACT L. KESARI, U.S. ENVIRONMENTAL PROTECTION AGENCY, DIVISION OF STATIONARY SOURCE ENFORCEMENT.

REFERENCES

EXTERNAL IRON DESULFURIZATION STATIONS

1. Letter response.Jim Dills, State of Kentucky to Michael Jasinski, GCA/Technology Division. November 19, 1981. (Reliability No. 1.)

2. Steel Processing Fugitive Emissions; Emission Test Report, ARMCO Steel, Ashland, Kentucky. Clayton Environmental Consultants. EMB Report No. 80-BOF-4. August 1980. (Reliability No. 4.)

3. Iron & Steel Engineer. Developments in the Iron & Steel Industry--U.S. and Canada. February 1980. p. 220. (Reliability No. 4.)

4. New ARMCO Facilities Reduce Sulfur Level. Iron & Steel Engineer. 56(1):63. January 1979. (Reliability No. 3.)

5. EPA Region V engineer's comments to GCA questionnaire, December 1981.

6. Telephone conversation. Ed Luebering, SW District Ohio EPA to Gene Bergson, GCA/Technology Division. Marcy 9, 1981. (Reliability No. 2.)

7. Telephone conversation. Dennis Myers. Colorado State Department of Health to Michael Jasinski, GCA/Technology Division. October 1981. (Reliability No. 2.)

8. Telephone conversation. Dennis Myers, Colorado State Department of Health to Stephen Piper, GCA/Technology Division. February 1981. (Reliability No. 2.)

9. Desulfurization '80: Heavy booking on a bandwagon promising quality. 33 Metal Producing Magazine. November 1980. pp. 43-48. (Reliability No. 4.)

10. Telephone conversation. Arthur Witt, PADER--Pittsburgh, PA to Sandy Beaton, GCA/Technology Division. November 17, 1981. (Reliability No. 2.)

11. Telephone conversation. Ken Bowman, Pennsylvania Department of Environmental Resources to Mike Jasinski, GCA/Technology Division. February 18, 1981. (Reliability No. 2.)

12. Telephone conversation. Edward Wojciechowski, U.S. Environmental Protection Agency Region V to Gene Bergson, GCA/Technology Division. February 4, 1981. (Reliability No. 2.)

13. Steiner, J. and B. J. Bodnaruk. Particulate and SO_2 Emission Factors for Hot Metal Desulfurization, Kaiser Steel, Fontana Works. Paper presented at EPA's Symposium on Iron and Steel Pollution Abatement Technology. Philadelphia, PA. November 18-20, 1980. (Reliability No. 2.)

14. Telephone conversation. Norm Ernstein, South Coast Air Quality Management District to Gene Bergson, GCA/Technology Division. February 1981. (Reliability No. 2.)

15. Formadley, R. J. Granite City: Bold Modernization of an Integrated Steel Plant. Iron and Steel Engineer. August 1980. pp. SL-67--SL-80. (Reliability No. 3.)

16. EPA Region V files (permit application to construct dated May 29, 1979).

17. Iron & Steel Engineer. Industry News. 57(2):100. February 1980. (Reliability No. 3.)

18. Telephone conversation. Sue Robertson, Alabama State Air Pollution Control to Michael Jasinski, GCA/Technology Division. October 27, 1981. (Reliability No. 2.)

19. Telephone conversation. Sue Robertson, Alabama State Air Pollution Control to Gene Bergson, GCA/Technology Division. February 25, 1981. (Reliability No. 2.)

20. Telephone conversation. Ted Davis. SW District Ohio EPA to Gene Bergson, GCA/Technology Division. February 27, 1981. (Reliability No. 2.)

21. Telephone conversation. Bob Felt, Allegheny County Department of Health to Gene Bergson, GCA/Technology Division. February 12, 1981. (Reliability No. 2.)

MATERIAL IN THIS SECTION SUBJECT TO CONFIDENTIALITY
REVIEW AND IS NOT RELEASABLE AS OF FEBRUARY 1, 1982.
FOR INFORMATION, CONTACT L. KESARI, U.S. ENVIRONMENTAL
PROTECTION AGENCY, DIVISION OF STATIONARY SOURCE ENFORCEMENT.

TABLE 1. ARMCO INC./ASHLAND WORKS IN ASHLAND, KY

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 1[1]	No. 2[1]
STARTUP DATE:	1963[1]	1963[1]
TYPE OF BLOWING MECHANISM:	Top[2]	Top[2]
TYPE OF COMBUSTION HOOD:[a]	Full[2]	Full[2]
STEEL PRODUCTION:		
RATED TONS/DAY:	5,640 (both furnaces combined)[3]	
AVERAGE TONS/DAY ( ):		
PRIMARY EMISSION CONTROL SYSTEM:	Common dry ESP serves both furnaces[2,4]	
MANUFACTURER:	Western Precipitator[1]	
DATE INSTALLED:[b]	1963[4]	
SYSTEM DESCRIPTION:	• Four chambered ESP; four fields per chamber[5] • Total plate area = 117,054 sq ft[5] • 4 I.D. fans with maximum rated capacity = 350,000 scfm (total)[5]	
SECONDARY EMISSION CONTROL SYSTEM:[c]	Hot metal transfer area ducted to baghouse[5]	
MANUFACTURER:	Carborundum[5]	
DATE INSTALLED:	1975[5]	
SYSTEM DESCRIPTION:	• Design specifications:[5] Flow rate = 90,000 acfm at 250°F 8 compartments; 2,304 total bags (Nomex) Total cloth area = 39,600 sq ft A/C = 2.27:1 Shaker cleaning mechanism	

ADDITIONAL COMMENTS:

[a]Membrane tube hood with steam condensed cooling and water sprays.[2]

[b]Seven ESP units were originally installed in 1963; eighth unit added in 1969.[4]

[c]Tapping enclosure on each furnace directs tapping emissions into primary exhaust hood and ESP.[2]

TABLE 2. ARMCO INC./MIDDLETOWN WORKS IN MIDDLETOWN, OH

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 15[1]	No. 16[1]
STARTUP DATE:	1969[1,6]	1969[1,6]
TYPE OF BLOWING MECHANISM:	Top[2]	Top[2]
TYPE OF COMBUSTION HOOD:[a]	Partial[2]	Partial[2]
STEEL PRODUCTION:		
RATED TONS/DAY:	7,599 (both furnaces combined)[7]	
AVERAGE TONS/DAY (1976):	5,795 (both furnaces combined)[7]	
PRIMARY EMISSION CONTROL SYSTEM:	Individual scrubber system per furnace[6,8,9]	
MANUFACTURER:	Chemico[10]	
DATE INSTALLED:	1969[6]	
SYSTEM DESCRIPTION:	• Separate but similar scrubber systems consisting of a venturi scrubber first and then a high-energy variable throat scrubber[8] • Scrubber Design Data (Single System):[8,10] Water flow = 2,000 gpm in primary venturi scrubber system Δp = 45 in. H_2O (primary venturi) Δp = 45 in. H_2O (variable throat) One I.D. fan rated at 100,000 acfm 825 gpm of recirculated water used 55,000 dscfm of gas leaves primary scrubber and enters variable throat scrubber • Test Data (1971):[b,8] 43,793-63,491 acfm	• Test Data (1969):[c,8] 49,100-57,100 scfm
SECONDARY EMISSION CONTROL SYSTEM:	Hot metal transfer area ducted to baghouse[d,11]	
MANUFACTURER:	Industrial Clean Air[11]	
DATE INSTALLED:	1975[11]	

(continued)

TABLE 2 (continued)

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

SYSTEM DESCRIPTION:	• Rated at 95,000 acfm at 275°F • A/C = 2.6:1[11] • Δp = 4-6 in H_2O[11]

ADDITIONAL COMMENTS:

[a]Membrane tube hood with double walled water cooling; gas cooling by water quenching.[2,8]

[b]Tests were performed for 6 consecutive heats from end of charging to beginning of tap.[6]

[c]Tests were performed during two oxygen blow periods.[8]

[d]HMT area was controlled by AAF multiclones from 1969 to 1975.[8,11]

TABLE 3. BETHLEHEM STEEL CORP./BETHLEHEM PLANT IN BETHLEHEM, PA

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 70[12]	No. 80[12]
STARTUP DATE:	1968[1]	1968[1]
TYPE OF BLOWING MECHANISM:	Top[2]	Top[2]
TYPE OF COMBUSTION HOOD:[a,b]	Full[2]	Full[2]
STEEL PRODUCTION:		
RATED TONS/DAY:		
AVERAGE TONS/DAY ( ):		
PRIMARY EMISSION CONTROL SYSTEM:	Common dry ESP serves both furnaces[2,13]	
MANUFACTURER:	Research Cottrell[12]	
DATE INSTALLED:	1970[14]	
SYSTEM DESCRIPTION:	• Exhaust from each furnace to common header, ESP, outlet header, 3 I.D. fans, and one outlet stack[12] • Six section ESP with four cells per section[12] • 750,000 acfm at 420°F (design flow during O_2 blow)[13] • <u>Test Data (1977):</u>[d,12] Avg. inlet--850,000 acfm at 400°F (O_2 blow) 650,000 acfm at 175°F (charging and tapping) Avg. outlet--900,000 acfm at 260°F (O_2 blow) 840,000 acfm at 175°F (charging and tapping) • <u>Test Data (1976):</u>[c,12] 442,400 dscfm (avg.); temperature = 207°F (avg.) • <u>Test Data (1972):</u>[15] 493,500 dscfm at 200°F (avg.)	
SECONDARY EMISSION CONTROL SYSTEM:	Permanent enclosures and awning on tapside of each furnace-emissions serviced by primary ESP[12,13]	

(continued)

TABLE 3 (continued)

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

MANUFACTURER:	
DATE INSTALLED:	1976[12]
SYSTEM DESCRIPTION:	• Evacuation rate during hot metal charging, turndowns, tapping, slagging, etc. = 500,000 acfm at 180°F[13]

ADDITIONAL COMMENTS:

[a]Finned tube hood with steam generation cooling.[2]

[b]Gas cooling by water sprays.[2]

[c]Both furnaces operating; testing only during O_2 blow periods.[12]

[d]Fan dampers set at 40 to 48 percent during normal full exhaust flow rate.[12]

TABLE 4. BETHLEHEM STEEL CORP./BURNS HARBOR PLANT IN CHESTERTON, IN

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 1[1]	No. 2[1]
STARTUP DATE:	1969[16]	1969[16]
TYPE OF BLOWING MECHANISM:[a]	Top[2]	Top[2]
TYPE OF COMBUSTION HOOD:[b]	Full[2]	Full[2]
STEEL PRODUCTION:		
RATED TONS/DAY:	12,050 (all three furnaces combined)[7]	
AVERAGE TONS/DAY (1976):	10,520 (all three furnaces combined)[7]	
PRIMARY EMISSION CONTROL SYSTEM:	Variable throat venturi scrubbers serve both furnaces[17,18]	
MANUFACTURER:	Chemico[10]	
DATE INSTALLED:	1969[10]	
SYSTEM DESCRIPTION:	• Three scrubbers in parallel with individual stacks[17] • 2,570,000 acfm at 180°F (design)[10] • Three I.D. fans rated at 1500-hp[18] • 5,700 gpm (water flow design)[10] • L/G = 2.2 gpm/1,000 acfm (calculated)[10] • Test Data (1974):[15] Δp = 55 in. H_2O	
SECONDARY EMISSION CONTROL SYSTEM:		

(continued)

TABLE 4 (continued)

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 3[1]
STARTUP DATE:	1978[2]
TYPE OF BLOWING MECHANISM:	Top[2]
TYPE OF COMBUSTION HOOD:	Partial[2]
STEEL PRODUCTION:	
RATED TONS/DAY: AVERAGE TONS/DAY ( ):	See previous page[7]
PRIMARY EMISSION CONTROL SYSTEM:	High-energy variable throat venturi scrubber[17,19]
MANUFACTURER: DATE INSTALLED: SYSTEM DESCRIPTION:	Chemico[10] 1978[10] • 280,000 acfm at 165°F (design)[10] • One I.D. fan rated at 7,000-hp[19,20] • 2,800 gpm (water flow design)[10] • L/G = 10 gpm/1,000 acfm (design-calculated)[10]
SECONDARY EMISSION CONTROL SYSTEM:[c]	Hot metal transfer area to baghouse[18]
MANUFACTURER: DATE INSTALLED: SYSTEM DESCRIPTION:	 • 100,000 cfm[18] • <u>Test Data (1978)</u>:[17] Avg. flow = 139,400 dscfm Avg. temp. = 138°F

ADDITIONAL COMMENTS:

[a]Can only blow one vessel at a time.[17]

[b]Tube hood with steam generation cooling; gas cooling by water quenching.[2]

[c]Secondary emissions controlled by hood located inside furnace enclosure drafted to primary scrubber.[17,19]

TABLE 5. BETHLEHEM STEEL CORP./LACKAWANNA PLANT IN LACKAWANNA, NY

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 16[21]	No. 17[21]	No. 18[21]
STARTUP DATE:	1964[22,23]	1964[22,23]	1966[22,23]
TYPE OF BLOWING MECHANISM:	Top[2]	Top[2]	Top[2]
TYPE OF COMBUSTION HOOD:[a]	Full[2]	Full[2]	Full[2]
STEEL PRODUCTION:			
RATED TONS/DAY:	14,400 (all three furnaces combined)[7]		
AVERAGE TONS/DAY (1976):	9,397 (all three furnaces combined)[7]		
PRIMARY EMISSION CONTROL SYSTEM:	Separate, identical scrubbers per furnace[23]		
MANUFACTURER:	Buell (all three scrubbers)[10]		
DATE INSTALLED:	1964[23]	1964[23]	1966[23]
SYSTEM DESCRIPTION:	• Separate, identical scrubber units; common manifold--single exhaust stack[21] • Each unit contains 384 multi-venturi tubes, assembled side by side (spray nozzles located above tubes)[23] • Design Δp = 50 in. H_2O • Entire system requires three I.D. fans; each rated at 327,000 cfm (fourth fan on standby)[23] • Each fan normally operates at 980-1,100 rpm[23] • Approx. inlet gas flow rate--650,000 scfm at 215°F (during oxygen blow)[23]		
SECONDARY EMISSION CONTROL SYSTEM:[b]	Hot metal transfer area ducted to baghouse.[24]		
MANUFACTURER:	Pangborn[24]		
DATE INSTALLED:	1969[24]		
SYSTEM DESCRIPTION:	• Design flow rate = 100,000 scfm[24] • Exit temperature = 90°F[24] • Δp = 6 in. H_2O[24]		

ADDITIONAL COMMENTS:

[a]Plate and tube hood with steam condensed cooling; gas cooling by water sprays.[2]

[b]Tapside enclosures installed on each furnace to control tapping emissions.[29]

TABLE 6. BETHLEHEM STEEL CORP./SPARROWS POINT PLANT IN SPARROWS POINT, MD

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 1[25]	No. 2[25]
STARTUP DATE:	1966[1]	1966[1]
TYPE OF BLOWING MECHANISM:	Top[2]	Top[2]
TYPE OF COMBUSTION HOOD:[a,b]	Full[2]	Full[2]
STEEL PRODUCTION:		
RATED TONS/DAY:	9,167 (both furnaces combined)[7]	
AVERAGE TONS/DAY (1976):	8,903;[7] 15,457--avg. in 1974[25] (both furnaces combined)	
PRIMARY EMISSION CONTROL SYSTEM:	Four venturi scrubbers serve both furnaces.[25,26]	
MANUFACTURER:	Chemico (all four scrubbers)[26]	
DATE INSTALLED:	Original 3 scrubbers--1966;[25] 4th scrubber--1975[c,25]	
SYSTEM DESCRIPTION:	• All scrubbers arranged in parallel[25] • Design Data (3 original scrubbers):[19,25] 81,069 dscfm per scrubber; 700,000 acfm (design-total) Water flow = 7,000 gpm Δp = 50 in. W.G. L/G = 10 (based on design) • Design Data (4th scrubber):[26] 150,000 acfm at 150°F Water flow = 1,400 gpm Δp = 50 in. H_2O L/G = 9.3 (based on design)	
SECONDARY EMISSION CONTROL SYSTEM:	Baghouse for hot metal transfer area[d,25,26]	

(continued)

TABLE 6 (continued)

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

MANUFACTURER:	Buell[26]
DATE INSTALLED:	1981[26]
SYSTEM DESCRIPTION:	• Exhaust flow = 100,000 acfm at 170°F (rated)[26]

ADDITIONAL COMMENTS:

[a]Membrane tube hood with steam generation cooling; gas cooling by water sprays[2]

[b]Waste heat boilers, quenchers, isolation dampers, and emergency stacks follow each combustion hood.[25]

[c]Fourth scrubber installed to increase hood draft and thereby collect charging and tapping emissions.[25]

[d]Buell baghouse replaced original Carborundum baghouse installed in 1971.[26]

TABLE 7. CF&I STEEL CORP./PUEBLO PLANT IN PUEBLO, CO

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	North[1]	South[1]
STARTUP DATE:	1961[1]	1961[1]
TYPE OF BLOWING MECHANISM:	Top[2]	Top[2]
TYPE OF COMBUSTION HOOD:[a]	Full[2]	Full[2]
STEEL PRODUCTION:		
RATED TONS/DAY:		
AVERAGE TONS/DAY ( ):		
PRIMARY EMISSION CONTROL SYSTEM:	Common ESP serves both furnaces[27,28]	
MANUFACTURER:	United McGill[27]	
DATE INSTALLED:	1961;[27] (Refurbished--1978)[29]	
SYSTEM DESCRIPTION:	• ESP contains four units with a design flow rate = 300,000 acfm at 350°F[29] • Test Data (1978):[15] Inlet--90,600-104,000 dscfm (range) --458-515°F (range) Outlet--151,000-169,000 dscfm (range) --207-289°F (range)	
SECONDARY EMISSION CONTROL SYSTEM:[b]	Three-sided evacuated enclosure per furnace, six roof canopy hoods, and hot metal transfer station ducted to common baghouse.[29,30]	
MANUFACTURER:	Wheelabrator-Frye[29]	
DATE INSTALLED:	1978[28]	
SYSTEM DESCRIPTION:	• Total system flow rate = 540,000 acfm[29] • Baghouse contains five compartments, with 600 Nomex bags per compartment[29] • Positive pressure; requires three fans[28,30] • Test Data (1975):[31] Inlet--606,000 acfm at 80°F (avg.)	

ADDITIONAL COMMENTS:

[a]Paneled plate hoods with gas cooling by water sprays.[2]

[b]The damper located on the reladling station opens only when hot metal is transferred.[28]

TABLE 8. FORD MOTOR CO./RIVER ROUGE WORKS IN DEARBORN, MI

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 1;[1] A[32]	No. 2;[1] B[32]
STARTUP DATE:	1964[33]	1964[33]
TYPE OF BLOWING MECHANISM:	Top[2]	Top[2]
TYPE OF COMBUSTION HOOD:[a]	Full[2]	Full[2]
STEEL PRODUCTION:		
RATED TONS/DAY:	8,380 (one vessel operation)[34]	
AVERAGE TONS/DAY (1977):	7,350 (one vessel operation)[34]	
PRIMARY EMISSION CONTROL SYSTEM:	Common dry ESP serves both furnaces[32,35]	
MANUFACTURER:	Western Precipitator (Type R)[36]	
DATE INSTALLED:	1964;[35] upgraded 1980[37]	
SYSTEM DESCRIPTION:	• 1,500,000 acfm (rated)[2] • Δp = 3 in. W.C. (across entire unit)[36] • 4 ESP units in parallel[35,36] • 8 chambers, 4 fields per chamber[35,36] • Test Data (1977):[38] 780,514 acfm (avg.); gas temp. = 300°F (avg.) • Test Data (1971):[36] Inlet--863,000 acfm at 492°F; Outlet--810,900 acfm at 284°F	
SECONDARY EMISSION CONTROL SYSTEM:[b]	Hot metal transfer and hot metal skimming station to spark arrestor and common baghouse[36,39]	
MANUFACTURER:	Flex Clean[39]	
DATE INSTALLED:	1978[39]	
SYSTEM DESCRIPTION:	• 130,000 acfm at 175°F[39] • Δp = 15 in. H_2O across baghouse[39] • I.D. fan rated at 457-hp[39] • 9 compartments--2,592 acrylic polymer fiber bags total[39] • Cloth area--38,052 sq. ft.[39] • Manual shaker cleaning[39]	

(continued)

TABLE 8 (continued)

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

	• <u>Test Data (1981):</u>[32] 784,000 acfm at 281°F (Vessel A operating only, during oxygen blow period)

ADDITIONAL COMMENTS:

[a]Membrane tube hood with steam generated cooling; gas cooling by water sprays.[2]

[b]Gaw dampers, installed in 1973, were replaced by the three-sided "doghouse" and charge side local hoods in 1981; charge side hood ducted to primary ESP.[3]

TABLE 9. INLAND STEEL CO./INDIANA HARBOR WORKS IN E. CHICAGO, IN

NO. 2 BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 10[1]	No. 20[1]
STARTUP DATE:	1974[1]	1974[1]
TYPE OF BLOWING MECHANISM:	Top[2]	Top[2]
TYPE OF COMBUSTION HOOD:[a]	Partial[2]	Partial[2]
STEEL PRODUCTION:		
RATED TONS/DAY:	6,000 (both furnaces combined)[7]	
AVERAGE TONS/DAY (1976):	5,424 (both furnaces combined)[7]	
PRIMARY EMISSION CONTROL SYSTEM:	Individual high-energy fixed throat venturi scrubbers per furnace[13]	
MANUFACTURER:	Chemico[10]	
DATE INSTALLED:	1974[40]	
SYSTEM DESCRIPTION:	• Separate but identical high-energy, fixed throat venturi scrubbers[13] • Overall system Δp = 51 in. W.G.[13] • One I.D. fan rated at 127,500 acfm at 170°F[40] • Δp = 67 in. W.G.[40] • Scrubber water flow rate = 825 gpm[10] • L/G = 6.5 gpm/1,000 acfm (design)[10,40]	
	• Test Data (1975):[b,41] Without preheating = 59,073 acfm at 118°F With preheating = 63,251 acfm at 183°F	• Test Data (1975):[b,41] Without preheating = 60,801 acfm at 127°F With preheating = 69,057 acfm at 142°F
SECONDARY EMISSION CONTROL SYSTEM:	Local hoods within "doghouse" enclosure drafted to primary scrubbers--(See above description)[13]	

(continued)

TABLE 9 (continued)

NO. 2 BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

MANUFACTURER:	
DATE INSTALLED:	
SYSTEM DESCRIPTION:	• Local hoods include a charging hood, a tapping hood and a wrap-around hood (at side of furnace)[c,13] • Design flow rate for enclosure = 131,000 acfm at 70°F[13]

ADDITIONAL COMMENTS:

[a]Gas cooling by water quencher; quencher is a manually adjustable throat venturi (design Δp = 6 in. W.C.)[2,40]

[b]Testing from beginning of O_2 blow to start of tap without preheating, and testing from start of preheating to start of tap (including HMC) with preheating.[41]

[c]During charging, only charging hood is drafted; during tapping the tapping hood and wrap-around hoods are drafted. During O_2 blows, all three hoods are drafted.[13]

TABLE 10. INLAND STEEL CO./INDIANA HARBOR WORKS IN E. CHICAGO, IN

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 50[1]	No. 60[1]
STARTUP DATE:	1966[1]	1966[1]
TYPE OF BLOWING MECHANISM:[a]	Top[2]	Top[2]
TYPE OF COMBUSTION HOOD:[b]	Full[2]	Full[2]
STEEL PRODUCTION:		
RATED TONS/DAY:	11,200 (both furnaces combined)[7]	
AVERAGE TONS/DAY (1976):	10,174 (both furnaces combined)[7]	
PRIMARY EMISSION CONTROL SYSTEM:	Four venturi scrubbers serve both furnaces.[35]	
MANUFACTURER:	Buell[35]	
DATE INSTALLED:	1966[42]	
SYSTEM DESCRIPTION:	• Four venturi scrubbers in parallel[42] • 500,000 acfm;[42] 484,500 acfm at 128°F[35] • L/G = 10 gpm/1,000 acfm (calculated)[10] • Test Data (1974):[43] 474,000 acfm at 122°F (cooling water on) • 495,000 acfm at 135°F (cooling water off)	
SECONDARY EMISSION CONTROL SYSTEM:	Hot metal transfer station (including desulfurization) drafted to baghouse.[13,40]	
MANUFACTURER:	Peabody[44]	
DATE INSTALLED:	1974[40]	
SYSTEM DESCRIPTION:	• 400,000 acfm at 275°F (rated)[13,40] • Available system Δp = 15 in. W.G.[13] • Test Data (1979):[44] 188,000 acfm at 187°F	

ADDITIONAL COMMENTS:

[a]Steam rings on lance hole help contain O_2 blow emissions[35]

[b]Paneled plate hoods with water cooling; gas cooling by water quenching.[2]

TABLE 11. INTERLAKE INC./RIVERDALE PLANT IN CHICAGO, IL

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 1[1]	No. 2[1]
STARTUP DATE:	1959[16]	1959[16]
TYPE OF BLOWING MECHANISM:	Top[2]	Top[2]
TYPE OF COMBUSTION HOOD:[a]	Full[2]	Full[2]
STEEL PRODUCTION:		
RATED TONS/DAY:	2,400 (both furnaces combined)[7]	
AVERAGE TONS/DAY (1976):	2,451 (both furnaces combined)[7]	
PRIMARY EMISSION CONTROL SYSTEM:	Common ESP serves both furnaces[45]	
MANUFACTURER:	Western Precipitator[b,45]	
DATE INSTALLED:	1980[46]	
SYSTEM DESCRIPTION:	• ESP is divided into three sections, each section rated at 100,000 scfm[45] • One section of ESP handles emissions captured by "scavenger hood" directed to single stack[45] • Remaining two sections of ESP handle primary furnace emissions and are ducted to a separate stack[45] • Test Data (1980):[47] Main stack--185,916 acfm at 198°F (avg.) Secondary stack--71,729 acfm at 127°F (avg.)	
SECONDARY EMISSION CONTROL SYSTEM:	Scavenger hood on tap side of each vessel ducted to primary ESP[45] (see above description)	
MANUFACTURER:		
DATE INSTALLED:		
SYSTEM DESCRIPTION:		

ADDITIONAL COMMENTS:

[a]Paneled plate hood with water cooling; gas cooling by water sprays prior to ESP.[2,48]

[b]Existing Western Precipitator ESP replaced a Research Cottrell ESP in 1980.[45,46]

TABLE 12. JONES & LAUGHLIN STEEL CORP./ALIQUIPPA WORKS IN ALIQUIPPA, PA

NO. 2 BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:[a]	No. 1[49]	No. 2[49]	No. 3[49]
STARTUP DATE:	1968[33]	1968[33]	1968[33]
TYPE OF BLOWING MECHANISM:	Top[2]	Top[2]	Top[2]
TYPE OF COMBUSTION HOOD:[b]	Full[2]	Full[2]	Full[2]
STEEL PRODUCTION:			
RATED TONS/DAY:	9,600 (all three furnaces combined)[7]		
AVERAGE TONS/DAY (1976):	6,700 (all three furnaces combined)[7]		
PRIMARY EMISSION CONTROL SYSTEM:	Common dry ESPs serve all three furnaces[49,50]		
MANUFACTURER:	Research Cottrell and Western Precipitator[49]		
DATE INSTALLED:	1975 and 1968, respectively[51]		
SYSTEM DESCRIPTION:	• Western Precipitator ESP consists of 8 units; units 1 through 6 control furnace Nos. 2 and 3 while the remaining 2 units are combined with the 6 unit Research Cottrell ESP to control furnace Nos. 2 and 1[49] • Maximum flow rate = 1,500,000 acfm at 500°F[50] • Three I.D. fans per ESP discharge to No. 1 (North) stack or No. 2 (South) stack[49] • Test Data (1976):[49] No. 1 stack--388,000 dscfm; temp. = 311°F (avg.) No. 2 stack--334,000 dscfm; temp. = 274°F (avg.)		
SECONDARY EMISSION CONTROL SYSTEM:	Hot metal transfer area ducted to primary control system ESPs (see above description)[c,50]		

ADDITIONAL COMMENTS:

[a]Furnaces are located in the No. 2 BOF shop which replaced the No. 1 BOF shop in 1968.

[b]Paneled plate hood with gas cooling by water sprays; 11 water spray banks.[2,49]

[c]The Research Cottrell ESP units were added in 1975 to increase system capacity to enable handling of reladling emissions.[50]

TABLE 13. JONES AND LAUGHLIN STEEL CORP./CLEVELAND WORKS IN CLEVELAND, OH

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 94[52]	No. 95[52]
STARTUP DATE:	1961[1]	1961[1]
TYPE OF BLOWING MECHANISM:	Top[2]	Top[2]
TYPE OF COMBUSTION HOOD:[a]	Full[2]	Full[2]
STEEL PRODUCTION:		
RATED TONS/DAY:	6,585;[7] 5,520[52] (entire shop)	
AVERAGE TONS/DAY (1976):	6,271 (entire shop)[7]	
PRIMARY EMISSION CONTROL SYSTEM:	Common dry ESPs serve both furnaces[a]	
MANUFACTURER:	Western Precipitator[52]	
DATE INSTALLED:	1961;[53] reconditioned-1975[52]	
SYSTEM DESCRIPTION:	• Two ESPs operate in parallel:[53] North ESP rated at 114,000 dscfm South ESP rated at 225,000 dscfm • Test data (1977):[52] Avg. flow rate = 564,000 acfm at 265°F	
SECONDARY EMISSION CONTROL SYSTEM:		

ADDITIONAL COMMENTS:

[a]Paneled plate hood with gas cooling by water sprays.[2]

TABLE 14. JONES & LAUGHLIN STEEL CORP./INDIANA HARBOR WORKS IN E. CHICAGO, IN

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 1[54]	No. 2[54]
STARTUP DATE:	1970[1,55]	1970[1,55]
TYPE OF BLOWING MECHANISM:	Top[2]	Top[2]
TYPE OF COMBUSTION HOOD:[a]	Full[2]	Full[2]
STEEL PRODUCTION:		
RATED TONS/DAY:	9,985 (both furnaces combined)[55]	
AVERAGE TONS/DAY ( ):		
PRIMARY EMISSION CONTROL SYSTEM:	Common dry ESP serves both furnaces[55,56]	
MANUFACTURER:	Western Precipitator[55,56]	
DATE INSTALLED:	1970[b,53]	
SYSTEM DESCRIPTION:	• 1,285,000 cfm at 600°F (design);[56] 878,261 cfm at 550°F[55] • Δp (design) = 25 in. H_2O; • Δp (operational) = 6-12 in. H_2O[56] • 8 chambers (7 operate normally) 5 fields/chamber designated as A, B, C, D and E[56] • Fields A and B--barbed wire; fields C, D and E--0.1055 shrouded plow steel[56] • Fields A and B--30 gas passages, Fields C, D and E--39 gas passages[56] • Test Data (1980):[54] Hot metal charge: 308,000-344,000 scfm (avg.) Oxygen blow: 380,000 scfm (avg.) Tapping: 160,000 scfm (avg.)	
SECONDARY EMISSION CONTROL SYSTEM:	Hot metal transfer and ladle desulfurization drafted to common baghouse[c,57]	

(continued)

TABLE 14 (continued)

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

MANUFACTURER:	
DATE INSTALLED:	1981[57]
SYSTEM DESCRIPTION:	

ADDITIONAL COMMENTS:

[a]Membrane tube hood with high pressure water cooling; gas cooling by water sprays from 11 banks.[2,56]

[b]ESP revamped--1980.[46]

[c]Prior to baghouse installation, HMT area was controlled by multiclones.[13,55]

TABLE 15. KAISER STEEL/FONTANA WORKS IN FONTANA, CA

NO. 2 BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 5[1]	No. 6[1]
STARTUP DATE:	1978[1]	1978[1]
TYPE OF BLOWING MECHANISM:	Top[2]	Top[2]
TYPE OF COMBUSTION HOOD:[a]	Partial[2]	Partial[2]
STEEL PRODUCTION:		
RATED TONS/DAY:		
AVERAGE TONS/DAY ( ):		
PRIMARY EMISSION CONTROL SYSTEM:	Separate, identical high-energy venturi scrubbers per furnace[58]	
MANUFACTURER:	Baumco[10]	
DATE INSTALLED:	1978[58]	
SYSTEM DESCRIPTION:	• Two stage venturi scrubbers:[59] First stage (quencher) with fixed throat area measuring 20,900 sq cm Second stage (scrubber) with variable throat area measuring 8,750 sq cm • Each scrubber rated at 200,000 cfm using a 5,000-hp fan[60]	
	• Test Data (1978):[58] Scrubber water flow rate = 2,400-2,500 gpm Δp = 65-73 in. H_2O	• Test Data (1978)[58] Scrubber water flow rate = 2,400 gpm Δp = 87-89 in. H_2O
SECONDARY EMISSION CONTROL SYSTEM:	Evacuated "doghouse" enclosure per furnace ducted to common baghouse[b,c,13]	
MANUFACTURER:		
DATE INSTALLED:	1978;[52,59] 1979[46]	
SYSTEM DESCRIPTION:	• 600,500 cfm capacity with 2 fans each rated at 315,000 acfm and 450°F[13] • 12 compartments (2 cells each); positive pressure; with gross cloth area = 360,058 sq ft[13]	

(continued)

TABLE 15 (continued)

NO. 2 BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

	• Gross A/C = 1.75:1; net A/C = 2:1, with 3 cells offline[13] • 7 fiberglass bags treated with silicon, graphite and Teflon[13] • Reverse air cleaning mechanism[13]

ADDITIONAL COMMENTS:

[a]Membrane water cooled hoods.[60]

[b]Hot metal transfer (HMT) and skimming operations are ducted to the secondary control baghouse.[13]

[c]The secondary baghouse does not permit oxygen blowing, turndowns, tapping, or slagging on one vessel while the second vessel is charged, and does not permit HMT, skimming, or hot metal charging on one vessel while the second vessel is being charged.[13]

TABLE 16. McLOUTH STEEL CORP./TRENTON WORKS IN TRENTON, MI

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:[a]	No. 1[1]	No. 2[1]	No. 3[1]
STARTUP DATE:	1958[1] (1960)[61]	1958[1,61]	1958[61]
TYPE OF BLOWING MECHANISM:	Top[2]	Top[2]	Top[2]
TYPE OF COMBUSTION HOOD:[b,c]	Full[2]	Full[2]	Full[2]
STEEL PRODUCTION:			
RATED TONS/DAY:	6,000 (all five furnaces combined)[7]		
AVERAGE TONS/DAY (1976):	5,502 (all five furnaces combined)[7]		
PRIMARY EMISSION CONTROL SYSTEM:	High efficiency wet scrubber--disintegrator per furnace[62,63]		
MANUFACTURER:	Thiessen (all 5 systems)[63,64]		
DATE INSTALLED:	No. 1--1960;[61] Nos. 2 and 3--1958;[61] Nos. 4 and 5--1969[61]		
SYSTEM DESCRIPTION:	• Each control system includes a settling chamber, wet centrifugal separator, and high efficiency wet scrubber, mist eliminator, and an I.D. fan rated at 60,000 scfm[68] • I.D. fans for systems on furnace Nos. 2 and 3 were installed in 1960; no induced draft was used on these systems prior to 1960[61] • Nos. 1, 2 and 3 control systems exhaust via a common stack; Nos. 4 and 5 control systems exhaust via a common stack[61] • Test Data (1981):[63] Outlet stack for Nos. 1, 2 and 3: Avg. flow = 134,525 acfm Avg. temp. = 112°F		
SECONDARY EMISSION CONTROL SYSTEM:	"Mark Hoods" on all five furnaces[63,65]		
MANUFACTURER:			
DATE INSTALLED:			

(continued)

TABLE 16 (continued)

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

SYSTEM DESCRIPTION:	• Movable hoods on furnace charge side[61] • No tapping control; roof is completely sealed[61]
ADDITIONAL CONTROL SYSTEMS:	Two hot metal transfer areas ducted to common baghouse[62]
MANUFACTURER:	
DATE INSTALLED:	
SYSTEM DESCRIPTION:	• Spark arrestor prior to baghouse inlet[62] • Baghouse exhausts within BOF shop[62]

(continued)

TABLE 16 (continued)

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:[a]	No. 4[1]	No. 5[1]
STARTUP DATE:	1969[1,61]	1969[1,61]
TYPE OF BLOWING MECHANISM:	Top[2]	Top[2]
TYPE OF COMBUSTION HOOD:[b,c]	Full[2]	Full[2]
STEEL PRODUCTION:		
RATED TONS/DAY: AVERAGE TONS/DAY (1976):	See previous pages[7]	
PRIMARY EMISSION CONTROL SYSTEM:		
MANUFACTURER: DATE INSTALLED: SYSTEM DESCRIPTION:	See previous pages[61,62,63,64]	
SECONDARY EMISSION CONTROL SYSTEM:		
MANUFACTURER: DATE INSTALLED: SYSTEM DESCRIPTION:	See previous pages[61,63,65]	
ADDITIONAL CONTROL SYSTEMS:		
MANUFACTURER: DATA INSTALLED: SYSTEM DESCRIPTION:	See previous pages[62]	

ADDITIONAL COMMENTS:

[a]All five BOF vessels and two EAF vessels are located in the same melt shop.[62]

[b]Hoods are water cooled.[64]

[c]Primary exhaust hoods are movable.[62]

TABLE 17. NATIONAL STEEL CORP./GREAT LAKES STEEL DIVISION IN ECORSE, MI

NO. 1 BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA[a]

FURNACE DESIGNATION:	No. 21[66]	No. 22[66]
STARTUP DATE:	1962[1]	1962[1]
TYPE OF BLOWING MECHANISM:	Top[2]	Top[2]
TYPE OF COMBUSTION HOOD:[b]	Full[2]	Full[2]
STEEL PRODUCTION:		
RATED TONS/DAY:	9,390 (both furnaces combined)[c,66]	
AVERAGE TONS/DAY ( ):		
PRIMARY EMISSION CONTROL SYSTEM:	Canopy hoods per furnace, ducted to common dry ESP[2]	
MANUFACTURER:	Koppers[67]	
DATE INSTALLED:		
SYSTEM DESCRIPTION:	• 1,260,000 acfm[2] • 3,000-hp fan[2]	
SECONDARY EMISSION CONTROL SYSTEM:	Canopy hoods at hot metal transfer area to multiclones[d,68]	
MANUFACTURER:	AAF[68]	
DATE INSTALLED:		
SYSTEM DESCRIPTION:	• Flow rate (design) = 106,000 acfm at 88°F[69] • Treadwell HMT operation[68] • Test Data (1976):[68] 71,879-74,122 acfm, 134-138°F (avg.)	

ADDITIONAL COMMENTS:

[a]Shop presently idle unless No. 2 shop is down for an extended period of time.[70]

[b]Paneled plate hoods with steam generation cooling; gas cooling by water sprays.[2]

[c]Estimated production figure.[66]

[d]Planning to duct multiclone outlet into primary ESP inlet rather than ESP outlet as previously planned.[69]

TABLE 18. NATIONAL STEEL CORP./GREAT LAKES STEEL DIVISION IN ECORSE, MI

NO. 2 BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 25[66]	No. 26[66]
STARTUP DATE:	1970[1]	1970[1]
TYPE OF BLOWING MECHANISM:	Top[2]	Top[2]
TYPE OF COMBUSTION HOOD:[a]	Full[2]	Full[2]
STEEL PRODUCTION:		
RATED TONS/DAY:	7,050 (both furnaces combined)[b,66]	
AVERAGE TONS/DAY ( ):		
PRIMARY EMISSION CONTROL SYSTEM:	Canopy hoods per furnace, ducted to common dry ESP[2]	
MANUFACTURER:	Koppers[36]	
DATE INSTALLED:	1970[71]	
SYSTEM DESCRIPTION:	• 650,000 acfm[2] • 60,000 scfm of dilution air added approximately 10 ft above vessel mouth during oxygen blow period[71] • Fan hp = 1,600[2] • 6 chambers, 4 fields per chamber[36] • Δp = 2.34 in H_2O (design)[71] • Δp = 2.4-2.5 in. H_2O (actual)[71] • Test Data (1980):[72] 649,000 acfm at 260°F 661,000 acfm at 260°F 607,000 acfm at 288°F • Test Data (1973):[36] 746,000 acfm at 505°F (inlet) 746,000 acfm at 325°F (outlet)	
SECONDARY EMISSION CONTROL SYSTEM:[c]	Hot metal transfer and skimmer station to common baghouse[71]	

ADDITIONAL COMMENTS:

[a]Membrane tube hood with water cooling; gas cooling by water sprays (series of five banks).[2,71]

[b]Estimated production figure.[66]

[c]"Garage door devices" retain tapping emissions for capture by the primary hood.[71]

TABLE 19. NATIONAL STEEL CORP./GRANITE CITY STEEL DIVISION IN GRANITE CITY, IL

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 1[1]	No. 2[1]
STARTUP DATE:	1967[1,2]	1967[1,2]
TYPE OF BLOWING MECHANISM:	Top[a,2]	KMS[b,2]
TYPE OF COMBUSTION HOOD:[c]	Full[2]	Full[2]
STEEL PRODUCTION:		
RATED TONS/DAY:	6,900 (both furnaces combined)[73,74]	
AVERAGE TONS/DAY (1978):	5,048 (both furnaces combined)[74]	
PRIMARY EMISSION CONTROL SYSTEM:	Common dry ESP serves both furnaces[74,75]	
MANUFACTURER:	Koppers[75,76]	
DATE INSTALLED:	1968[75]	
SYSTEM DESCRIPTION:	• Rated at 800,000-810,000 acfm[74,75] • Control system consists of three double-chamber ESP's[75,77] • Each ESP contains the following:[77] 68 gas channels 4 electrical fields 2 rows per field of 18 gauge mild steel flat plates • Each field has effective collection area of 78,336 sq ft • Three I.D. fans operate in parallel, each with 1,000-hp motor rated at 360,000 cfm[77] • Test Data (1981):[78] 392,854-472,681 acfm (range) 237-273°F (range)	
SECONDARY EMISSION CONTROL SYSTEM:[d]	Hot metal transfer and external desulfurization[75,79]	
MANUFACTURER:	Carborundum[75,80]	AAF[75,76]
DATE INSTALLED:	1978[75]	1973[75]

(continued)

TABLE 19 (continued)

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

SYSTEM DESCRIPTION:	• Rated at 100,000 acfm[80] • 8 compartments[80] • A/C = 1.1:1[80] • Nomex bags with 93,356 sq ft of filter area	• 300,000 acfm[75] • 93 kW power requirement[75]

ADDITIONAL COMMENTS:

[a]Furnace No. 1 will be converted to KMS (Klockner-Maxhutte-Scrap) steelmaking process when furnace No. 2 becomes operational.[79]

[b]Furnace No. 2 converted to KMS but not operational yet.[79]

[c]Water cooled combustion hood.[75]

[d]Secondary emissions will be controlled by "doghouse" enclosures per furnace ducted to primary ESP; secondary emissions are currently ducted to primary ESP.[73,75]

TABLE 20. NATIONAL STEEL CORP./WEIRTON STEEL DIVISION IN WEIRTON, WV

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 6[81]	No. 7[81]
STARTUP DATE:	1967[1]	1967[1]
TYPE OF BLOWING MECHANISM:	Top[2]	Top[2]
TYPE OF COMBUSTION HOOD:[a,b]	Full[2]	Full[2]
STEEL PRODUCTION:		
RATED TONS/DAY:	11,690;[7] 13,570[82] (both furnaces combined)	
AVERAGE TONS/DAY (1976):	9,892 (both furnaces combined)[7]	
PRIMARY EMISSION CONTROL SYSTEM:	Common high-energy variable throat venturi scrubber serves both furnaces[36,81]	
MANUFACTURER:	Chemico[81]	
DATE INSTALLED:	1967[81]	
SYSTEM DESCRIPTION:	• Dual scrubber system--common header after waste heat boiler (for each furnace) to crossover pipe; flow split into 2 sections to separate venturis, and common exhaust stack[81] • Scrubber Design Data:[36] Flow = 225,000 scfm with Δp = 32 in. W.C. Inlet temperature = 850°F (prior to quencher); outlet temperature = 140°F • 420,000 acfm at 140°F or 369,000 scfm (design for entire system)[81] • Water flow = 4,200 gpm[81] • L/G = 10 gpm/acfm (calculated)[81] • Δp = 44 in. H_2O (design)[81] • Test Data (1979):[81] Exhaust flow = 388,609-401,845 acfm at 127.5-150.8°F	
SECONDARY EMISSION CONTROL SYSTEM:	Hot metal transfer area to baghouse[c,36,82]	

(continued)

TABLE 20 (continued)

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

MANUFACTURER:	Amerclone[36]
DATE INSTALLED:	1967[83]
SYSTEM DESCRIPTION:	• Flow = 83,000 scfm (est.)[36] • Temperature = 180°F (inlet est.); 140°F (outlet est.)[36] • A/C = 3.9:1[36] • Δp = 8 in. W.C.

ADDITIONAL COMMENTS:

[a]Membrane tube hood with steam generation.[2]

[b]Waste heat boilers (for each furnace) generate steam during the O_2 blow period.[81]

[c]Baghouse reportedly is inoperable most of the time; new consent order requires new control device for hot metal transfer area.[83]

TABLE 21. REPUBLIC STEEL CORP./BUFFALO DISTRICT IN BUFFALO, NY

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 1[1]	No. 2[1]
STARTUP DATE:	1970[1]	1970[1]
TYPE OF BLOWING MECHANISM:	Top[2]	Top[2]
TYPE OF COMBUSTION HOOD:[a]	Full[2]	Full[2]
STEEL PRODUCTION:		
RATED TONS/DAY:	4,356 (both furnaces combined)[7]	
AVERAGE TONS/DAY (1976):	2,680 (both furnaces combined)[7]	
PRIMARY EMISSION CONTROL SYSTEM:	Common dry ESP serves both furnaces[84]	
MANUFACTURER:	Western Precipitator[21] (Wheelabrator Corp.)[24]	
DATE INSTALLED:	1970[84]	
SYSTEM DESCRIPTION:	• Design flow rate = 475,000 scfm[84] • Total plate area = 130,000 sq ft[84] • 4 identical, parallel compartments with 2 fields per compartment[84] • Each compartment contains 32 frames with 60 discharge wires per furnace[84] • Two fans at 700-hp each[84] • Single stack exhaust[84] • Test Data (1975):[84] 245,450 scfm at 260°F	
SECONDARY EMISSION CONTROL SYSTEM:[b]	Hot metal transfer station ducted to baghouse[24]	
MANUFACTURER:	Pangborn[24]	
DATE INSTALLED:	1970[24]	
SYSTEM DESCRIPTION:	• Design flow rate = 81,000 scfm[24] • Δp = 6 in. H_2O[24] • Total fan hp = 400[24]	

ADDITIONAL COMMENTS:

[a]Water cooled combustion hood; gas cooling by water sprays.[2]

[b]Tapside enclosures installed on both vessels (1980) for tapping emissions control. Drafted to primary control system ESP.[24]

TABLE 22. REPUBLIC STEEL CORP./CHICAGO DISTRICT IN CHICAGO, IL

NO. 2 BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 1[1]	No. 2[1]
STARTUP DATE:	1977[1,85]	1977[1,85]
TYPE OF BLOWING MECHANISM:	Bottom[2]	Bottom[2]
TYPE OF COMBUSTION HOOD:[a]	Partial[2]	Partial[2]
STEEL PRODUCTION:		
RATED TONS/DAY:		
AVERAGE TONS/DAY ( ):		
PRIMARY EMISSION CONTROL SYSTEM:	Separate, identical high-energy venturi scrubber per furnace[85]	
MANUFACTURER:	Baumco[46]	
DATE INSTALLED:	1977[85]	
SYSTEM DESCRIPTION:	• 424,000 acfm (total exhaust rate of two systems)[86] • Δp = 60 in. H_2O (each scrubber)[86] • One 6,000-hp I.D. fan; Δp = 76-86 in. W.C. (each scrubber)[86] • 2,500 gpm water (inlet)[86] • Test Data (1977):[87] 101,903-106,085 acfm at 139-184°F	
SECONDARY EMISSION CONTROL SYSTEM:	Evacuated "doghouse" enclosure drafted by both primary scrubber systems[85] (see above description)	
MANUFACTURER:		
DATE INSTALLED:		
SYSTEM DESCRIPTION:	• Local hood on charge side of vessel[85] • Design evacuation rate = 370,000 acfm[13] • Quenchers bypassed during charging and tapping[85] • Test Data (1977):[87] 197,508-205,895 acfm at 118-125°F	

(continued)

TABLE 22 (continued)

NO. 2 BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

	• Test Data (1978):[88] Charging--268,000-463,000 dscfm Temp.--168-243°F Tapping--106,000-196,500 dscfm Temp.--173-313°F

ADDITIONAL COMMENTS:

[a]Gas cooling by two venturi quenchers operated in parallel; three section combustion hood.[86]

TABLE 23. REPUBLIC STEEL CORP./CLEVELAND DISTRICT IN CLEVELAND, OH

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 1[1]	No. 2[1]
STARTUP DATE:	1966[36,89]	1966[36,89]
TYPE OF BLOWING MECHANISM:	Top[2]	Top[2]
TYPE OF COMBUSTION HOOD:	Partial[2]	Partial[2]
STEEL PRODUCTION:		
RATED TONS/DAY:	9,800;[7] 9,400[89] (entire shop)	
AVERAGE TONS/DAY (1976):	7,840 (entire shop)[7]	
PRIMARY EMISSION CONTROL SYSTEM:	Separate, identical IRSID-CAFL scrubber system per furnace[90]	
MANUFACTURER:	American Air Filter[91]	
DATE INSTALLED:	1977[91]	
SYSTEM DESCRIPTION:	• <u>Test Data (1977-1978):</u>[92] 70,076-89,088 acfm • <u>Test Data (1977):</u>[90] 79,076 acfm at 146.1°F	• <u>Test Data (1977-1978):</u>[92] 66,653-84,722 acfm • <u>Test Data (1977):</u>[90] 78,521 acfm at 130°F
SECONDARY EMISSION CONTROL SYSTEM:[a,b]	Furnace enclosure--hoods on each vessel and hot metal transfer area, ducted to common dry ESP[91,93]	
MANUFACTURER:	Koppers (original 3 units), and Western Precipitator (additonal 1 unit)[93]	
DATE INSTALLED:	1966--Koppers units[93] 1974--Western Precipitator unit[93]	
SYSTEM DESCRIPTION:		

- Series of hoods located within the furnace enclosure, and scavenger hoods in the building trusses collect secondary emissions[91,93]
- Design evacuation rate (enclosure hoods) = 300,000 acfm at 100°F[13]
- Charging aisle scavenger hoods designed for 100,000 acfm at 100°F[13]

(continued)

TABLE 23 (continued)

- Design Data (Western Precipitator Unit):[93]
  375,500 acfm at 550°F,
  Δp = 10 in. VWC (negative)
  2 chamber, 5 field ESP unit
  Fields identified: "A", "B", "C", "D", and "E"
  Discharge electrodes: 560 barbed wires for field "A"; 2,496 round wires for fields "B" through "E."
  Collecting surface is unitized modular finned plate
- Design Data (Koppers Precip. Units):[93]
  Three, 4 field, double chamber units
  Total collecting surface area = 139,536 ft^2
  Discharge electrodes: 4,752 barbed wires and 1,584 square wires
  Total design flow rate = 1,000,000 acfm at 550°F
- Test Data (1979):[94]
  Inlet--292,900-400,700 dscfm (during hot metal charging--HMC)
  Outlet--410,000-788,800 dscfm (during HMC)
  Inlet--290,200-410,700 dscfm (during tapping)
  Outlet--450,900-815,000 dscfm (during tapping)

ADDITIONAL COMMENTS:

[a]These ESP units were the original primary emission control system from 1966-1977.[89,91]

[b]Republic Steel is in the preliminary stages of removing these ESP units and replacing them with a baghouse.[95]

TABLE 24. REPUBLIC STEEL CORP./SOUTHERN DISTRICT, GULFSTEEL WORKS IN GADSDEN, AL

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 1[96]	No. 2[96]
STARTUP DATE:	1965[1]	1965[1]
TYPE OF BLOWING MECHANISM:	Top[2]	Top[2]
TYPE OF COMBUSTION HOOD:[a]	Full[2]	Full[2]
STEEL PRODUCTION:		
RATED TONS/DAY:	4,500 (both furnaces combined)[7]	
AVERAGE TONS/DAY (1976):	3,087 (both furnaces combined)[7]	
PRIMARY EMISSION CONTROL SYSTEM:[b]	Common dry ESP serves both furnaces[13,96]	
MANUFACTURER:	Koppers[97]	
DATE INSTALLED:	1964[97]	
SYSTEM DESCRIPTION:	• Two double-chambered ESPs; four fields per chamber[96] • Flow rate = 700,000 acfm at 550°F (design)[96] • Three I.D. fans (with a fourth on standby) required, each rated at 240,000 acfm at 500°F and 15 in. W.G.[96] • Evacuation rate during oxygen blow period = 600,000 acfm at approximately 16 in. W.G. (normally)[96]	
SECONDARY EMISSION CONTROL SYSTEM:	Gaw damper for hot metal charging (HMC) and a fume canopy for tapping on each furnace, drafted by primary control system ESP[96]	
MANUFACTURER:		
DATE INSTALLED:	Gaw damper and fume canopies installed between 1977 and 1979[96,97]	
SYSTEM DESCRIPTION:	• Gaw damper closes off approximately 50% of primary hood face during HMC[13] • Fume canopies contain tapping fumes to allow evacuation through primary exhaust hood[13]	

(continued)

TABLE 24 (continued)

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

	• Evacuation rate during HMC = 600,000 acfm at approximately 170°F[13] • Evacuation rate during tapping, slagging and turndowns = 350,000 acfm at 170°F[13]

ADDITIONAL COMMENTS:

[a]Paneled plate hood with gas cooling by water sprays.[2]

[b]Only one furnace operates at a time.[97]

TABLE 25. REPUBLIC STEEL CORP./MAHONING VALLEY DISTRICT IN WARREN, OH

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 1[1]	No. 2[1]
STARTUP DATE:	1965[1]	1965[1]
TYPE OF BLOWING MECHANISM:	Top[2]	Top[2]
TYPE OF COMBUSTION HOOD:[a]	Full[2]	Full[2]
STEEL PRODUCTION:		
RATED TONS/DAY:	7,120 (entire shop)[7]	
AVERAGE TONS/DAY (1976):	5,493 (entire shop)[7]	
PRIMARY EMISSION CONTROL SYSTEM:	Common dry ESP serves both furnaces[98,99]	
MANUFACTURER:	Koppers and Wheelabrator-Frye[98,100]	
DATE INSTALLED:	1965;[100] Upgraded-1980[98,100]	
SYSTEM DESCRIPTION:	• System upgraded 50% in 1980[100] • ESP contained 4 chambers prior to upgrading--currently contains 6 chambers with steam accumulators for improved efficiency.[98] • Design flow rate: 720,000 acfm with three fans operating (fourth fan on standby)[101] • Test data (1981):[102] 587,100 acfm at 212°F	
SECONDARY EMISSION CONTROL SYSTEM:[b]	Gaw damper[98,99]	Gaw damper[98,99]
DATE INSTALLED:	1979[99]	1979[99]

ADDITIONAL COMMENTS:

[a]Paneled plate hood with gas cooling by water sprays.[2]

[b]Installation of "baffle plates" for tapping control in future.[101]

TABLE 26. SHARON STEEL CORP./STEEL DIVISION IN FARRELL, PA

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:[a,b]	No. 3[103,104]
STARTUP DATE:	1974[1,104]
TYPE OF BLOWING MECHANISM:	Top[2]
TYPE OF COMBUSTION HOOD:	Full[2]
STEEL PRODUCTION:	
RATED TONS/DAY:	
AVERAGE TONS/DAY ( ):	
PRIMARY EMISSION CONTROL SYSTEM:[c]	Variable throat venturi scrubber[105]
MANUFACTURER:	Baumco[105]
DATE INSTALLED:	1972[103]
SYSTEM DESCRIPTION:	• In series: Water cooled exhaust duct, quencher venturi, scrubber, cyclone separator, I.D. fan, stack[105] • I.D. fan rated at 300,000 cfm[105] • Δp (quencher venturi) = 7 in. W.G.[105] • Δp (venturi throat) = 55 in. W.G.[105] • 110,000 acfm at Δp = 58 in. W.G.[103] • Water flow = 6,600 gpm[105] • Test Data (1978):[106] 172,105 acfm at 146°F (run No. 1) • 169,851 acfm at 155°F (run No. 2) Test Data (1976):[105] 209,600 scfm; temp. = 144°F (avg.)
SECONDARY EMISSION CONTROL SYSTEM:	Hot metal transfer area to baghouse[104]
MANUFACTURER:	Pangborn[104]
DATE INSTALLED:	1980[d,104]
SYSTEM DESCRIPTION:	Baghouse rated at 90,800 acfm[104]

ADDITIONAL COMMENTS:

[a]Shop originally contained two "Kaldo" vessels (Nos. 1 and 2) which were taken out of service in 1974 and 1980, respectively.[104]

[b]A new BOF vessel has been acquired to replace the No. 2 "Kaldo" and is scheduled to be operational in 1981-1982.[104]

[c]The shop will operate one vessel at a time once second BOF is installed, using existing scrubber control system.[104]

[d]Control system was previously used at the Alan Wood Steel BOF shop.[104]

TABLE 27. UNITED STATES STEEL CORP./EDGAR THOMSON-IRVIN WORKS IN BRADDOCK, PA

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	R[1]	L[1]
STARTUP DATE:	1972[1]	1972[1]
TYPE OF BLOWING MECHANISM:	Top[1]	Top[1]
TYPE OF COMBUSTION HOOD:[a]	Full[2]	Full[2]
STEEL PRODUCTION:		
RATED TONS/DAY:	7,750 (both furnaces combined)[7]	
AVERAGE TONS/DAY (1976):	7,283 (both furnaces combined)[7]	
PRIMARY EMISSION CONTROL SYSTEM:	Three common venturi scrubbers serve both furnaces.[107]	
MANUFACTURER:	AAF[107,108]	
DATE INSTALLED:	1972[46,107]	
SYSTEM DESCRIPTION:	• Variable throat scrubbers operated in parallel[107] • Each furnace has a gas quencher[107] • Design flow = 223,000 dscfm[46] • 2 I.D. fans (1 fan is a spare)[107] • Fan hp = 4,600[109] • Test Data (1974):[109] Flow range = 176,500-248,500 scfm • (wet) Test Data (1972):[107] Δp = 65-76 in. H^2O	
SECONDARY EMISSION CONTROL SYSTEM:[b]	Hot metal transfer to baghouse[110]	
MANUFACTURER:		
DATE INSTALLED:	1975[111]	
SYSTEM DESCRIPTION:	• Movable hood between pouring spouts[110] • 14 module baghouse[110] • 150,100 scfm (avg. observed); 130,000 scfm (total)[110] • Test Data (1978):[110] 151,000 acfm (avg.)	

ADDITIONAL COMMENTS:

[a]Paneled plate hoods with water cooling; gas cooling by water spray.[2]

[b]BOF secondary emissions control by a Carborundum baghouse, planned for Dec. 1982.[111]

TABLE 28. UNITED STATES STEEL CORP./SOUTH WORKS IN CHICAGO, IL

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	H[1]	J[1]	K[1]
STARTUP DATE:	1969[33]	1969[33]	1969[33]
TYPE OF BLOWING MECHANISM:	Top[2]	Top[2]	Top[2]
TYPE OF COMBUSTION HOOD:[a]	Full[2]	Full[2]	Full[2]
STEEL PRODUCTION:			
RATED TONS/DAY:	11,200 (all three furnaces combined)[7]		
AVERAGE TONS/DAY (1976):	7,091 (all three furnaces combined)[7]		
PRIMARY EMISSION CONTROL SYSTEM:	Common scrubber system serves three furnaces[112]		
MANUFACTURER:	AAF[10]		
DATE INSTALLED:	1969[79]		
SYSTEM DESCRIPTION:	• Exhaust hoods ducted to a manifold, to a single pre-scrubber, then a single duct from pre-scrubber branches to 3 separate, identical scrubbers operating in parallel.[112] • Design flow rate = 500,000 acfm (total)[17] • Scrubbers designated as "A," "B" and "C."[112] • <u>Test Data (1977)</u>:[112] Total (average) flow of system = 425,000 acfm Scrubber A--138,500 acfm (avg.) Scrubber B--150,300 acfm (avg.) Scrubber C--135,900 acfm (avg.)		
SECONDARY EMISSION CONTROL SYSTEM:[b]	Hot metal transfer and mixing station ducted to baghouse[17]		
MANUFACTURER:			
DATE INSTALLED:	1979[79]		
SYSTEM DESCRIPTION:	• Negative pressure, 12 compartments[17] • One I.D. fan per compartment[17] • Shaker type cleaning mechansim[79]		

ADDITIONAL COMMENTS:

[a]Paneled plate hood with water cooling; gas cooling by water quencher.[2]

[b]Gaw dampers and tapping deflectors have been installed. Gaw dampers are not used; have met compliance by pouring hot metal at slow rate.[17]

TABLE 29. UNITED STATES STEEL CORP./DUQUESNE WORKS IN DUQUESNE, PA

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 1[1] (A)[111]	No. 2[1] (B)[111]
STARTUP DATE:	1963[1]	1963[1]
TYPE OF BLOWING MECHANISM:	Top[2]	Top[2]
TYPE OF COMBUSTION HOOD:[a]	Full[2]	Full[2]
STEEL PRODUCTION:		
RATED TONS/DAY:	7,500 (both furnaces combined)[7]	
AVERAGE TONS/DAY (1976):	6,109 (both furnaces combined)[7]	
PRIMARY EMISSION CONTROL SYSTEM:	Common venturi scrubber serves both furnaces[111]	
MANUFACTURER:	AAF[10]	
DATE INSTALLED:	1968[b,111]	
SYSTEM DESCRIPTION:	• Scrubber design data:[111] 200,000 scfm; p = 57 in. H_2O • Test Data (1978):[113] Vessel No. 1: 105,100-113,400 dscfm; Δp = 37.7-39.5 in. H_2O Vessel No. 2: 78,900-82,200 dscfm; Δp = 43.2-45.1 in H_2O	
SECONDARY EMISSION CONTROL SYSTEM:	Unevacuated "doghouse" enclosures per furnace, drafted to primary control system scrubber [111]	
MANUFACTURER: DATE INSTALLED: SYSTEM DESCRIPTION:	(See above system description)	

ADDITIONAL COMMENTS:

[a]Membrane tube hood with water cooling.[2]

[b]Scrubber upgraded in 1975.[111]

TABLE 30. UNITED STATES STEEL CORP./FAIRFIELD WORKS IN FAIRFIELD, AL

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	U[1]	X[1]
STARTUP DATE:	1974[2,33]	1974[2,33]
TYPE OF BLOWING MECHANISM:	Bottom[2]	Bottom[2]
TYPE OF COMBUSTION HOOD:	Partial[2]	Partial[2]
STEEL PRODUCTION:		
RATED TONS/DAY:	7,400 (furnaces U and X combined)[7]	
AVERAGE TONS/DAY (1976):	6,198 (furnaces U and X combined)[7]	
PRIMARY EMISSION CONTROL SYSTEM:	Separate, identical scrubbers per furnace[114]	
MANUFACTURER:	Baumco (both scrubbers)[46]	
DATE INSTALLED:	1974;[15] 1976[46] (both scrubbers)	
SYSTEM DESCRIPTION:	• Test Data (1974):[15,115] 67,900-69,200 scfm (range) 140-150°F (range) p = 68-71 in. H_2O (range) 220-225 gpm, (scrubber water)	
SECONDARY EMISSION CONTROL SYSTEM:	Secondary emissions captured by hoods within "doghouse" enclosures ducted to primary scrubber system (see above system description)[a,b,114]	
MANUFACTURER:		
DATE INSTALLED:		
SYSTEM DESCRIPTION:		

(continued)

TABLE 30 (continued)

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	C[51]
STARTUP DATE:	1978[114]
TYPE OF BLOWING MECHANISM:	Bottom[2]
TYPE OF COMBUSTION HOOD:	Partial[2]
STEEL PRODUCTION:	
RATED TONS/DAY:	
AVERAGE TONS/DAY ( ):	
PRIMARY EMISSION CONTROL SYSTEM:	Venturi scrubber[46,116]
MANUFACTURER:	Baumco[46]
DATE INSTALLED:	1978[46]
SYSTEM DESCRIPTION:	• Design Parameters:[117] Flow rate = 177,900 acfm at 160°F Δp (quencher) = 10 in. H_2O Δp (venturi) = 55 in. H_2O • Test Data (1978):[15] 76,300 dscfm at 163°F; 92,700 dscfm at 158°F
SECONDARY EMISSION CONTROL SYSTEM:	Unevacuated "doghouse" and charge-side canopy hood ducted to a baghouse[118]
MANUFACTURER:	Carborundum[114]
DATE INSTALLED:	1980[114]
SYSTEM DESCRIPTION:	• Canopy hood--30 ft long x 3 ft wide[114] • Baghouse design flow = 370,000 acfm at 200°F[114] • Draft for canopy hood = 440,000 acfm[118] • Baghouse also serves south hot metal mixer area via a hood[118]

ADDITIONAL COMMENTS:

[a]Enclosure doors and secondary hoods for Furnace U, were originally installed December 1978; doors replaced and hoods moved inside enclosure in January 1979.[114]

[b]Enclosure doors and secondary hoods for Furnace X, (located inside of enclosure) installed in February 1974.[114]

TABLE 31. UNITED STATES STEEL CORP./GARY WORKS IN GARY, IN

NO. 1 BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	Mary[119]	Evelyn[119]	Daisy[119]
STARTUP DATE:	1965[1]	1965[1]	1965[1]
TYPE OF BLOWING MECHANISM:	Top[2]	Top[2]	Top[2]
TYPE OF COMBUSTION HOOD:	Full[2]	Full[2]	Full[2]
STEEL PRODUCTION:			
RATED TONS/DAY:	12,400 (all three furnaces combined)[7]		
AVERAGE TONS/DAY (1976):	10,762 (all three furnaces combined)[7]		
PRIMARY EMISSION CONTROL SYSTEM:	Common venturi scrubber system serves all three furnaces[36,119]		
MANUFACTURER:	Chemico[36]		
DATE INSTALLED:	1965[b,36]		
SYSTEM DESCRIPTION:	• Two variable throat venturi scrubbers operate in parallel[119] • 1,161,000 dscfm at 2975°F (total design)[119] • Δp = 50-80 in. H_2O[119] • 5,500-hp fan[119] • Test Data (1981):[120] 208,000 dscfm at 73°F • Test Data (1979):[36] 212,900 acfm (east inlet) Δp = 62-68; 186, 900 acfm (west inlet) Δp = 62-64		
SECONDARY EMISSION CONTROL SYSTEM:	Gaw damper and tapping enclosure per furnace drafted to primary scrubber system.[119]		
MANUFACTURER:	(See above description)		
DATE INSTALLED:			
SYSTEM DESCRIPTION:	• Gaw damper for charging installed 1978/1979[119] • Tapping enclosure installed 1977[117]		

ADDITIONAL COMMENTS:

[a]Water cooled combustion hood; 1970--complete replacement of furnace hoods.[119]

[b]New fans installed in 1978, replaced original 2,500-hp fans; new venturi's installed in 1979.[119]

TABLE 32. UNITED STATES STEEL CORP./GARY WORKS IN GARY, IN

NO. 2 BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	T[1]	W[1]	X[1]
STARTUP DATE:	1973[1]	1973[1]	1973[1]
TYPE OF BLOWING MECHANISM:	Bottom[2]	Bottom[2]	Bottom[2]
TYPE OF COMBUSTION HOOD:[a]	Partial[2]	Partial[2]	Partial[2]
STEEL PRODUCTION:			
RATED TONS/DAY:	15,000 (all three furnaces combined)[7]		
AVERAGE TONS/DAY (1976):	11,875 (all three furnaces combined)[7]		
PRIMARY EMISSION CONTROL SYSTEM:[b]	Twin scrubber system serves all three furnaces[121,122]		
MANUFACTURER:	AAF[122]		
DATE INSTALLED:	1973[122]		
SYSTEM DESCRIPTION:	Entire system consists of: • Two triple-throat venturi scrubbers each with two I.D. fans designed for 202,000 dscfm[121] • <u>Test Data (1975)</u>:[123] 212,900 dscfm (east stack) 186,900 dscfm (west stack)		
SECONDARY EMISSION CONTROL SYSTEM:	Unevacuated "doghouse" drafted by primary scrubber system[121]		
MANUFACTURER:	(See above description)		
DATE INSTALLED:			
SYSTEM DESCRIPTION:			

ADDITIONAL COMMENTS:

[a]Conventional water cooled combustion hood; gas cooling by water sprays.[2]

[b]Gas cleaning system designed for two furnaces operating on O_2 blow.[121]

TABLE 33. UNITED STATES STEEL CORP./LORAIN--CUYAHOGA WORKS IN LORAIN, OH

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	East[124] ("L")[36]	West[124] ("N")[36]
STARTUP DATE:	1971[1]	1971[1]
TYPE OF BLOWING MECHANISM:	Top[2]	Top[2]
TYPE OF COMBUSTION HOOD:[a]	Partial[2]	Partial[2]
STEEL PRODUCTION:		
RATED TONS/DAY:	7,700 (entire shop)[7]	
AVERAGE TONS/DAY (1976):	3,086 (entire shop)[7]	
PRIMARY EMISSION CONTROL SYSTEM:	• Separate, identical twin stage--Venturi scrubber per furnace[125]	
MANUFACTURER:	Chemico[36]	
DATE INSTALLED:	1971[124,125]	
SYSTEM DESCRIPTION:	• Design flow rate (both systems combined) = 140,000 acfm at 168°F[36] • Inlet design Δp = 65-70 in. H_2O[36] • Test Data (1972):[124] Avg. flow rate = 73,408 acfm • Avg. temp. = 126°F Test Data (1971):[125] Flow rate (range) = 56,619-57,800 dscfm	
SECONDARY EMISSION CONTROL SYSTEM:[b]	Local hood on charge side of each vessel ducted to common venturi scrubber[124]	
MANUFACTURER:	Chemico[36]	
DATE INSTALLED:		
SYSTEM DESCRIPTION:	• Scrubber designed for 104,000 acfm at 98°F[36]	

ADDITIONAL COMMENTS:

[a]Membrane combustion hood with gas cooling by water quenching.[2]

[b]Evacuated doghouse enclosure on each vessel ducted to a common baghouse planned for December 1982.[102]

TABLE 34. WHEELING-PITTSBURGH STEEL CORP./MON VALLEY PLANT IN MONESSEN, PA

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 101[1]	No. 102[1]
STARTUP DATE:	1964[1]	1964[1]
TYPE OF BLOWING MECHANISM:	Top[2]	Top[2]
TYPE OF COMBUSTION HOOD:	Full[2]	Full[2]
STEEL PRODUCTION:		
RATED TONS/DAY:	4,800 (both furnaces combined)[7]	
AVERAGE TONS/DAY (1976):	3,776 (both furnaces combined)[7]	
PRIMARY EMISSION CONTROL SYSTEM:	Common dry ESP serves both furnaces[126]	
MANUFACTURER:	Western Precipitator[126]	
DATE INSTALLED:	1964[b,127]	
SYSTEM DESCRIPTION:	• Six section ESP with five cells per section[126] • 3 I.D. fans rated at 300,000 cfm (each)[126] • 13 ft I.D. stack (outlet)[126] • Test Data (1979):[126] Flow = 356,500 scfm (avg. of 4 heats during blow period)	
SECONDARY EMISSION CONTROL SYSTEM:		

ADDITIONAL COMMENTS:

[a]Membrane tube hood with water cooling; gas cooling by water sprays (7 banks)[2,126]

[b]ESP rebuilt in 1981.[127]

TABLE 35. WHEELING-PITTSBURGH STEEL CORP./STEUBENVILLE PLANT IN MINGO JUNCTION, OH

BASIC OXYGEN FURNACE SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	"A"[128]	"B"[128]
STARTUP DATE:	1965[1]	1965[1]
TYPE OF BLOWING MECHANISM:	Top[2]	Top[2]
TYPE OF COMBUSTION HOOD:	Full[2]	Full[2]
STEEL PRODUCTION:		
RATED TONS/DAY:	8,550 (both furnaces combined)[7]	
AVERAGE TONS/DAY (1976):	7,707 (both furnaces combined)[7]	
PRIMARY EMISSION CONTROL SYSTEM:	Common venturi scrubber serves both furnaces[2]	
MANUFACTURER:	Chemico[2]	
DATE INSTALLED:	1965[129]	
SYSTEM DESCRIPTION:	• 570,800 acfm (est.)[10] • 57,000 gpm (water flow)[10] • L/G = 10 gpm/1,000 acfm (calculated)[10]	
SECONDARY EMISSION CONTROL SYSTEM:	Hot metal transfer area ducted to baghouse[130,131]	
MANUFACTURER:		
DATE INSTALLED:	1980[130]	
SYSTEM DESCRIPTION:	• Eight modules[130] • One I.D. fan rated at 175,000 cfm[131] • Test Data (1980):[130] 24,278-25,090 acfm (range) 108-110°F (range)	

ADDITIONAL COMMENTS:

[a]Paneled plate hoods with water cooling; gas cooling with water sprays.[2]

MATERIAL IN THIS SECTION SUBJECT TO CONFIDENTIALITY
REVIEW AND IS NOT RELEASABLE AS OF FEBRUARY 1, 1982.
FOR INFORMATION, CONTACT L. KESARI, U.S. ENVIRONMENTAL
PROTECTION AGENCY, DIVISION OF STATIONARY SOURCE ENFORCEMENT.

REFERENCES

BASIC OXYGEN CONVERTERS

1. World Steel Industry Data Handbook: Volume I. The United States. McGraw-Hill Magazine. 1978. (Reliability No. 4.)

2. Caine, K. E., Jr. Development of Technology For Controlling BOP Charging Emissions. EPA-600/2-77-218. October 1977. (Reliability No. 3.)

3. Letter response. James Dills, Commonwealth of Kentucky Department of Natural Resources and Environmental Protection to Michael Jasinski, GCA/Technology Division. November 19, 1981. (Reliability No. 1.)

4. Letter to Barry Gilbert, Air Programs Branch of U.S. Environmental Protection Agency, Atlanta, Georgia from John E. Barker, Director of Environmental Engineering, ARMCO, Middletown, Ohio. December 12, 1979. (Reliability No. 1.)

5. Bergson, Eugene, et al. Assessment of Air Emissions from Steel Plant Operations-ARMCO Steel, Ashland, Kentucky. GCA/Technology Division Draft Final Report No. TR-81-95-G. Prepared for U.S. Environmental Protection Agency. September 1981. (Reliability No. 1.)

6. Cowherd, C., Jr. Source Testing--EPA Task No. 2, ARMCO Steel Corporation, Middletown, Ohio, BOF Shop. RACT #202185-202275. (Reliability No. 1.)

7. Development Document for Proposed Effluent Limitations Guidelines and Standards for the Iron and Steel Manufacturing Point Source Category, Vol. IV. Draft Report. EPA-440/1-79-024a. October 1979. pp. 15-17. (Reliability No. 4.)

8. Kashay, A. M. ARMCO's Middletown Works - A Blend of In-House Knowledge and Supplier Competence. Iron & Steel Engineer. September 1974. p. M-47. (Reliability No. 4.)

9. Determination of BOF and Kish Collector Emissions at ARMCO Steel Corporation, Middletown, Ohio. Roy F. Weston, Environmental Scientists and Engineers. November 14, 1969. RACT Box #202611-202636. (Reliability No. 1.).

10. U.S. Steel Industry Air Pollution Control Equipment Market. The McIlvaine Company. July 1980. Figure 8. (Reliability No. 4.)

11. EPA Region V files. (Permit Applications dated December 5, 1980, prepared by B. Steiner, ARMCO.)

12. Testing Data from Bethlehem Steel Corp./Bethlehem, Pennsylvania BOF Shop. RACT Box #200903-300956. (Reliability No. 1.)

13. Letter from Don R. Goodwin, Director of Emission Standards and Engineering Division, U.S. Environmental Protection Agency to Bernard Bloom, Division of Stationary Source Enforcement, U.S. Environmental Protection Agency. Re: Working Group Meeting - NSPS for Basic Oxygen Process Furnace Secondary Emission Control. Attachments Nos. 1 and 2, letter dated November 24, 1980. (Reliability Nos. 3 and 4.)

14. Letter response. J. McGrogan, PADER-Wernersville, Pennsylvania to Gene Bergson, GCA/Technology Division. March 17, 1981. (Reliability No. 1.)

15. Castino, T. A., Jr. Particulate Emission Factors Applicable to the Iron and Steel Industry. Final Report. Midwest Research Institute Project No. 4468-L(23). (Reliability No. 2.)

16. L-D Process Newsletter, L-D Capacity 1979. June 1979. News Letter No. 77. p. 2. (Reliability No. 2.)

17. Telephone conversation. Dan Bakk, U.S. Environmental Protection Agency, Region V to Michael Jasinski, GCA/Technology Division. October 1980. (Reliability Nos. 1 and 2.)

18. Labee, C. J. From Sand to Steel: The Burns Harbor Story. Iron & Steel Engineer. 48(10):B-18 through B-48. October 1971. (Reliability No. 3.)

19. Performance Test of No. 3 BOF Gas Cleaning System at BSC/Burns Harbor, Indiana. Prepared by Indiana State APC Board. 1978. RACT #201612-201727. (Reliability No. 1.)

20. Burns Harbor Unveils New Facilities. Iron and Steel Engineer. September 1978. p. 69. (Reliability No. 4.)

21. Telephone conversation. Henry Sandonato, New York Department of Environmental Conservation to Gene Bergson, GCA/Technology Division. February 17, 1981. (Reliability No. 2.)

22. Labee, D. J. Lackawanna Plant: Bethlehem Steel Corporation. Iron & Steel Engineer. 50(9):60-75. September 1973. (Reliability No. 3.)

23. Wilkinson, F. M. Wet Washing of BOF Gases-Lackawana. Iron & Steel Engineer. September 1967. p. 142. (Reliability No. 3.)

24. Letter response. Richard Craig, U.S. Environmental Protection Agency, Region II to William Farino, GCA/Technology Division. December 1981. (Reliability No. 1.)

25. Letter to Robert McCrillis, U.S. Environmental Protection Agency, from Peter Spawn, GCA/Technology Division. May 5, 1980. (Reliability No. 2.)

26. Telephone conversation. Ralph Hall, Maryland State Department of Health and Mental Hygiene to Michael Jasinski, GCA/Technology Division. October 29, 1981. (Reliability No. 2.)

27. CF&I to Install Precipitator in BOF. Editor's Notes. Iron & Steel Engineer. September 1976. (Reliability No. 4.)

28. Fugitive Visible Emission and Process Observation of CF&I BOP Secondary Emission Control System. RACT Box #200971-200826. (Reliability No. 3.)

29. Telephone conversation. Dennis Myers, Colorado State Air Pollution Control Division to Michael Jasinski, GCA/Technology Division. October 1981. (Reliability No. 2.).

30. Letter to Bernard Bloom, U.S. Environmental Protection Agency, Division of Stationary Source Enforcement from Peter Spawn, GCA/Technology Division. Preliminary Data Analysis of BOF Roof Monitor Emissions Data. April 10, 1980. (Reliability No. 2.)

31. Investigation of Particulate Emissions--Basic Oxygen Furnace Roof Monitor. CF&I Corporation, Pueblo, Colorado. Seton, Johnson and Odell, Inc., Portland, Oregon. December 1975. (RACT Box #201437-201611.)

32. EPA Region V files. (Test Report at Ford Steel. May 1, 1981.)

33. Draft EIS for Revised Standards for Basic Oxygen Process Furnaces - Background Information for Proposed Standards. Prepared by the Emission Standards and Engineering Division of the U.S. Environmental Protection Agency. November 1980. pp. 3-3. (Reliability Nos. 2-3)

34. EPA Region V files. (Ford response to EPA questionnaire, February 21, 1978).

35. Nunno, T. J., et al. Field Evaluation of Fugitive Emissions from BOF Steelmaking Shops. Paper presented at EPA's Iron and Steel Symposium, Philadelphia, PA. November 1980. (Reliability No. 2.)

36. Summary sheets compiled by PEDCo, from stack tests in regional EPA offices. Provided to JACA for Steel Library by Tom Maslany, U.S. Environmental Protection Agency, Region III. (Reliability No. 1.)

37. Telephone conversation. Mike Maillard, Wayne County Department of Health to Gene Bergson, GCA/Technology Division. February 1980. (Reliability No. 2.)

38. EPA Region V files. (Stack Test Report by Wayne County at Ford, June 1977.)

39. Piper, S. Assessment of Air Emissions from Steel Plant Operations, Pretest Survey Report, Ford Steel, Dearborn, Michigan. GCA/Technology Division. Report No. 1061. Prepared for U.S. Environmental Protection Agency. March 1980. (Reliability No. 1.)

40. McCluskey, E. J. Design Engineering of the OG Gas Cleaning System at Inland's No. 2 BOF Shop. Iron & Steel Engineer. December 1976. p. 53. (Reliability No. 4.)

41. Schmidt, J. H. Source Sampling Studies at Inland Steel Co., E. Chicago, Indiana. No. 2 BOF APC System Emission Tests on OG Stacks No. 10 and No. 20. Nalco Contract No. PCD-522. RACT #202337-202366. (Reliability No. 1.)

42. Air, Water and Inland Steel. Inland Steel Publications. pp. 26-31. (Reliability No. 4.)

43. EPA Region V files. (Test Report on Inland No. 4 BOF, June 1974.)

44. Baghouse Exhaust Particulates Emission Test, Fume Emission Control System for the Hot Metal Transfer Station. No. 4 BOF Shop at Inland Steel Company. Almega Corporation. July 3, 1979. (Reliability No. 1.)

45. EPA Region V files. (Letter to file from trip report at Interlake, June 1980.)

46. Telephone conversation. Bernard Bloom, U.S. Environmental Protection Agency, Washington, D.C. to Michael Jasinski, GCA/Technology Division. November 1980-February 1981. (Reliability No. 2.)

47. EPA Region V files. (Interlake Tests at BOF, October 1980).

48. Stationary Source Testing, Interlake, Inc., Riverdale Plant--BOF. August 18, 1976. RACT #202277-202308. (Reliability No. 2.)

49. J&L Steel Corporation, Aliquippa, Pennsylvania. Process Description. RACT Box #200879-200902. (Reliability No. 1.)

50. Iron & Steel Engineer. Equipment News. 48(9):145-146. September 1971. (Reliability No. 3.)

51. Telephone conversation. Ken Bowman, Pennsylvania Department of Environmental Resources to Michael Jasinski, GCA/Technology Division. February 18, 1981. (Reliability No. 2.)

52. Letter response. Gary Nied, Cleveland Division of Air Pollution to Gene Bergson, GCA/Technology Division. March 9, 1981. (Reliability No. 1.)

53. Telephone conversation. Edward Wojciechowski, U.S. Environmental Protection Agency, Region V to Gene Bergson, GCA/Technology Division. February 4, 1981. (Reliability No. 2.)

54. Bergson, G., et al. Assessment of Air Emissions from Steel Plant Sources. J&L Steel Indiana Harbor Works BOF Shop. GCA/Technology Division Final Report No. TR-80-84-G. Prepared for U.S. Environmental Protection Agency. (Reliability No. 1.)

55. EPA Region V files. (J&L letter to EPA, April 1978.)

56. Steiner, J., and J. Knuck. Particulate Matter Emission Rates for BOF Operations at Youngstown Sheet and Tube, East Chicago, Indiana. Acurex Report TR-78-123, Vol. 1. pp. 2-5. August 1978. RACT Box #201137-201244. (Reliability No. 1.)

57. EPA Region V files. (J&L letter to EPA, 1981.)

58. DeVorkin, H. Report on Source Test, Visible Emissions and Plant Observations, Kaiser Steel Corporation/Fontana Works, Basic Oxygen Furnace 5 and 6. Engineering-Science, Inc., February 1979. p. 5. RACT Box #202391-202574A. (Reliability No. 1.)

59. Kaiser Steel Dedicates New Steelmaking Shop. Iron & Steel Engineer. May 1979. pp. 29-31. (Reliability No. 4.)

60. Letter to Bernard Bloom from Howard Lange, Chief Deputy Air Pollution Control Officer, South Coast Air Quality Management District, concerning fugitive emission control system at new BOF at Kaiser Steel. June 7, 1977. RACT Box #201911-201928. (Reliability No. 1.)

61. EPA Region V files. (McLouth 1974 permits.)

62. Anderson, P. Compliance Monitoring Inspection Report, McLouth Steel Corp./Trenton, Michigan. Prepared by GCA/Technology Division for U.S. Environmental Protection Agency, Region V. 1979. (Reliability No. 2.)

63. EPA Region V files. (EPA inspection of McLouth, May 14, 1981.)

64. Bloomfield, Bernard. Air Pollution Control Installations. Industrial Hygiene Quarterly. December 1956. (Reliability No. 4.)

65. Letter to John Heeney. U.S. Environmental Protection Agency, Region V, from GCA/Technology Division. August 27, 1979. (Reliability No. 4.)

66. EPA Region V files. (March 1979 Litigation Report on NSC/Ecorse.)

67. Emission Study, BOP No. 1 Precipitator, Great Lakes Steel, Detroit, Michigan. George D. Clayton Associates. March 1971. RACT Box #202607-202716. (Reliability No. 1.)

68. Memo from Mike Maillard of the Wayne County Department of Health to Technical Services File, dated 1/19/77. Re: Source sampling performed at Great Lakes Steel, Ecorse, Michigan on the No. 1 BOP Kish Collector. JACA Library. (Reliability No. 1.)

69. EPA Region V files. (Permit Applications for HMT, November 1977, NSC/GLS.)

70. Telephone conversation. Al Buck, Wayne County Department of Health--Down River Office to Sandy Beaton, GCA/Technology Division. January 1982. (Reliability No. 2.)

71. Piper, S.G. and T. J. Nunno. Assessment of Air Emissions from Steel Plant Operations, National Steel Division Great Lakes Steel No. 2 BOF Shop, Ecorse, Michigan. GCA/Technology Division Draft Final Report No. TR-80-33-G. Prepared for the U.S. Environmental Protection Agency. June 1980. (Reliability No. 1.)

72. EPA Region V files. (Stack Test Report by GLS No. 2 BOP Shop.)

73. Telephone conversation. Anton Telford, Illinois Environmental Protection Agency to Sandy Beaton, GCA/Technology Division. October 1981. (Reliability No. 2.)

74. EPA Region V files. (Litigation Report on NSC/GC, December 12, 1978.)

75. Fornadley, R. J. Granite City: Bold Manufacturing of an Integrated Steel Plant. Iron & Steel Engineer. August 1980. pp. SL-67 through SL-80. (Reliability No. 3.)

76. EPA Region V files. (National Steel 114 letter response to EPA, 1974).

77. EPA Region V files. (Stack Tests at BOF, FSC/GC, December 1974).

78. EPA Region V files. (Stack Tests at BOF, NSC/GC, January 1981).

79. Region V Engineers response to GCA/Technology Division questionnaire, December 1981.

80. EPA Region V files. (Permit Applications to construct dated May 1979).

81. Gronberg, S. and P. Bareford. National Steel, Weirton Division Basic Oxygen Furnace BOF No. 6 and 7, Particulate Emission Testing Region III. GCA/Technology Division, Draft Final Report No. TR-79-32-G. Prepared for U.S. Environmental Protection Agency. RACT Box No. 200967-201136. (Reliability No. 1.)

82. Telephone conversation. John Raggi, West Virginia Air Pollution Control to Gene Bergson, GCA/Technology Division. February 1981. (Reliability No. 2.)

83. Letter response. John Raggi, West Virginia Regional Engineer to Michael Jasinski, GCA/Technology Division. November 1981. (Reliability No. 1.)

84. Letter report to Norman Surprenant from Peter Spawn, GCA/Technology Division. Facility Inspection Report for BOFs at Republic Steel in Buffalo, New York. December 1978. (Reliability No. 2.)

85. Anderson P. and P. Spawn. Assessment of Air Emissions from Steel Operations, Republic Steel Corporation, Chicago District Q-BOP Shop, Emission Evaluation, GCA/Technology Division, Draft Final Report No. TR-79-64-G. Prepared for U.S. EPA. September 1979. pp. 33-37. (Reliability No. 1.)

86. Williams, E., and W. Hayard. The Engineering and Installation of Two 225-ton Q-BOP Vessels in an Open Hearth Shop. Iron & Steel Engineer. November 1978. pp. 33-37. (Reliability No. 4.)

87. Particulate Emission Test Data of Republic Steel Corporation Chicago District No. 1 Q-BOP Shop. Mostardi Platt, Inc. Submitted to L. Kertcher, U.S. EPA Region V. September 1977. RACT No. 202575-202604. (Reliability No. 1.)

88. Steiner, J., and J. Knuch. Particulate Matter Emissions Factor Tests for Q-BOP Hot Metal Addition and Tapping Operations at RSC, Chicago, Illinois. Acurex Report No. TR-78-143, Vol. 1. November 1978. RACT Box No. 201975-202080. (Reliability No. 1.)

89. EPA Region V files. (RSC/Cleveland, 1978 Publication).

90. Test Results of Basic Oxygen Furnace Suppressed Combustion Gas Cleaning System, Republic Steel Corporation, Cleveland District, Cleveland, Ohio. Submitted by Republic Steel. May 1978. RACT Box No. 201245-201254. (Reliability No. 1.)

91. Brown, C.M. and R.W. Englebert. Control of Secondary Emissions of Basic Oxygen Steelmaking Furnaces. Iron & Steel Engineer. June 1980. pp. 39-45. (Reliability No. 4.)

92. Report on Stack Tests conducted on the Suppressed Combustion Gas Cleaning System at Republic Steel Corporation, Cleveland District, Cleveland, Ohio BOF. Submitted to U.S. EPA, Region V by RSC/Environmental Control Department, General Office-Cleveland. May 1978. JACA Library. (Reliability No. 2.)

93. Steiner, J. Steel Mill Enforcement Compliance Testing in Region V. Trip Report Presurvey of BOF Shop Republic Steel, Cleveland, Ohio, July 27, 1978. RACT No. 201951-201974. (Reliability No. 1.)

94. Paper, R. and J. Steiner. Particulate Matter Emissions Factor Tests for BOF Hot Metal Charging and Tapping at Republic Steel, Cleveland, Ohio. Vol. 1, Acurex Final Report 80-62/EE. Acurex Project No. 280. June 1980. JACA Library. (Reliability No. 1.)

95. Telephone conversation. Mr. Habib, City of Cleveland Air Pollution Control to Sandy Beaton, GCA/Technology Division. October 1981. (Reliability No. 2.)

96. Anderson, P., et al. Assessment of Air Emissions From Steel Plant Operations, Republic Steel Corporation BOF Shop Gadsden, Alabama. GCA/Technology Division Final Report No. TR-79-68-G. Prepared for U.S. EPA. March 1980. RACT Box No. 200703-200790. (Reliability No. 1.)

97. Telephone conversation. Sue Roberson, Alabama Air Pollution Control to Gene Bergson, GCA/Technology Division. February 25, 1981. (Reliability No. 2.)

98. EPA Region V file. Review by GCA December 1981.

99. EPA Region V files. (Letter by RSC, Progress Report, August 28, 1979).

100. Telephone conversation. Ted Davis, NE District Ohio EPA to Gene Bergson, GCA/Technology Division. March 3, 1981. (Reliability No. 2.)

101. EPA Region V files. (Letter to EPA dated January 25, 1980).

102. Letter response. Dennis Bush, Ohio EPA-NE to GCA/Technology Division. November 1981. (Reliability No. 1.)

103. Telephone conversation. Larry Wonders, Pennsylvania Department of Environmental Conservation to Gene Bergson, GCA/Technology Division. February 17, 1981. (Reliability No. 2.)

104. Telephone conversation. Bill Charleton, PADER-Meadsville, PA to GCA/Technology Division. October and November 1981. (Reliability No. 2.)

105. Stack Tests at Sharon Steel Corporation, "L-D" Vessel BOF Stack. December 9, 1976. Commonwealth of Pennsylvania, Department of Environmental Resources. RACT No. 201847-201864. (Reliability No. 1.)

106. Testing of Sharon Steel BOF. Mogul Corporation. May 31, 1978. RACT No. 201863-201910. (Reliability No. 1.)

107. U.S. Steel Memo of Dust Emission and Efficiency Testing at Edgar Thompson BOP Shop. June 1972. (Reliability No. 1.)

108. Telephone conversation. Bob Felt, Allegheny County Department of Health to Sandy Beaton, GCA/Technology Division. November 1981. (Reliability No. 2.)

109. Roof Monitor Emission Rates, U.S. Steel Corp./Braddock, Pennsylvania. Vol. No. 1, Roof Monitor. April 15, 1974. JACA Library. (Reliability No. 1.)

110. U.S. Steel Memo of Stack Tests for Operating Permit at the BOF Shop Hot Metal Transfer Facility - Edgar Thompson Plant. July 18, 1978. RACT No. 300131-300148. (Reliability No. 1.)

111. Telephone conversation. Bob Felt, Pennsylvania Department of Environmental Resources to Gene Bergson, GCA/Technology Division. February 12, 1981. (Reliability No. 2.)

112. Stack Test Particulates, BOF Scrubbers, U.S. Steel South Works, Chicago, Illinois. Engineering Services Division, Department of Environmental Control, City of Chicago. July 1977. RACT No. 202641-202696. (Reliability No. 1.)

113. U.S. Steel Memo of Stack Testing at Duquesne BOF 1 and 2. October 25, 1978. RACT No. 201821-201846. (Reliability No. 1.)

114. Letter response from Jefferson County Department of Health to GCA/Technology Division. December 1981. (Reliability No. 1.)

115. Letter from Jim Carroll, Jefferson County Department of Health Engineer to Larry Ketcher, U.S. EPA Region V, concerning stack tests at USS/Fairfield. RACT No. 202367-202389. (Reliability No. 1.)

116. Measurement of Fugitive Roof Emissions and Auxiliary Hood Capture at U.S. Steel Corporation/Fairfield Q-BOP. April 2, 1975. JACA Library. (Reliability No. 1.)

117. Kenner, W.F. and R.W. McIlvaine. Review of Venturi Scrubber Performance on Q-BOP Vessel C at the Fairfield Works of USSC. February 1979. JACA Library. (Reliability No. 4.)

118. Spawn, P.D. and S. Beaton. U.S. Steel, Fairfield, AL. Q-BOP Fugitive Emissions Evaluation in June 1981. GCA/Technology Division Draft Report. December 1981. Prepared for U.S. EPA. (Reliability No. 1.)

119. Spawn, P., et al. Assessment of Air Emissions From Steel Plant Operations.USSC No. 1 BOF Shop, Gary, Indiana. GCA/Technology Division. Draft Final Report No. TR-79-68-G. March 1980. Prepared for U.S. EPA. (Reliability No. 1.)

120. EPA Region V files. (Stack test at Gary BOF, May 1981).

121. Hubbard, H.N., and W.T. Lankford. Development and Operation of the Q-BOP Process in the U.S. Steel Corporation. Iron & Steel Engineer. 50(10):37-43. October 1973. (Reliability No. 3.)

122. Markoya, R. Q-BOP Roof Monitor Emissions at U.S. Steel Gary Works, Gary, Indiana, January 1980. Acurex Report No. TR-80-57/EE. (Reliability No. 1.)

123. Stack Emission Tests Results-No. 2 Q-BOP, Gary Works. Report No. 18-E-005(003). RACT No. 201929-201950. (Reliability No. 1.)

124. EPA Test Number 72-MM-02, Basic Oxygen Furnace, USSC, Lorain, Ohio. Engineering Science, Inc. June 27, 1972. RACT No. 201281-201360. (Reliability No. 1.)

125. U.S. Steel Corp./Lorain, Ohio BOF Tests. Engineering Science Inc. December 21, 1971 publication. RACT No. 201361-201436. (Reliability No. 1.)

126. Process Description of Wheeling-Pittsburgh Steel Corporation, Monessan, Pennsylvania. RACT No. 202637-202640. (Reliability No. 1.)

127. Telephone conversation. Tony Johnson, Pennsylvania Department of Environmental Resources to Gene Bergson, GCA/Technology Division. February 26, 1981. (Reliability No. 2.)

128. Letter in EPA Region V files.

129. Telephone conversation. Harold Strohmeyer, North Ohio Air Quality Authority to Sandy Beaton, GCA/Technology Division. November 1981. (Reliability No. 2.)

130. EPA Region V files. (Stack Test Report by Clean Air Engineering, Inc.)

131. EPA Region V files. (Reladling Baghouse Blueprints.)

MATERIAL IN THIS SECTION SUBJECT TO CONFIDENTIALITY
REVIEW AND IS NOT RELEASABLE AS OF FEBRUARY 1, 1982.
FOR INFORMATION, CONTACT L. KESARI, U.S. ENVIRONMENTAL
PROTECTION AGENCY, DIVISION OF STATIONARY SOURCE ENFORCEMENT.

TABLE 1. ARMCO INC./BALTIMORE WORKS IN BALTIMORE, MD

ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:[a]	No. 3[b,1]	"A"[c,2]
STARTUP DATE:	1937[1]	1980[2]
SHELL DIAMETER (ft-in.):	14-3[1]	
STEEL PRODUCTION:		
RATED TONS/DAY:		
AVERAGE TONS/DAY ( ):		
TYPE(S) OF STEEL PRODUCED:	Stainless and super alloy[1]	
PRIMARY EMISSION CONTROL SYSTEM:	Direct shell evacuation per furnace, ducted to common baghouse[2,3]	
MANUFACTURER:	Fuller[2]	
DATE INSTALLED:	1968[2]	
SYSTEM DESCRIPTION:	• 292,000 acfm at 270°F (rated)[2] • A/C = 2.54:1 (design)[2] • Positive pressure[3] • Baghouse also controls AOD vessel via local hood capture system[3]	
SECONDARY EMISSION CONTROL SYSTEM:	Canopy hood above "A" furnace, ducted to primary control system baghouse[2] (see above system description)	

ADDITIONAL COMMENTS:

[a]Shop presently operates "A" furnace only; furnace No. 3 used as back-up.[3]

[b]Furnace No. 3 to be shut down in December 1981.[2]

[c]"A" furnace replaced furnace Nos. 5 and 6 in December 1980.[2]

TABLE 2. ARMCO INC./BUTLER WORKS IN BUTLER, PA

ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 2[1]	No. 3[1]	No. 4[1]
STARTUP DATE:	1969[1]	1969[1]	1969[1]
SHELL DIAMETER (ft-in.):	22-0[1]	22-0[1]	22-0[1]

STEEL PRODUCTION:

RATED TONS/DAY:	2,500 (all three furnaces combined)[4]
AVERAGE TONS/DAY (1976):	2,502 (all three furnaces combined)[4]
TYPE(S) OF STEEL PRODUCED:	Carbon, alloy, stainless[1,5]
PRIMARY EMISSION CONTROL SYSTEM:	Direct shell evacuation per furnace, ducted to individual scrubbers[6]
MANUFACTURER:	Pease-Anthony (all three scrubbers)[7]
DATE INSTALLED:	1969 (all three scrubbers)[7]
SYSTEM DESCRIPTION:	• Each scrubber system similar, unless noted: Scrubber design = 30,000 dscfm at Δp= 50 in. H_2O (Nos. 2 and 3)[7] Fan rated capacity = 112,000 cfm; 1750-hp motor[6] • Test Data (1972):[8] No. 2 furnace: 54,140 dscfm; Δp = 48 in. H_2O; Water flow = 970 gpm No. 4 furnace: 53,183 dscfm; Δp = 45 in. H_2O; Water flow = 970 gpm
SECONDARY EMISSION CONTROL SYSTEM:	Hot metal transfer area, charging and tapping control by canopy hood over each furnace, ducted to common baghouse[7,8]
MANUFACTURER:	Wheelabrator-Frye[7,9]
DATE INSTALLED:	1975[7]
SYSTEM DESCRIPTION:	• Design flow rate = 350,000 acfm at 275°F[7,9] • 8 compartments; total of 1536 woven Dacron bags[9] • A/C varies with each furnace--No. 2 = 2.53:1; No. 3 = 2.89:1; No. 4 = 3.05:1[9] • Reverse air cleaning[9]

ADDITIONAL COMMENTS:

TABLE 3. ARMCO INC./HOUSTON WORKS IN HOUSTON, TX

NO. 1 ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 4[1]	No. 5[1]
STARTUP DATE:	1951[1]	1956;[1] 1957[10]
SHELL DIAMETER (ft-in.):	20-0[1]	20-0[1]
STEEL PRODUCTION:		
RATED TONS/DAY:	1,100 (both furnaces combined)[4]	
AVERAGE TONS/DAY (1976):	949 (both furnaces combined)[4]	
TYPE(S) OF STEEL PRODUCED:	Low carbon, alloy[1]	
PRIMARY EMISSION CONTROL SYSTEM:[a]	Direct shell evacuation per furnace, ducted to individual scrubbers[11]	
MANUFACTURER:		
DATE INSTALLED:	1969[11]	1969[11]
SYSTEM DESCRIPTION:	• Δp = 55 in. W.C. (normal)[11]	• Δp = 55 in. W.C. (normal)[11]

ADDITIONAL COMMENTS:

[a]Primary control during 1962-1969 consisted of a direct shell evacuation-baghouse which was subsequently replaced by scrubbers.[11]

TABLE 4. ARMCO INC./HOUSTON WORKS IN HOUSTON, TX

NO. 2 ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 6[1]	No. 7[1]	No. 8[1]	No. 9[1]
STARTUP DATE:	Two in 1966; one in 1970; and one in 1971[10]			
SHELL DIAMETER (ft-in.):	22-0[1]	22-0[1]	22-0[1]	22-0[1]
STEEL PRODUCTION:				
RATED TONS/DAY:	3,900 (all four furnaces combined)[4]			
AVERAGE TONS/DAY (1976):	2,081 (all four furnaces combined)[4]			
TYPE(S) OF STEEL PRODUCED:	Low carbon, and ~35 percent alloys[1]			
PRIMARY EMISSION CONTROL SYSTEM:[a]	Direct shell evacuation per furnace, ducted to common baghouse[12]			
MANUFACTURER:	Fuller[12]			
DATE INSTALLED:	1978[10,12]			
SYSTEM DESCRIPTION:	• Baghouse rated at 2,000,000 cfm[13] • 24-compartments, and 6,912 polyester-cloth bags (total)[12] • A/C (design) = 3:1[12] • Five fans required, 12,500 hp (total)[12] • Reverse air cleaning with 200 hp fan[12]			
SECONDARY EMISSION CONTROL SYSTEM:	Canopy hoods per furnace, ducted to primary control system baghouse[12] (see above system description)			

ADDITIONAL COMMENTS:

[a]Baghouse appears to have replaced high-energy venturi scrubber in 1978.[10,12]

TABLE 5. ARMCO INC./KANSAS CITY WORKS IN KANSAS CITY, MO

NO. 1 ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 1[1,14]	No. 2[1,14]
STARTUP DATE:	1952;[1,14] 1953[15]	1956[1,14]
SHELL DIAMETER (ft-in.):	20-2;[1,14] 20-0[16]	20-2;[1,14] 20-0[16]
STEEL PRODUCTION:		
RATED TONS/DAY:	622[16]	622[16]
AVERAGE TONS/DAY ( ):		
TYPE(S) OF STEEL PRODUCED:	Carbon;[1] carbon, alloy[5]	
PRIMARY EMISSION CONTROL SYSTEM:	Direct shell evacuation per furnace, ducted to individual baghouse[14,16]	
MANUFACTURER:	AAF[16]	Western Precipitator[16]
DATE INSTALLED:	1970[16]	1962[16]
SYSTEM DESCRIPTION:	• 107,000 acfm at 400°F[16] • A/C = 1.65:1[16] • 10 compartments--720 bags (total)[16] • Reverse air cleaning[16]	• 177,000 acfm at 400°F[16] • A/C = 1.9:1[16] • 16 compartments--1,152 bags (total)[16] • Reverse air cleaning[16]
SECONDARY EMISSION CONTROL SYSTEM:	Canopy hoods per furnace, ducted to common baghouse[a,14]	
MANUFACTURER:	AAF[14]	
DATE INSTALLED:	1977 (2 furnaces)[16,17]--1978 (for remaining furnaces)[17]	
SYSTEM DESCRIPTION:	• 900,000 acfm at 140°F[14,16] • A/C = 2.7:1 (design)[16] • Positive pressure with 12 compartments--3,024 seamless polyester bags (total)[14,16] • Δp = 5 in. H_2O (design)[14] • 4 fans--800 hp each[14] • Reverse air cleaning[14,16]	

(continued)

TABLE 5 (continued)

NO. 1 ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 3[1,14]	No. 4[1,14]
STARTUP DATE:	1961;[1,14] 1963[15]	1970[1,14]
SHELL DIAMETER (ft-in.):	22-6;[1,14] 22-0[16]	22-0[16]
STEEL PRODUCTION:		
RATED TONS/DAY:	1,020[16]	1,020[16]
AVERAGE TONS/DAY ( ):		
TYPE(S) OF STEEL PRODUCED:	Carbon;[1] carbon, alloy[5]	
PRIMARY EMISSION CONTROL SYSTEM:	Direct shell evacuation per furnace, ducted to individual baghouse[14,16]	
MANUFACTURER:	AAF[16]	AAF[16]
DATE INSTALLED:	1970[16]	1970[16]
SYSTEM DESCRIPTION:	• 70,000 acfm at 400°F[16] • A/C = 1.47:1[16] • 6 compartments--528 bags (total)[16] • Reverse air cleaning[16]	• 140,000 acfm at 400°F[16] • A/C = 1.76:1[16] • 10 compartments--880 bags (total)[16] • Reverse air cleaning[16]
SECONDARY EMISSION CONTROL SYSTEM:	Canopy hoods per furnace, ducted to common baghouse[a,14] (see previous page system description)	

ADDITIONAL COMMENTS:

[a]Each furnace has charge side and tap side canopy hood ducted to a common 17-ft diameter duct and baghouse.[14]

TABLE 6. ARMCO INC./KANSAS CITY WORKS IN KANSAS CITY, MO

NO. 2 ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 5[1,14]	No. 6[1,14]
STARTUP DATE:	1977[1,14]	1977[1,14]
SHELL DIAMETER (ft-in.):	22-0[1,14]	22-0[1,14]
STEEL PRODUCTION:		
RATED TONS/DAY:	1,020[16]	1,020[16]
AVERAGE TONS/DAY ( ):		
TYPE(S) OF STEEL PRODUCED:	Carbon;[1] carbon, alloy[5]	
PRIMARY EMISSION CONTROL SYSTEM:	Direct shell evacuation per furnace, ducted to common baghouse[1,14,16]	
MANUFACTURER:	AAF[14,16]	
DATE INSTALLED:	1977[14,16]	
SYSTEM DESCRIPTION:	• 672,000 acfm at 270°F[14,16] • Positive pressure, 10 compartments with 2,520 polyester bags (total)[14,16] • Δp = 7 in. H_2O[14,16] • 4 fans, (1 spare)[14,16] • A/C (design) = 3:1[16] • Reverse air cleaning performed by one 250 hp fan[14]	
SECONDARY EMISSION CONTROL SYSTEM:	Canopy hoods per furnace, ducted to primary control system baghouse[14] (see above system description)	

ADDITIONAL COMMENTS:

TABLE 7. ARMCO INC./MARION WORKS IN MARION, OH

ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	A[1]	B[1]
STARTUP DATE:	1968;[1] 1967[18]	1975;[1] 1976[15,18]
SHELL DIAMETER (ft-in.):	13-6[1,5]	13-6[1,5]
STEEL PRODUCTION:		
RATED TONS/DAY:		
AVERAGE TONS/DAY ( ):		
TYPE(S) OF STEEL PRODUCED:	Carbon[1]	
PRIMARY EMISSION CONTROL SYSTEM:	Canopy hood per furnace, ducted to common baghouse[18]	
MANUFACTURER:	Wheelabrator-Frye[18]	
DATE INSTALLED:	1976[18]	
SYSTEM DESCRIPTION:	• Rated at 225,000 acfm[18] • Δp = 4-6 in. H_2O[18]	
SECONDARY EMISSION CONTROL SYSTEM:	Total building evacuation, ducted to primary control system baghouse[18] (see above system description)	

ADDITIONAL COMMENTS:

TABLE 8. ARMCO INC./SAND SPRINGS WORKS IN SAND SPRINGS, OK

ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 1[1]	No. 2[1]
STARTUP DATE:	1957[a,1,19]	1970[1,19]
SHELL DIAMETER (ft-in.):	18-0[1,5]	18-0[1,5]
STEEL PRODUCTION:		
RATED TONS/DAY:		
AVERAGE TONS/DAY ( ):		
TYPE(S) OF STEEL PRODUCED:	Carbon[1,5]	
PRIMARY EMISSION CONTROL SYSTEM:	Direct shell evacuation per furnace, ducted to common baghouse[19]	
MANUFACTURER:	AAF[19,20]	
DATE INSTALLED:	1970[19]	
SYSTEM DESCRIPTION:	• Baghouse rated at 112,000 acfm at 210°F[19,20] • Baghouse contains 1,080 "silicone-graphite" treated bags with an effective cloth area = 100,300 sq ft[19,21] • Design A/C = 1.12:1[21]	
SECONDARY EMISSION CONTROL SYSTEM:		

ADDITIONAL COMMENTS:

[a]Furnace No. 1 revamped in 1969.[15]

TABLE 9. ARMCO INC./TORRANCE PLANT IN TORRANCE, CA

ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 5[1]	No. 6[1]
STARTUP DATE:	1941[1]	1949[1]
SHELL DIAMETER (ft-in.):	12-0;[1] 17-0[22]	10-0;[1] 14-0[22]
STEEL PRODUCTION:		
RATED TONS/DAY:		
AVERAGE TONS/DAY ( ):		
TYPE(S) OF STEEL PRODUCED:	Low carbon, alloy, stainless[1,5]	
PRIMARY EMISSION CONTROL SYSTEM:[a]	Canopy hoods per furnace, ducted to common baghouse[1,22,23]	
MANUFACTURER:	Fuller[22]	
DATE INSTALLED:	1956[22]	
SYSTEM DESCRIPTION:	• Exhaust flow rate = 60,000 cfm[22] • A/C (design) = 1.96:1[22] • Shaker type cleaning mechanism[24]	
SECONDARY EMISSION CONTROL SYSTEM:	Tap pit enclosure per furnace, ducted to primary control system baghouse[23] (see above system description)	

ADDITIONAL COMMENTS:

[a]Baghouse also controls two jaw crushers and a chaser mill.[22]

TABLE 10. BETHLEHEM STEEL CORP./BETHLEHEM PLANT IN BETHLEHEM, PA

ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No.21[25]	No.22[25]	No.23[25]	No.24[25]	No.25[25]
STARTUP DATE:	1938[1]	1940[1]	1940[1]	1957[1]	1957[1]
SHELL DIAMETER (ft-in.):	15-0[1]	18-0[1]	18-0[1]	18-0[1]	18-0[1]
STEEL PRODUCTION:					
RATED TONS/DAY:					
AVERAGE TONS/DAY ( ):					
TYPE(S) OF STEEL PRODUCED:	Alloy[1,5]				
PRIMARY EMISSION CONTROL SYSTEM:	Canopy hood per furnace, ducted to common baghouse[25,26]				
MANUFACTURER:	Fuller[8]				
DATE INSTALLED:	1972[a,26]				
SYSTEM DESCRIPTION:	• Each canopy hood (unbaffled) measures 1,296 sq ft located 30 ft above furnaces[26] • Hood draft controlled by five 900-hp, 600 rpm, F.D. fans[26] • Total fan (5) capacity = 1,350,000 cfm[27] • 5 section baghouse (one fan per section); 10 compartments, 90 Dacron bags per compartment[8,26] • Reverse air cleaning[25]				
SECONDARY EMISSION CONTROL SYSTEM:	Total building evacuation, ducted to primary control system baghouse[25,26] (see above system description)				

ADDITIONAL COMMENTS:

[a]All bags replaced in 1976.[25]

TABLE 11. BETHLEHEM STEEL CORP./JOHNSTOWN PLANT IN JOHNSTOWN, PA

ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:		
STARTUP DATE:	1981[28]	1981[28]
SHELL DIAMETER (ft-in.):		
STEEL PRODUCTION:		
RATED TONS/DAY:		
AVERAGE TONS/DAY ( ):		
TYPE(S) OF STEEL PRODUCED:		
PRIMARY EMISSION CONTROL SYSTEM:	Direct shell evacuation per furnace, ducted to common baghouse[28]	
MANUFACTURER:	Baumco[28]	
DATE INSTALLED:	1981[28]	
SYSTEM DESCRIPTION:	• Design flow rate = 740,000 acfm[28] • 20 compartments; 176 polyester bags per compartment[28] • A/C = 2.28:1 (design)[28] • 4 fans--3 operate, 1 as spare[28] • Positive pressure, reverse air cleaning[28]	
SECONDARY EMISSION CONTROL SYSTEM:	Canopy hood and 3-sided (partial) enclosure per furnace, ducted to primary control system baghouse[28] (see above system description)	

ADDITIONAL COMMENTS:

TABLE 12. BETHLEHEM STEEL CORP./LOS ANGELES PLANT IN LOS ANGELES, CA

NO. 3 ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 1[22]	No. 2[22]	No. 3[22]
STARTUP DATE:	1948[1,22]	1950[1,22]	1951;[1] 1952[22]
SHELL DIAMETER (ft-in.):	17-0[1]	20-0[1]	20-0[1]
STEEL PRODUCTION:			
RATED TONS/DAY:			
AVERAGE TONS/DAY ( ):			
TYPE(S) OF STEEL PRODUCED:	Rimmed;[1] carbon, alloy[5]		
PRIMARY EMISSION CONTROL SYSTEM:[a,b]	Direct shell evacuation per furnace, ducted to common baghouse[29]		
MANUFACTURER:	Fuller[22]		
DATE INSTALLED:	1965[b,22,29]		
SYSTEM DESCRIPTION:	• Rated at 525,000 cfm with A/C = 1.95:1;[22] 1.80:1[29] • Two 250 hp exhaust fans[29] • 26 compartments; total of 3,120 silicone treated glass fiber bags[29] • Reverse air cleaning using 29,750 cfm[29]		
SECONDARY EMISSION CONTROL SYSTEM:	Canopy hoods per furnace, ducted to primary control system baghouse[29] (see above system description)		
MANUFACTURER:			
DATE INSTALLED:			
SYSTEM DESCRIPTION:	• Canopy hood dimensions--40 x 60 x 18-ft[29]		

ADDITIONAL COMMENTS:

[a]Baghouse also controls the hot scarfer (located at blooming mill) and the leaded steel preparation area.[22,29]

[b]Baghouse replaced an ESP previously used for primary emission control between 1950 and 1965.[29]

TABLE 13. BETHLEHEM STEEL CORP./SEATTLE PLANT IN SEATTLE, WA

ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 1[30]	No. 2[30]
STARTUP DATE:	1958[1]	1958[1]
SHELL DIAMETER (ft-in.):	20-0[1]	20-0[1]
STEEL PRODUCTION:[a]		
RATED TONS/DAY:		
AVERAGE TONS/DAY ( ):		
TYPE(S) OF STEEL PRODUCED:	Rimmed;[1] carbon, alloy[5]	
PRIMARY EMISSION CONTROL SYSTEM:	Direct shell evacuation per furnace, ducted to common baghouse[31]	
MANUFACTURER:	Western Precipitator[31]	
DATE INSTALLED:	1959[31]	
SYSTEM DESCRIPTION:	• Rated at 90,000 acfm at 350°F[31]	
SECONDARY EMISSION CONTROL SYSTEM:	Total building evacuation, ducted to baghouse[31]	
MANUFACTURER:	Wheelabrator-Frye[31]	
DATE INSTALLED:	1972;[31] 1973[30]	
SYSTEM DESCRIPTION:	• Rated at 900,000 acfm at 100°F[31] • 14 compartments with design A/C = 3.17:1; using acrylic bags[30]	

ADDITIONAL COMMENTS:

[a]Actual yearly production figures from entire shop (tons):[30]
1975 - 357,400
1976 - 262,986
1978 - 373,400
1979 - 402,900
1980 - 316,246

TABLE 14. BETHLEHEM STEEL CORP./STEELTON PLANT IN STEELTON, PA

ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 207[32]	No. 208[32]	No. 209[32]
STARTUP DATE:	1968[1]	1968[1]	1968[1]
SHELL DIAMETER (ft-in.):	22-0[1]	22-0[1]	22-0[1]
STEEL PRODUCTION:			
RATED TONS/DAY:			
AVERAGE TONS/DAY (1979):	1,176[33]	1,222[33]	1,183[33]
TYPE(S) OF STEEL PRODUCED:	Carbon, alloy[1,5]		
PRIMARY EMISSION CONTROL SYSTEM:	Direct shell evacuation per furnace, ducted to common baghouse[32,33]		
MANUFACTURER:	Wheelabrator-Frye[32,33]		
DATE INSTALLED:	1968;[33] 1969[32]		
SYSTEM DESCRIPTION:	• 253,000 acfm (rated)[32] • 10 compartment baghouse[32]		
SECONDARY EMISSION CONTROL SYSTEM:	Total building evacuation, ducted to baghouse[32,34]		
MANUFACTURER:	AAF[32,34]		
DATE INSTALLED:	1976[32,33,34]		
SYSTEM DESCRIPTION:	• Design Data:[32,34] 20 compartments with a total of 5,040 ringed Dacron filter tubes (12 in. diameter x 34 ft long) 4 F.D. fans (400,000 cfm each) Reverse air cleaning		

ADDITIONAL COMMENTS:

TABLE 15. CF&I STEEL CORP./PUEBLO PLANT IN PUEBLO, CO

ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 3[35]	No. 4[35]
STARTUP DATE:	1973[35]	1976[35]
SHELL DIAMETER (ft-in.):	22-0[35]	22-0[35]
STEEL PRODUCTION:		
RATED TONS/DAY:		
AVERAGE TONS/DAY ( ):		
TYPE(S) OF STEEL PRODUCED:	Carbon, alloy[1,5]	
PRIMARY EMISSION CONTROL SYSTEM:	Direct shell evacuation per furnace, ducted to common baghouse[35,36]	
MANUFACTURER:	Cadre Corp.[37]	
DATE INSTALLED:	1974[a,36]	
SYSTEM DESCRIPTION:	• Rated at 540,000 acfm, containing 32 compartments with 1,920 Dacron bags (total)[35,37] • Positive pressure using three exhausters, and reverse air cleaning[35,37]	
SECONDARY EMISSION CONTROL SYSTEM:	Canopy hoods per furnace, ducted to primary control system baghouse[35,36] (see above system description)	

ADDITIONAL COMMENTS:

[a]Baghouse was upgraded in 1976 to accommodate startup of furnace No. 4.[36]

TABLE 16. CRUCIBLE INC./A DIVISION OF COLT INDUSTRIES, STAINLESS STEEL DIVISION IN MIDLAND, PA

ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:[a]	No. 1[38]	No. 2[38]	No. 3[38]	No. 5[38]
STARTUP DATE:	1937[38]	1937[38]	1937[38]	1937[38]
SHELL DIAMETER (ft-in.):				
STEEL PRODUCTION:				
RATED TONS/DAY:				
AVERAGE TONS/DAY ( ):				
TYPE(S) OF STEEL PRODUCED:	Stainless, specialty steels[1,5,38,39]			
PRIMARY EMISSION CONTROL SYSTEM:	Canopy hood per furnace, ducted to common baghouse[7,38,39]			
MANUFACTURER:	AAF[7,38]			
DATE INSTALLED:	1973[b,7]			
SYSTEM DESCRIPTION:				

- Baghouse controls all 6 furnaces, and an AOD vessel (100-ton) tied into the baghouse via a canopy hood and common duct work[38,39]
- Total system flow = 1,375,000 acfm at 275°F (during tap/melt phase)[40]
  = 1,504,000 acfm at 205°F (during charge/melt phase)[40]
- Canopy hoods (each) measure 48 ft x 43 ft[40]
- Cloth area = 23,867 sq ft per compartment (24 compartments)[40]
- A/C = 2.63:1 (24 compartments operating);
  A/C = 2.86:1 (22 compartments operating)[40]

SECONDARY EMISSION CONTROL SYSTEM: Canopy hoods (see above system description)[7,38,39]

(continued)

TABLE 16 (continued)

ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	A[38]	B[38]
STARTUP DATE:	1981[39]	1981[39]
SHELL DIAMETER (ft-in.):		
STEEL PRODUCTION:		
RATED TONS/DAY:		
AVERAGE TONS/DAY ( ):		
TYPE(S) OF STEEL PRODUCED:	Carbon, alloy[39]	
PRIMARY EMISSION CONTROL SYSTEM:	Direct shell evacuation per furnace, ducted to common baghouse[39,40] (see previous page for system description)	
SECONDARY EMISSION CONTROL SYSTEM:	3-section canopy hood over each furnace, ducted to primary control system baghouse[c,39,40] (see previous page for system description)	

ADDITIONAL COMMENTS:

[a]Furnace No. 4 has not operated since 1979.[38]

[b]Baghouse was upgraded in 1981.[48,49]

[c]Canopy hoods divided into charge, central, and tap sections.[40]

TABLE 17. CRUCIBLE INC./A DIVISION OF COLT INDUSTRIES, SPECIALTY METALS DIVISION IN SYRACUSE, NY

ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:[a]	No. 1[41]	No. 2[41]	No. 3[41]
STARTUP DATE:	1966[1]	1951[1]	1951[1]
SHELL DIAMETER (ft-in.):	15-0[1]	11-6[1]	11-6[1]
STEEL PRODUCTION:			
RATED TONS/DAY:			
AVERAGE TONS/DAY ( ):			
TYPE(S) OF STEEL PRODUCED:	T-300, T-400, value, high speed and tool steel;[1] Carbon, alloy, stainless.[5]		
PRIMARY EMISSION CONTROL SYSTEM:	Direct shell evacuation per furnace, ducted to common baghouse[41]		
MANUFACTURER:	AAF[41]		
DATE INSTALLED:	1973[41]		
SYSTEM DESCRIPTION:	• Design flow rate = 84,000 scfm[41] • Positive pressure[41] • Reverse air cleaning[41]		

ADDITIONAL COMMENTS:

[a]Shop originally contained 5 furnaces; No. 4 has not been used in years; No. 5 was dismantled.[41]

TABLE 18. FORD MOTOR CO./RIVER ROUGE WORKS IN DEARBORN, MI

ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:		
STARTUP DATE:	1976[1]	1976[1]
SHELL DIAMETER (ft-in.):	24-0[1]	24-0[1]
STEEL PRODUCTION:		
RATED TONS/DAY:	2,304 (both furnaces combined)[42]	
AVERAGE TONS/DAY ( ):		
TYPE(S) OF STEEL PRODUCED:	Low carbon sheet, bar, AK & HSLA;[1] Carbon, alloy[5]	
PRIMARY EMISSION CONTROL SYSTEM:	Direct shell evacuation per furnace, ducted to common baghouse[8,42,43]	
MANUFACTURER:	AAF[44]	
DATE INSTALLED:	1976;[46] 1978[45]	
SYSTEM DESCRIPTION:	• 1,000,000 acfm (design)[8,42,43] • 14 compartments;[8,43] positive pressure[42,47] • Three forced draft fans required[42]	
SECONDARY EMISSION CONTROL SYSTEM:	Canopy hood and tapping-slagging fume hoods per furnace, ducted to primary control system baghouse[8,42,43] (see above system description)	

ADDITIONAL COMMENTS:

TABLE 19. INLAND STEEL CO./INDIANA HARBOR WORKS IN E. CHICAGO, IN

NO. 1 ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 80[48]	No. 90[48]
STARTUP DATE:	1970[1,49]	1970[1,49]
SHELL DIAMETER (ft-in.):	22-0[1]	22-0[1]
STEEL PRODUCTION:		
RATED TONS/DAY:		
AVERAGE TONS/DAY ( ):		
TYPE(S) OF STEEL PRODUCED:[a]	Carbon, low alloy[1,5]	
PRIMARY EMISSION CONTROL SYSTEM:	Direct shell evacuation per furnace, ducted to common baghouse[48,49]	
MANUFACTURER:	AAF[50]	
DATE INSTALLED:	1970[51]	
SYSTEM DESCRIPTION:	• 615,000 cfm (capacity)[49] • 20 chambers--2,400 Dacron bags (total)[49] • Three I.D. fans rated at 210,000 acfm each[51] • Reverse air cleaning[49]	
SECONDARY EMISSION CONTROL SYSTEM:	Canopy hoods per furnace, ducted to primary control system baghouse[48] (see above system description)	
MANUFACTURER:		
DATE INSTALLED:		
SYSTEM DESCRIPTION:	• Each canopy hood measures 4,500 sq ft[49] • Hoods are divided into 3 sections: 1 section over charge side; 1 directly over furnace, and 1 on tap side[51]	

ADDITIONAL COMMENTS:

[a]All heats are sent to continuous caster.[48]

TABLE 20. JONES & LAUGHLIN STEEL CORP./CLEVELAND WORKS IN CLEVELAND, OH

ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 79[52]	No. 80[52]
STARTUP DATE:	1959[1]	1959[1]
SHELL DIAMETER (ft-in.):	22-0[1]	22-0[1]
STEEL PRODUCTION:		
RATED TONS/DAY:	2,280 (entire shop)[4]	
AVERAGE TONS/DAY (1976):	2,081 (entire shop)[4]	
TYPE(S) OF STEEL PRODUCED:	Rimmed, semikilled, hot-topped steel;[1] Carbon, high strength steel[5]	
PRIMARY EMISSION CONTROL SYSTEM:	Direct shell evacuation per furnace, ducted to common dry ESP[52]	
MANUFACTURER:	Western Precipitator[52]	
DATE INSTALLED:	1971[52]	
SYSTEM DESCRIPTION:	• Design flow rate: 140,000 acfm at 170°F[53] • <u>Test data (1972):</u>[52] 106,333 dscfm	
SECONDARY EMISSION CONTROL SYSTEM:[a]		

ADDITIONAL COMMENTS:

[a]Secondary emission control via charging and tapping canopy hoods ducted to a 1,075,000 acfm positive pressure baghouse with a gross air-to-cloth ratio of 3.15:1 scheduled for November 1982 startup.[52]

TABLE 21. JONES & LAUGHLIN STEEL CORP./PITTSBURGH WORKS IN PITTSBURGH, PA

ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 91[54]	No. 92[54]
STARTUP DATE:	1979[1,54]	1979[1,54]
SHELL DIAMETER (ft-in.):	32-0[1]	32-0[1]
STEEL PRODUCTION:		
RATED TONS/DAY:		
AVERAGE TONS/DAY ( ):		
TYPE(S) OF STEEL PRODUCED:	Carbon[1]	
PRIMARY EMISSION CONTROL SYSTEM:	Direct shell evacuation per furnace, ducted to common baghouse[54]	
MANUFACTURER:	AAF[55]	
DATE INSTALLED:	1979[45,55]	
SYSTEM DESCRIPTION:	• Rated flow = 1,000,000 acfm at 200°F[55] • 13 compartments; Dacron bags[55] • Pressurized baghouse[54] • Three 2,000 hp fans required[54]	
SECONDARY EMISSION CONTROL SYSTEM:	Canopy hood per furnace, ducted to primary control system baghouse[54] (see above system description)	

ADDITIONAL COMMENTS:

TABLE 22. JONES & LAUGHLIN STEEL CORP./WARREN PLANT IN WARREN, MI

ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 1[1,56]	No. 2[1,56]	No. 3[1,56]
STARTUP DATE:	1933[1,56]	1939[1,56]	1945[1,56]
SHELL DIAMETER (ft-in.):	18-0[1]	18-0[1]	18-8[1]
STEEL PRODUCTION:			
RATED TONS/DAY:	2,100 (all five furnaces combined)[57]		
AVERAGE TONS/DAY ( ):	1,260 (with normal three furnace operation)[a,57]		
TYPE(S) OF STEEL PRODUCED:	Stainless, alloy[1,5]		
PRIMARY EMISSION CONTROL SYSTEM:	Canopy hood per furnace, ducted to common baghouse[56,57]		
MANUFACTURER:	Wheelabrator[56]		
DATE INSTALLED:	1967[56]		
SYSTEM DESCRIPTION:[b]	• 800,000 acfm (rated)[56] • Four 700 hp forced draft fans operated in parallel[56,57] • Positive pressure--30 compartments[56,37] • 5,760 bags (total)[57]		
SECONDARY EMISSION CONTROL SYSTEM:	Total building evacuation, ducted to primary control system baghouse[56,57] (see above system description)		

(continued)

TABLE 22 (continued)

ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 4[1,56]	No. 5[1,56]
STARTUP DATE:	1948[1,56]	1949[1,56]
SHELL DIAMETER (ft-in.):	18-0[1]	18-0[1]
STEEL PRODUCTION:		
RATED TONS/DAY: AVERAGE TONS/DAY ( ):	See previous page[a,57]	
TYPE(S) OF STEEL PRODUCED:	Stainless, alloy[1,5]	
PRIMARY EMISSION CONTROL SYSTEM:[b]	Canopy hoods per furnace, ducted to common baghouse[56,57] (see previous page for system description)	
SECONDARY EMISSION CONTROL SYSTEM:	Total building evacuation, ducted to primary control system baghouse[56,57] (see previous page for system description)	

ADDITIONAL COMMENTS:

[a]Only three EAF's operate at one time, fourth furnace on standby, fifth furnace being relined.[56,57]

[b]AOD and all five EAF's ducted to common baghouse. Curtain wall inside shop on charge side of furnaces extends 10 to 15 ft down from roof to direct emissions to each duct.[56]

TABLE 23. LONE STAR STEEL CO. IN LONE STAR, TX

ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 6[51]	No. 7[51]
STARTUP DATE:	1976[51]	1976[51]
SHELL DIAMETER (ft-in.):	15-0[58]	15-0[58]
STEEL PRODUCTION:		
RATED TONS/DAY:		
AVERAGE TONS/DAY ( ):		
TYPE(S) OF STEEL PRODUCED:	Carbon[1,5]	
PRIMARY EMISSION CONTROL SYSTEM:	Total enclosure on each furnace, ducted to common steam-hydro scrubber system[51]	
MANUFACTURER:	Hydro-sonics/Lone Star[59,60]	
DATE INSTALLED:	1976[51,60]	
SYSTEM DESCRIPTION:	• Enclosure volume = 114,000 cu ft per furnace[59,60] • 75,000-90,000 acfm exhausted from each enclosure during all process modes[59,60] • Gas temperature (charging, melt, refine) = 175°F[60] • Inlet Δp = 7.5 in. W.G.[60] • Steam pressure per unit = 400 psig[51] • Typical operating parameters (2 furnace operation):[51] 175,000-200,000 acfm at 150°F 480 gpm H_2O required L/G = 2.4-2.7 gpm/1000 acfm	
SECONDARY EMISSION CONTROL SYSTEM:	Tapping emissions collected by a local hood inside each enclosure[51] (see above system description)	

ADDITIONAL COMMENTS:

TABLE 24. McLOUTH STEEL CORP./TRENTON WORKS IN TRENTON, MI

ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:[a]	No. 6[61]	No. 7[61]
STARTUP DATE:	1954[1]	1954[1]
SHELL DIAMETER (ft-in.):	27-6[1]	24-6[1]
STEEL PRODUCTION:		
RATED TONS/DAY:	1,150 (both furnaces combined)[4]	
AVERAGE TONS/DAY (1976):	410 (both furnaces combined)[4]	
TYPE(S) OF STEEL PRODUCED:[b]	Carbon[1,5]	
PRIMARY EMISSION CONTROL SYSTEM:	Direct shell evacuation per furnace, ducted to common scrubber-disintegrator system[62]	
MANUFACTURER:	Thiessen[63]	
DATE INSTALLED:	1954[63]	
SYSTEM DESCRIPTION:	• High efficiency wet scrubber-disintegrator[8,62] • 60,000 scfm induced draft fan[62] • Test data (1956):[8] 50,000 acfm at 60°F (inlet)	

ADDITIONAL COMMENTS:

[a]Furnaces are located in BOF shop.[61]

[b]Facility produced stainless steel prior to November 1977.[62]

TABLE 25. NATIONAL STEEL CORP./GREAT LAKES STEEL DIVISION IN ECORSE, MI

ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 31[64]	No. 32[64]
STARTUP DATE:	1968;[64] 1970[1]	1970[1]
SHELL DIAMETER (ft-in.):	22-0[1]	22-0[1]
STEEL PRODUCTION:		
RATED TONS/DAY:	2,085 (both furnaces combined)[65]	
AVERAGE TONS/DAY (1976):	1,903 (both furnaces combined)[4]	
TYPE(S) OF STEEL PRODUCED:	Low, medium carbon, low alloy[1]	
PRIMARY EMISSION CONTROL SYSTEM:	Direct shell evacuation per furnace, ducted to common baghouse[64]	
MANUFACTURER:		
DATE INSTALLED:		
SYSTEM DESCRIPTION:	• Flow rate = 75,300 scfm (each furnace)[65] • 7 compartments--966 graphite coated bags (total)[64] • A/C = 1.67:1 (normal operation) one compartment down for cleaning[64] • Baghouse exhausts through 3 stacks[65]	
SECONDARY EMISSION CONTROL SYSTEM:[a]		

ADDITIONAL COMMENTS:

[a]Planning to install roof canopy hoods by December 1982.[66]

TABLE 26. REPUBLIC STEEL CORP./CENTRAL ALLOY DISTRICT IN CANTON, OH

NO. 3 ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 2[67]	No. 4[67]	No. 5[67]
STARTUP DATE:	1942[68]	1942[68]	1942[68]
SHELL DIAMETER (ft-in.):			
STEEL PRODUCTION:			
RATED TONS/DAY:			
AVERAGE TONS/DAY ( ):			
TYPE(S) OF STEEL PRODUCED:	Carbon, alloy, stainless[1,5]		
PRIMARY EMISSION CONTROL SYSTEM:	Canopy hoods per furnace, ducted to common baghouse[69]		
MANUFACTURER:	Wheelabrator[68]		
DATE INSTALLED:	1976[67,68]		
SYSTEM DESCRIPTION:	• Design flow rate = 1,400,000 acfm; positive pressure baghouse[67] • Baghouse also controls AOD vessel within No. 3 shop[67]		
SECONDARY EMISSION CONTROL SYSTEM:	Total building evacuation, ducted to primary control system[69] (see above system description)		

ADDITIONAL COMMENTS:

TABLE 27. REPUBLIC STEEL CORP./CENTRAL ALLOY DISTRICT IN CANTON, OH

NO. 4 ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 6[67]	No. 7[67]	No. 8[67]	No. 9[67]
STARTUP DATE:	1968[1]	1968[1]	1968[1]	1968[1]
SHELL DIAMETER (ft-in.):	26-0[1]	26-0[1]	26-0[1]	26-0[1]
STEEL PRODUCTION:				
RATED TONS/DAY:	3,776 (all four furnaces combined)[70]			
AVERAGE TONS/DAY:				
TYPE(S) OF STEEL PRODUCED:	Carbon, alloy, stainless[1,5]			
PRIMARY EMISSION CONTROL SYSTEM:[a]	Direct shell evacuation per furnace, ducted to common baghouse[67,69]			
MANUFACTURER:	AAF[68,71]			
DATE INSTALLED:[b]	1968[67]			
SYSTEM DESCRIPTION:	• Total flow rate = 450,000 acfm;[67] 112,000 acfm at 275°F from each furnace[70] • Positive pressure baghouse[69] • AMERtherm ringed-Dacron bag collector[71]			
SECONDARY EMISSION CONTROL SYSTEM:[a]				

ADDITIONAL COMMENTS:

[a]The No. 4 shop will have a new 2.7 x 10^6 acfm baghouse by 1982 for primary and secondary emission control.[70]

[b]Baghouse upgraded in 1977.[67]

TABLE 28. REPUBLIC STEEL CORP./CHICAGO DISTRICT IN CHICAGO, IL

ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 5[72]	No. 6[72]	No. 7[72]
STARTUP DATE:	1970[1]	1970[1]	1970[1]
SHELL DIAMETER (ft-in.):	24-0[1]	24-0[1]	24-0[1]
STEEL PRODUCTION:			
RATED TONS/DAY:			
AVERAGE TONS/DAY (1974):	1,985 (all three furnaces combined)[73]		
TYPE(S) OF STEEL PRODUCED:	Carbon, alloy[1,5]		
PRIMARY EMISSION CONTROL SYSTEM:	Direct shell evacuation per furnace, ducted to common baghouse[74]		
MANUFACTURER:	AAF[71]		
DATE INSTALLED:	1970[a,73]		
SYSTEM DESCRIPTION:	Rated at 700,000 acfm[74]		
SECONDARY EMISSION CONTROL SYSTEM:	Canopy and scavenger hoods per furnace, ducted to common ESP[74]		
MANUFACTURER:	Research Cottrell and Western Precipitator[74]		
DATE INSTALLED:	1977[b,74]		
SYSTEM DESCRIPTION:	• System consists of three dry Research Cottrell ESP units; each rated at 120,000 acfm at 500°F and four dry Western Precipitator units; each rated at 176,000 acfm at 500°F[74] • ESP units are all operated in parallel with an individual exhaust fan per ESP unit[74]		

ADDITIONAL COMMENTS:

[a]Primary system upgraded in 1977.[74]

[b]The ESP's currently in use for secondary control of EAF shop were originally installed between 1963 and 1971 for control at the dismantled open hearth shop.[74]

TABLE 29. SHARON STEEL CORP./STEEL DIVISION IN FARRELL, PA

ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 1[75]	No. 2[75]
STARTUP DATE:	1958[1]	1962[1]
SHELL DIAMETER (ft-in.):		
STEEL PRODUCTION:		
RATED TONS/DAY:		
AVERAGE TONS/DAY ( ):		
TYPE(S) OF STEEL PRODUCED:	Carbon, alloy, stainless[1,5]	
PRIMARY EMISSION CONTROL SYSTEM:	Side-draft hood per furnace, ducted to common baghouse[75,76]	
MANUFACTURER:		
DATE INSTALLED:[a]	1980[75,76]	
SYSTEM DESCRIPTION:	• Baghouse rated at 900,000 scfm[75] • A/C = 3:1 (design)[76]	
SECONDARY EMISSION CONTROL SYSTEM:	Charge side canopy hood per furnace, ducted to primary control system baghouse[75,76] (see above system description)	

ADDITIONAL COMMENTS:

[a]Baghouse replaced original 300,000 scfm unit (installed in 1973) which controlled by primary emissions.[75]

TABLE 30. UNITED STATES STEEL CORP./TEXAS WORKS IN BAYTOWN, TX

NO. 1 ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 1[77]	No. 2[77]
STARTUP DATE:	1970;[1] 1971[78]	1970[1,78]
SHELL DIAMETER (ft-in.):	24-0[1]	24-0[1]
STEEL PRODUCTION:		
RATED TONS/DAY:	1,560 (both furnaces combined)[4]	
AVERAGE TONS/DAY (1976):	1,536 (both furnaces combined)[4]	
TYPE(S) OF STEEL PRODUCED:	Carbon, alloy[1,5]	
PRIMARY EMISSION CONTROL SYSTEM:	Direct shell evacuation per furnace, ducted to separate, identical scrubbers[78]	
MANUFACTURER:	AAF[77]	
DATE INSTALLED:	1971[77]	
SYSTEM DESCRIPTION:	• Each system consists of a quencher, scrubber, cyclone separator and fan ducted to a common stack[78] • Each scrubber rated at 42,000 scfm, and using 950 gpm of scrubber water[79]	

ADDITIONAL COMMENTS:

TABLE 31. UNITED STATES STEEL CORP./TEXAS WORKS IN BAYTOWN, TX

NO. 2 ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 3[77]	No. 4[77]
STARTUP DATE:	1977[78]	1977[78]
SHELL DIAMETER (ft-in.):	24-0[78]	24-0[78]
STEEL PRODUCTION:		
RATED TONS/DAY:		
AVERAGE TONS/DAY ( ):		
TYPE(S) OF STEEL PRODUCED:	Carbon, alloy[1,5]	
PRIMARY EMISSION CONTROL SYSTEM:	Direct shell evacuation per furnace, ducted to common baghouse[78]	
MANUFACTURER:	Wheelabrator-Frye[77]	
DATE INSTALLED:	1977[77,78]	
SYSTEM DESCRIPTION:	• Baghouse rated at 1,750,000 acfm at 150°F (inlet)[77] • Baghouse contains 20-compartments with 13,440 bags (total)[77] • Design A/C = 2.75:1 with shaker type cleaning[77]	
SECONDARY EMISSION CONTROL SYSTEM:	Canopy hoods per furnace, ducted to primary control system bghouse (see above system description)[78]	

ADDITIONAL COMMENTS:

TABLE 32. UNITED STATES STEEL CORP./SOUTH WORKS IN CHICAGO, IL

NO. 4 ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 411[80]	No. 412[80]
STARTUP DATE:	1970[81]	1970[81]
SHELL DIAMETER (ft-in.):	24-0[1]	24-0[1]

STEEL PRODUCTION:

RATED TONS/DAY:	1,985 (both furnaces combined)[4]
AVERAGE TONS/DAY (1976):	1,914 (both furnaces combined)[4]
TYPE(S) OF STEEL PRODUCED:	Carbon, alloy, stainless[1,5]
PRIMARY EMISSION CONTROL SYSTEM:	Direct shell evacuation per furnace, ducted to individual scrubbers[82]
MANUFACTURER:	Research Cottrell[81,83]
DATE INSTALLED:	1971[81,83]
SYSTEM DESCRIPTION:	Both control systems similar, except where noted:

- Each scrubber rated at 322,190 acfm at 400°F (inlet) and Δp = 2.17 psi[81]
- One I.D. fan[80]
- Exhaust discharge via dual stacks (denoted as east and west)[82]
- Test Data (1978):[84]
  Furnace No. 411: Δp (throat-DSE) = 60 in. H_2O
  Water flow = 1,274-1,547 gpm
  East stack = 56,400 dscfm
  West stack = 82,100 dscfm
  Furnace No. 412: Δp (throat-DSE) = 61-62 in. H_2O
  Water flow = 1,691-1,700 gpm
  East stack = 74,600-79,200 dscfm
  West stack = 62,300-63,400 dscfm
- Test Data (1977):[80]
  Furnace No. 412: DSE inlet flow = 43,800 acfm (wet)
  DSE inlet flow = 46,100 acfm (wet)
  DSE outlet flow = 81,200 acfm (wet)
  Δp (throat-DSE operation) = 60 in. H_2O
  Water flow = 1,680 gpm

SECONDARY EMISSION CONTROL SYSTEM: Canopy hood per furnace, ducted to individual scrubbers (one per furnace)[82]

(continued)

TABLE 32 (continued)

NO. 4 ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

MANUFACTURER:	Research Cottrell[81,83]
DATE INSTALLED:	1971[81,83]
SYSTEM DESCRIPTION:	Both control systems similar, except where noted:

- Each scrubber rated at 230,000 acfm at 150°F (inlet) and Δp = 1.08 psi[81]
- A common I.D. fan and manifold exhausts from both primary and secondary systems. (The dual exhaust stacks are also common for both systems.)[82]
- Test Data (1978):[84]
  Δp (building evacuation) = 30 in. H_2O (same for both furnaces)
- Test Data (1977):[80]
  Furnace No. 412: Canopy inlet flow = 183,900 acfm (wet)
  Canopy outlet flow = 36,800 acfm (wet)

(continued)

TABLE 32 (continued)

NO. 4 ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 435[81]
STARTUP DATE:	1975[81]
SHELL DIAMETER (ft-in.):	20-0[81]
STEEL PRODUCTION:	
RATED TONS/DAY:	463[4]
AVERAGE TONS/DAY (1976):	544[4]
TYPE(S) OF STEEL PRODUCED:	Stainless
PRIMARY EMISSION CONTROL SYSTEM:	Direct shell evacuation ducted to Venturi Scrubber[8]
MANUFACTURER:	AAF[81,85]
DATE INSTALLED:	1975[81]
SYSTEM DESCRIPTION:	• Scrubber Design Data:[81,85] 49,870 acfm at 156°F (inlet) 60,300 acfm (outlet) Δp = 62 in. H_2O (2.3 psi) Water use rate = 54,100 gph L/G = 18 gpm/1,000 acfm • Test Data (1976):[85] 39,500-42,700 dscfm Δp (Kinpactor) = 61.3-62.4 in. H_2O Scrubber water flow = 300-320 gpm Quencher water flow = 504-517 gpm
SECONDARY EMISSION CONTROL SYSTEM:	Canopy hoods ducted to baghouse[86,87]
MANUFACTURER:	Carborondum[81,83]
DATE INSTALLED:	1975[81]
SYSTEM DESCRIPTION:	• Baghouse Design Data:[8,81] 232,000 acfm (inlet) at 150°F 222,000 acfm (outlet) 54,000 sq ft (total cloth area) Dacron bags

(continued)

TABLE 32 (continued)

NO. 4 ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

	• 10 compartment baghouse; each compartment uses one fan rated at 23,000 cfm[87] • Canopy hood dimensions are 70 ft x 100 ft[87]

ADDITIONAL COMMENTS:

TABLE 33. UNITED STATES STEEL CORP./NATIONAL-DUQUESNE WORKS IN DUQUESNE, PA

ELECTRIC ARC SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	No. 1[88]	No. 2[88]	No. 3[88]	No. 4[88]	No. 5[88]
STARTUP DATE:	1942[1]	1943[1]	1943[1]	1956[1]	1956[1]
SHELL DIAMETER (ft-in.):	18-0[1]	20-0[1]	20-0[1]	20-0[1]	20-0[1]
STEEL PRODUCTION:					
RATED TONS/DAY:					
AVERAGE TONS/DAY ( ):					
TYPE(S) OF STEEL PRODUCED:	Alloy, stainless[1,5]				
PRIMARY EMISSION CONTROL SYSTEM:[a]	Canopy hoods per furnace, ducted to common baghouse[89]				
MANUFACTURER:	AAF[89,90]				
DATE INSTALLED:	1971[89,90]				
SYSTEM DESCRIPTION:	• Flow = 1,750,000 scfm (rated)[88] • 3 compartment baghouse; 8 sections per compartment[89] • Ringed Dacron bags[91] • 3 fans used[89] • Positive pressure[89] • Reverse air cleaning[91]				
SECONDARY EMISSION CONTROL SYSTEM:	Total building evacuation, ducted to primary control system baghouse[89] (see above system description)				

ADDITIONAL COMMENTS:

[a]Canopy hoods divided into 2 sections--over tapping operation and over furnace directly[91]

MATERIAL IN THIS SECTION SUBJECT TO CONFIDENTIALITY
REVIEW AND IS NOT RELEASABLE AS OF FEBRUARY 1, 1982.
FOR INFORMATION, CONTACT L. KESARI, U.S. ENVIRONMENTAL
PROTECTION AGENCY, DIVISION OF STATIONARY SOURCE ENFORCEMENT.

REFERENCES

ELECTRIC ARC FURNACES

1. World Steel Industry Data Handbook: Vol.. I. The United States. McGraw-Hill Magazine. 1978. pp. 80-89. (Reliability No. 4.)

2. Telephone conversation. Ralph Hall, Maryland State Department of Health and Mental Hygiene to Michael Jasinski, GCA/Technology Division. October 29, 1981. (Reliability No. 2.)

3. Telephone conversation. Mark Sylvester, Maryland State Department of Health and Mental Hygiene to Michael Jasinski, GCA/Technology Division. February 13, 1981. (Reliability No. 2.)

4. Development Document for Proposed Effluent Limitations Guidelines and Standards for the Iron and Steel Manufacturing Point Source Category. EPA-440/1-79-024a, Volume V. Draft Report, U.S. Environmental Protection Agency, Effluent Guidelines Division Office of Water and Waste Management. October 1979. (Reliability No. 4.)

5. American Iron and Steel Institute. Directory of Iron and Steel Works in the U.S. and Canada. Thirty-fourth Edition. 1977. (Reliability No. 4.)

6. McKewer, P. L. Unique Features of ARMCO-Butler's Electric Furnace Melt Shop. Iron and Steel Engineer. 49(6):75-86, June 1972. (Reliability No. 3.)

7. Telephone conversation. Ken Bowman, Pennsylvania Department of Environmental Resources, Pittsburgh, PA to Michael Jasinski, GCA/Technology Division. February 18, 1981. (Reliability No. 2.)

8. JACA Steel Library. Summary Sheets Submitted by Thomas Maslany compiled by JACA from stack tests contained in Environmental Protection Agency Regional Offices. (Reliability No. 1.)

9. Telephone conversation. Arthur Witt, Pennsylvania Department of Environmental Resources, Pittsburgh, Pa. to Sandy Beaton, GCA/Technology Division. November 17, 1981. (Reliability No. 2.)

10. Lakee, C. J. Steel in Texas. Iron and Steel Engineer. 48(4):T-3 through T-14, April 1971. (Reliability No. 3.)

11. Allen, R.R. ARMCO Scrubs up for Clean Air. Iron and Steel Engineer. 48(9):113-116. September 1971. (Reliability No. 3.)

12. Iron and Steel Engineer. Industry News. 55(2):88,91. February 1978. (Reliability No. 3.)

13. Telephone conversation. Lawrence Pewitt, Texas Air Pollution Control Board to William Farino, GCA/Technology Division. October 16, 1980. (Reliability No. 2.)

14. Nunno, T. Assessment of Air Emissions from Steel Plant Operations. GCA/Technology Division Report No. 1061, Pretest Survey Report for ARMCO Steel, Kansas City, Missouri. Prepared for U.S. EPA. April 9, 1980. (Reliability No. 1.)

15. Brown, D. I. Mini and Medium Steel Plants of North America. Iron and Steel Engineer. 52(11):MM-1, MM-38. November 1975. (Reliability No. 4.)

16. Letter from Larry Cole, City of Kansas City Health Department (Air Quality Section) to Gene Bergson, GCA/Technology Division. March 6, 1981. (Reliability No. 1.)

17. Telephone conversation. Don Steele, Kansas City Health Department (Air Quality Section) to Michael Jasinski, GCA/Technology Division. October 22, 1981. (Reliability No. 2.)

18. Telephone conversation. Joe Morehart, Ohio Northwest District Air Pollution Control Board to Gene Bergson, GCA/Technology Division. March 6, 1981. (Reliability No. 2.)

19. Telephone conversation. Glen Castleberry, Tulsa City-County Health Department to Gene Bergson, GCA/Technology Division. February 25, 1981. (Reliability No. 2.)

20. Kofsch, J. A. Iron and Steel Engineer. Editor's Notes. 52(9):23. August 1975. (Reliability No. 3.)

21. Telephone conversation. Glen Castleberry, Tulsa City-County Health Department to Michael Jasinski, GCA/Technology Division. October 22, 1981. (Reliability No. 2.)

22. Letter from Joseph Tramma, South Coast Air Quality Management District to Gene Bergson, GCA/Technology Division. March 10, 1981. (Reliability No. 1.)

23. Fennelly, P. F., and P. D. Spawn. Air Pollutant Control Techniques for Electric Arc Furnaces in the Iron and Steel Foundry Industry. EPA-450/2-78-024, OAQPS No. 1.2-099. U.S. Environmental Protection Agency, Office of Air Quality and Pollution Standards, Research Triangle Park, North Carolina. June 1978. pp. 3-19 through 3-27. (Reliability No. 3.)

24. Telephone conversation. Ted Polychronis, South Coast Air Quality Management District to Michael Jasinski, GCA/Technology Division. October 21, 1981. (Reliability No. 2.)

25. Gronberg, S. Assessment of Air Emissions from Steel Plant Sources. GCA/Technology Division Pretest Survey Report for Bethlehem Steel Corp., Bethlehem, Pennsylvania. Prepared for U.S. Environmental Protection Agency. June 13, 1979. (Reliability No. 1.)

26. Telephone conversation. Mr. DiLazaro, District Supervisor, Pennsylvania Department of Environmental Resources, Bethlehem, Pennsylvania to Eugene Bergson, GCA/Technology Division. October 22, 1980. (Reliability No. 2.)

27. Iron and Steel Engineer. Equipment News. 48(5):92. May 1971. (Reliability No. 3.)

28. Telephone conversation. Richard Maxwell, Pennsylvania Department of Environmental Resources, Williamsport, PA to Michael Jasinski, GCA/Technology Division. October 29, 1981. (Reliability No. 2.)

29. Venturini, J. L. Operating Experience with a Large Baghouse in the Electric Arc Furnace Steelmaking Shop at Bethlehem Steel Corporation's Los Angeles Plant. Presented at the Sixty-third Annual Meeting of the Air Pollution Control Association, St. Louis, Missouri, June 14-18, 1970. (Reliability No. 4.)

30. Telephone conversation. John Roberts, Puget Sound Air Quality Board to Michael Jasinski, GCA/Technology Division. October 21, 1981. (Reliability No. 2.)

31. Telephone conversation. Puget Sound Air Quality Board to Gene Bergson, GCA/Technology Division. February 24, 1981. (Reliability No. 2.)

32. Telephone conversation. John Buckley, Pennsylvania Department of Environmental Resources to Gene Bergson, GCA/Technology Division. February 13, 1981. (Reliability No. 2.)

33. Telephone conversation. Ron Davis, Pennsylvania Department of Environmental Resources to Sandy Beaton, GCA/Technology Division. November 4, 1981. (Reliability No. 2.)

34. Iron and Steel Engineer. Equipment News. 55(5):73. May 1978. (Reliability No. 3.)

35. Johnson, E. R., and J. Simmons. CF&I Replaces 73 Year Old Open Hearth Shop with UHP Electric Arc Furnaces. Iron and Steel Engineer. 55(1):46-54. January 1978. (Reliability No. 3.)

36. Telephone conversation. Dennis Myers, Colorado State Department of Health to Steve Piper, GCA/Technology Division. February 1981. (Reliability No. 2.)

37. Advertisement by The Cadre Corporation, Environmental Services Group to Michael Jasinski, GCA/Technology Division from Terry Bartlett, Cadre Corporation. (Reliability No. 4.)

38. Jasinski, M. Trip Report-Pretest Survey, Crucible Stainless Steel Div., Midland, Pennsylvania, Electric Arc Shop. GCA/Technology Division. Prepared for U.S. Environmental Protection Agency. April 9, 1980. (Reliability No. 2.)

39. Telephone conversation. Bill Baxter, Pennsylvania Department of Environmental Resources, Pittsburgh, Pa. to Sandy Beaton, GCA/Technology Division. January 1982. (Reliability No. 2.)

40. Draft Report. Prepared by Pacific Environmental Services. Data Compilation of Electric Arc Furnaces in the United States. December 1981. (Reliability No. 2.)

41. Telephone conversation. Mr. Burdick and Mr. Abbott, Onondaga County Department of Health to Gene Bergson, GCA/Technology Division. February 1981. (Reliability No. 2.)

42. Region V files. (Ford response to EPA questionnaire - 2/21/78).

43. Letter from Michael Maillard, Wayne County Department of Health, to the Technical Service Files. RE: Source Testing Conducted at the Electric Arc Furnace Baghouse at the Ford Motor Company Rogue Complex. October 20, 1977. JACA Steel Library. (Reliability No. 2.)

44. Letter from Robert Bower, Assistant of Technical Services in Wayne County Department of Health, to William Achinger, Assistant Director of Wayne County Department of Health. RE: Comments on Proposed Method for Particulate Emission Tests of Baghouse Collection - Ford Motor Company, Electric Arc Facility. October 26, 1975. JACA Steel Library. (Reliability No. 2.)

45. Telephone conversation. Bernard Bloom, U.S. Environmental Protection Agency, Division of Stationary Source Enforcement to Michael Jasinski, GCA/Technology Division. (Reliability No. 2.)

46. Region V files (1974 letter from Ford).

47. Telephone conversation. Michael Maillard, Wayne County Department of Health, Air Pollution Division to William Farino, GCA/Technology Division. October 16, 1980. (Reliability No. 2.)

48. Pekron, P. Checklist Supporting Findings of Violation. U.S. Environmental Protection Agency, Region V. November 25, 1979. (Reliability No. 1.)

49. Air, Water, and Inland Steel. Environmental Quality Control at Inland Steel Company's Indiana Harbor Works. 2nd Edition, Inland Steel Publication. (Reliability No. 4.)

50. Brough, J. R., and W. A. Carter. Air Pollution Control of an Electric Furnace Steelmaking Shop. Presented at the Sixty-fourth Annual Meeting of the Air Pollution Control Association, Atlantic City, New Jersey. June 27-July 2, 1971. (Reliability No. 4.)

51. Blair, T. R., and W. L. Martin. Electric Arc Furnace Fume Control at Lone Star Steel Company. Presented at the Seventy-first Annual Meeting of the Air Pollution Control Association, Houston, Texas. June 25-30, 1978. (Reliability No. 4.)

52. Telephone conversation. Ed Wojciechowski, U.S. EPA, Region V to Gene Bergson, GCA/Technology Divsion. February 4, 1981. (Reliability No. 2.)

53. Letter from Gary Nied, Cleveland Division of Air Pollution Control to Gene Bergson, GCA/Technology Division. March 9, 1981. (Reliability No. 1.)

54. Grandy, P. J., and R. M. Vesokey. J&L Steel's Pittsburgh Works Electric Furnace Shop. Iron and Steel Engineer. 57(10):25. October 1980. (Reliability No. 4.)

55. Telephone conversation. S. Baninthaya, Allegheny County Health Department to Gene Bergson, GCA/Technology Division. February 12, 1981. (Reliability No.2.)

56. Spawn, P. Trip Report--Pretest Survey, J&L Steel Electric Arc Shop, Warren, Michigan. GCA Technology Division. Prepared for U.S. Environmental Protection Agency. February 12, 1980. (Reliability No. 2.)

57. EPA Region V Files (11-7-79 Trip Report at J&L/Warren).

58. Telephone conversation. Lawrence Pewitt, Texas Air Control Board to Sandy Beaton, GCA/Technology Division. November 1981. (Reliability No. 2.)

59. Review of Standards of Performance for Electric Arc Furnaces in the Steel Industry. Emission Standards and Engineering Division, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina. EPA-450/3-79-033. October 1979. pp. 4-8 through 4-15. (Reliability No. 3.)

60. Fennelly, P. F., and P. D Spawn, op. cit., Reference 23. pp. 3-38 through 3-40. (Reliability No. 3.)

61. Anderson, P. Compliance Inspection of McLouth Steel. GCA/Technology Division. Conducted for EPA Region V in 1978. (Reliability No. 2.)

62. EPA Region V Files (EPA inspection on 3-14-81).

63. EPA Region V Files (1974 permits).

64. Miller, R. L. The Electric Furnace Shop at Great Lakes Steel. Iron and Steel Engineer. 48(5):69-76. May 1971. (Reliability No. 3.)

65. EPA Region V Files (Litigation Report dated March 1979 w/NSC).

66. EPA Region V Files (March 1981 Memo from P. Kelly).

67. Telephone conversation. B. Blankinship, Canton City Health Department to Gene Bergson, GCA/Technology Division. March 2, 1981. (Reliability No. 2.)

68. Letter response. Andy Pasko, Canton City Health Department to Sandy Beaton, GCA/Technology Division. November 2, 1981. (Reliability No. 1.)

69. Telephone conversation. Mr. Stromsky, Canton City Health Department, Air Pollution Control Division to William Farino, GCA/Technology Division. November 1980. (Reliability No. 2.)

70. EPA Region V Files review by GCA/Technology Division. December 1981.

71. Advertisement in Iron and Steel Engineer. 48(10):24,25. October 1971. (Reliability No. 3)

72. Telephone conversation. J. Solkorowski, City of Chicago Department of Inspectional Services to Marc Grant, GCA/Technology Division. March 5, 1981. (Reliability No. 2.)

73. EPA Region V Files (Region V 1974 Emission Inventory--RSC/Chicago).

74. EPA Region V Files (Trip Report by Edward Wojciechowski at RSC/Chicago--6/79).

75. Telephone conversation. Larry Wonders, Pennsylvania Department of Environmental Resources to Gene Bergson, GCA/Technology Division. February 17, 1981. (Reliability No. 2.)

76. Telephone conversation. Bill Charleton, Pennsylvania Department of Environmental Resources, Meadsville, PA to Sandy Beaton, GCA/Technology Division. November 9, 1981 (Reliability No. 2.)

77. Telephone conversation. John Hepola, U.S. EPA Region VI to Michael Jasinski, GCA/Technology Division. November 1981. (Reliability No. 2.)

78. Laber, C. J. Baytown Revisited--U.S. Steel Texas Works' Update. Iron and Steel Engineer. 55(3):T-1 through T-12. March 1978. (Reliability No. 3.)

79. Richards, J. H. U.S. Steel Corporation's First Ingot-free Electric Arc Furnace Steel Melting Shop. Iron and Steel Engineer. 48(8):41-52. August 1971. (Reliability No. 3.)

80. Letter from D. R. Cronin, U.S. Steel Corporation/Manager of Environmental Control-West, to Laxmi Kesari, U.S. Environmental Protection Agency, Region V. RE: Stack Test Report Conducted at the No. 4 Electric Arc Furnace Shop at U.S. Steel Corporation/South Works in August 1977. JACA Steel Library. (Reliability No. 2.)

81. EPA Region V files. (Emission Inventory Data on USS/Chicago.)

82. Bergson, E. and T. Nunno. Assessment of Air Emissions from Iron and Steelmaking Sources. U.S. Steel Corporation/South Works. No. 4 EAF Shop--Scrubber stack Test Overview. GCA/Technology Division Draft Final Report No. TR-81-80-G. Prepared for U.S. Environmental Protection Agency. July 1981. (Reliability No. 1)

83. Telephone conversation. Phil Borowy, Environmental Engineer, U.S. Steel/South Works in So. Chicago, Illinois to Tom Nunno, GCA/Technology Division. September 21, 1981. (Reliability No. 2.)

84. Letter from J. H. Gross, U.S. Steel Corporation/Director-Research, to Dr. P. X. Masciantonio, U.S. Steel Corporation/Director-Environmental Control. RE: Particulate Emissions Tests, South Works Electric Arc Furnace Gas Cleaning Systems No. 411 and 412 Furnaces. Performed by U.S. Steel Corporation for Both Stacks. JACA Steel Library. June 1978. (Reliability No. 2.)

85. Letter from J. H. Gross, U.S. Steel Corporation/Director-Research, to Mr. S. P. Curtis, U.S. Steel Corporation/Vice President-Engineering. RE: Compliance Test 100-ton Electric Furnace Facility, South Works, performed by U.S. Steel Corporation. JACA Steel Library. April 23-24. (Reliability No. 2.)

86. Telephone conversation. Daniel Bakk, U.S. Environmental Protection Agency, Region V to Michael Jasinski, GCA/Technology Division. October 1980. (Reliability No. 2.)

87. EPA Region V Files (Checklist prepared 1-22-81 by D. Bakk for USS/Chicago).

88. Telephone conversation. Bob Felt, Allegheny County Health Department to Gene Bergson, GCA/Technology Division. February 12, 1981. (Reliability No. 2.)

89. Telephone conversations. Robert Felt, Allegheny County Health Department to William Farino, GCA/Technology Division. October-November 1980. (Reliability No. 2.)

90. Telephone conversation. Bob Felt, Alleghehy County Health Department to Sandy Beaton, GCA/Technology Division. November 3, 1981. (Reliability No. 2.)

91. Advertisement in Iron and Steel Engineer. 49(9):140-141. September 1972. (Reliability No. 3.)

MATERIAL IN THIS SECTION SUBJECT TO CONFIDENTIALITY
REVIEW AND IS NOT RELEASABLE AS OF FEBRUARY 1, 1982.
FOR INFORMATION, CONTACT L. KESARI, U.S. ENVIRONMENTAL
PROTECTION AGENCY, DIVISION OF STATIONARY SOURCE ENFORCEMENT.

TABLE 1. ARMCO INC./MIDDLETOWN WORKS IN MIDDLETOWN, OH

OPEN HEARTH SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:[a]	Nos. 9 through 14[1]
STARTUP DATE:	1950-1956;[1] 1956[2] (all 6 furnaces)
STEEL PRODUCTION:[b,c]	
RATED TONS/DAY:	5,507 (all 6 furnaces combined)[3]
AVERAGE TONS/DAY (1976):	2,754 (all 6 furnaces combined)[3]
TYPE OF EMISSION CONTROL SYSTEM:	Venturi scrubber per furnace[4]
MANUFACTURER:	Research Cottrell[5]
DATE INSTALLED:	1964 (Furnace No. 9)[2], 1969 (Furnace Nos. 10-14)[2]
SYSTEM DESCRIPTION:	

- In series:[4]
  Venturi scrubber, flooded elbow, cyclonic separator, fan and a sound attenuated stack
- Each scrubber designed for 117,000 acfm at 194°F; 225,000 acfm at 1350°F (maximum at scrubber inlet)[2]
- Design scrubber Δp = 52 in. H_2O[2]
- 1,500 gpm water flow[4]
- L/G = 6.7 gpm/1,000 acfm (based on 225,000 acfm)[4]
- Test Data (1971):[4]
  Δp = 47 in. W.C.

ADDITIONAL COMMENTS:

[a]As of 1981, three furnaces operating due to low steel demand.[6]

[b]Total tonnage in 1977 = 934,000.[1]

[c]Furnaces normally on 100 percent scrap charge; tap to tap time is 12 hours; oxygen lancing @ 60,000 scf/hr, 100,000 scf/hr (max); checker blowing on a 4-hr cycle.[4]

TABLE 2. BETHLEHEM STEEL CORP./SPARROWS POINT PLANT IN SPARROWS POINT, MD

NO. 4 OPEN HEARTH SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:	Nos. 90 through 96[1]
STARTUP DATE:	4 furnaces in 1957; 3 furnaces in 1958[3]
STEEL PRODUCTION:	
RATED TONS/DAY:	10,822 (all 7 furnaces combined)[3]
AVERAGE TONS/DAY (1976):	6,304 (all 7 furnaces combined)[3]
TYPE OF EMISSION CONTROL SYSTEM:	6 dry ESPs (designated C, D, E, F, G, H) and 2 venturi scrubbers (designated A and B) serve all 7 furnaces[7]

MANUFACTURER:	Koppers (ESPs)[8]	Chemico (scrubbers)[7]
DATE INSTALLED:	1961[7]	1972[7]

SYSTEM DESCRIPTION:

- Common manifold connects scrubbers and ESPs which operate in parallel[7]
- Each ESP discharges to an individual stack; scrubbers discharge to a common stack[7]
- ESP Design Data:[7]
  - 57,200 dscfm per ESP
  - Inlet temp = 503°F
  - Outlet temp = 467°F
  - 34,700 sq ft collection area per ESP
  - 50 sparks/min (rated)
- Scrubber Design Data:[7]
  - 99,300 dscfm per scrubber
  - Inlet temp = 503°F
  - Outlet temp = 141°F
  - Δp = 55 in. W.C. per scrubber
- Test Data (1976):[a,9]
  - Scrubbers "A" and "B": 192,206 dscfm (avg.), 143°F (avg.)
  - ESP "C": 52,640 dscfm (avg.), 428°F (avg.)
  - ESP "D": 56,165 dscfm (avg.), 434°F (avg.)
  - ESP "E": 58,618 dscfm (avg.), 449°F (avg.)
  - ESP "F": 62,988 dscfm (avg.), 434°F (avg.)
  - ESP "G": 59,782 dscfm (avg.), 446°F (avg.)
  - ESP "H": 64,300 dscfm (avg.), 410°F (avg.)
- Control System Operating Data (1976):[a,9]
  - Scrubber A: Δp = 54-57 in. H_2O; water flow = 930-1,200 gpm
  - Scrubber B: Δp = 54-55 in. H_2O; water flow = 1,070-1,140 gpm

(continued)

TABLE 2 (continued)

NO. 4 OPEN HEARTH SHOP PROCESS AND EMISSION CONTROL DATA

SECONDARY EMISSION CONTROL SYSTEM:	Hot metal transfer area to baghouse[7,10]
MANUFACTURER:	Buell[10]
DATE INSTALLED:	1975;[8] 1977[10]
SYSTEM DESCRIPTION:	• Conventional hood system with a spark box[7] • 150,000 scfm and 200°F (design)[7,10] • Positive pressure design[7]

ADDITIONAL COMMENTS:

[a]Six of seven furnaces operating during 1976 testing; i.e., Nos. 90, 91, 92, 93, 95, and 96.[9]

TABLE 3. INLAND STEEL CO./INDIANA HARBOR WORKS IN E. CHICAGO, IN

NO. 3 OPEN HEARTH SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:[a,b]	Nos. 1 through 7[1]
STARTUP DATE:	Nos. 1 through 4 in 1951;[1] Nos. 5 through 7 in 1953[1]
STEEL PRODUCTION:[c]	
RATED TONS/DAY:	8,136 (all 7 furnaces combined)[11]
AVERAGE TONS/DAY:	
TYPE OF EMISSION CONTROL SYSTEM:	All 7 furnaces manifold to common, dry ESPs[1,13]
MANUFACTURER:	Western Precipitator[14]
DATE INSTALLED:	1968[15]
SYSTEM DESCRIPTION:[d]	

- Five ESPs each divided into two chambers; system designed for 9 out of 10 to be in use[14]
- Five I.D. fans rated at 400,000 cfm each[14]
- 1.6×10^6 acfm (avg.)[13]
- 130 flat collection plates spaced 10 in. apart[13]
- Surface area = 490,000 sq ft (total)[13]
- 304 ft^2/1,000 acfm[13]
- Test Data (1981):[16]
  5-furnace operation, exhaust flow rate = 1,288,000 acfm at 419°F
- Test Data (1974):[13]
  Flow rate = 1,590,000-1,630,000 (range)
  Temperature = 435-460°F (range)

ADDITIONAL COMMENTS:

[a]Reversing recuperator, overfired type furnaces.[1]

[b]Six furnaces operate at any one time.[12]

[c]1977 yearly production (total shop) = 1,910,000 tons.[12]

[d]Manifold collects gases from all seven furnaces to 18 x 20 x 32 ft mixing chamber which provides a homogeneous mixture of particulate at ESP inlet; ten 8 x 7 ft rectangular ducts carry gases to the ESP.[13]

TABLE 4. LONE STAR STEEL CO. IN LONE STAR, TX

OPEN HEARTH SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:[a,b]	No. 1[1] No. 2[1] No. 3[1] No. 4[1] No. 5[1]
STARTUP DATE:	4 units in 1953; 5th unit added in 1956[17]
STEEL PRODUCTION:	
RATED TONS/DAY:	3,835 (all 5 furnaces combined)[3]
AVERAGE TONS/DAY (1976):	3,048 (all 5 furnaces combined)[3]
TYPE OF EMISSION CONTROL SYSTEM:	3 steam-hydro scrubber units in parallel serve all 5 furnaces[18]
MANUFACTURER:	Hydro-Sonics/Lone Star[18]
DATE INSTALLED:	1972[18]
SYSTEM DESCRIPTION:	

- Common manifold from all furnaces to 3 waste-heat boilers[18]
- Design flow rate = 105,000-160,000 acfm (total)[18]
- Gas temp (inlet) = 1,200-1,700°F[18]
- Each steam-hydro unit consists of steam nozzle-water injector which induces flow (no fan needed)[18]

ADDITIONAL COMMENTS:

[a]Maximum of 4 furnaces operate at any one time.[18]

[b]Natural gas and oil used as fuel; gas/oil ratio = 80/20 during meltdown and 50/50 during refining.[17]

TABLE 5. UNITED STATES STEEL CORP./FAIRLESS WORKS IN FAIRLESS HILLS, PA

OPEN HEARTH SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION: Nos. 1 through 9[1]

STARTUP DATE: From 1951-1953; rebuilt 1960[21]

STEEL PRODUCTION:[a]

RATED TONS/DAY:
AVERAGE TONS/DAY (   ):

TYPE OF EMISSION CONTROL SYSTEM:	9 Dry ESPs (Primary)[19]	1 Dry ESP (Secondary)[19]
MANUFACTURER:	Koppers[20]	Research Cottrell[20]
DATE INSTALLED:		1970[21]

SYSTEM DESCRIPTION:

- Waste heat boiler, ducted to a primary ESP per furnace, common manifold to the secondary ESP which serves all 9 furnaces, discharging to a common stack[19]
- 3 I.D. fans preceed stack (total rating = 1,023,000 scfm)[20]

- Koppers ESP--9 pairs of single-celled ESPs (1 per furnace) operated in parallel[20]

- Research Cottrell ESP--2 dual-celled units operated in parallel[20]
- Design Data:[21]
  Plate area = 119,300 sq ft
  3 I.D. fans @ 340,000 cfm each

- Test Data (1974):[22]
  847,500 scfm
  Temp = 414°F (avg.)
- Test Data (1977):[b,20]
  1,059,914-1,202,511 acfm
  Temp = 401-410°F

ADDITIONAL COMMENTS:

[a]Plant presently operating at 50 percent capacity.[19]

[b]All furnaces, except No. 2, operated during 1977 stack tests.[20]

TABLE 6. UNITED STATES STEEL CORP./HOMESTEAD WORKS IN HOMESTEAD, PA

OPEN HEARTH SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:[a]	Nos. 65 through 75[1]	
STARTUP DATE:	Approx. 1946 (all furnaces)[23]	
STEEL PRODUCTION:[b]		
RATED TONS/DAY:		
AVERAGE TONS/DAY ( ):		
TYPE OF EMISSION CONTROL SYSTEM:	5 dry ESPs[24]	
MANUFACTURER:	4 ESPs--Research Cottrell[25]	1 ESP--Western Precipitator[25]
DATE INSTALLED:	Pre-1970[26]	1971[26]
SYSTEM DESCRIPTION:	• Common manifold directs gases to 5 ESPs operating in parallel[24] • Total (combined) flow rate = 600,000 scfm[25] • <u>Test Data (1977)</u>:[24] ESP No. 1--318,281 acfm (avg.) ESP No. 2--165,963 acfm (avg.) ESP No. 3--156,322 acfm (avg.) ESP No. 4--193,838 acfm (avg.) ESP No. 5--282,755 acfm (avg.)	

ADDITIONAL COMMENTS:

[a]Only 10 furnaces can be operated at any one time; usually 6-8 furnaces are in operation simultaneously.[24]

[b]Oxygen lancing at 105,000-110,000 cfh during refining.[24]

TABLE 7. UNITED STATES STEEL CORP./GENEVA WORKS IN PROVO, UT

OPEN HEARTH SHOP PROCESS AND EMISSION CONTROL DATA

FURNACE DESIGNATION:[a]	Nos. 90 through 99[1]
STARTUP DATE:	1944 (all 10 furnaces)[3]
STEEL PRODUCTION:	
RATED TONS/DAY:	6,550;[3] 6,850[27] (all 10 furnaces combined)
AVERAGE TONS/DAY (1976):	5,867 (all 10 furnaces combined)[3]
TYPE OF EMISSION CONTROL SYSTEM:	8 ESP-scrubber units serve all 10 furnaces[27]
MANUFACTURER:	ESPs, Research Cottrell;[27] Scrubbers, U.S. Steel[27]
DATE INSTALLED:[b-e]	ESPs, 1955;[27] Scrubbers, 1962[27]
SYSTEM DESCRIPTION:	• Each unit contains an ESP and scrubber in series; all 8 units operate in parallel[27,28] • Design flow rate per unit = 66,400 dscfm[28] • <u>ESP Specifications</u>:[27] - Plate-type, each with three fields and two sections per field - Collection area per unit: Field 1 = 6,043.5 sq ft Field 2 = 6,043.5 sq ft Field 3 = 12,087 sq ft - SCA per unit = 180 sq ft/1,000 acfm • <u>Scrubber Specifications</u>:[27] - Partial-orifice type wet scrubbers - Δp = 4 in. W.C. (per unit) - Scrubber water = 650 gpm (per unit) - L/G = 5.9:1 (per unit)

ADDITIONAL COMMENTS:

[a]Four furnaces operate at any one time (1981).[29]

[b]All ESPs upgraded in 1968 to increase voltage.[28]

[c]Each ESP unit was modified in 1972 by increasing the number of transformer-rectifier sets from two to three.[27]

[d]All scrubbers were modified in 1972 by relocating the internal sprays.[27]

[e]Four of eight ESP-scrubber units were upgraded in 1981.[29]

MATERIAL IN THIS SECTION SUBJECT TO CONFIDENTIALITY REVIEW AND IS NOT RELEASABLE AS OF FEBRUARY 1, 1982. FOR INFORMATION, CONTACT L. KESARI, U.S. ENVIRONMENTAL PROTECTION AGENCY, DIVISION OF STATIONARY SOURCE ENFORCEMENT.

REFERENCES

OPEN HEARTH SHOP

1. World Steel Industry Data Handbook: Volume No. 1. The United States. McGraw-Hill Magazine. 1978. (Reliability No. 4.)

2. Data collected by GCA from EPA Region V files. (Renewal Permit Applications No. 1809010006P028-33, dated September 1976.)

3. Development Document for Proposed Effluent Limitations Guidelines and Standards for the Iron and Steel Manufacturing Point Source Category. Draft Report. Vol. IV. EPA 440/1-79-024a. October 1979. pp. 275. (Reliability No. 4.)

4. Metallurgical Applications. JAPCA. 27(11): 1072-1074. November 1977. (Reliability No. 4.)

5. Telephone conversation. Ed Luebering, SW District-Ohio EPA to Gene Bergson, GCA/Technology Division. March 9, 1981. (Reliability No. 2.)

6. Telephone conversation. Steve Samorgin, SW District-Ohio Environmental Protection Agency to Sandy Beaton, GCA/Technology Division. October 1981. (Reliability No. 2.)

7. Correspondence to Robert McCrillis, U.S. EPA, Research Triangle Park, NC from Peter Spawn, GCA/Technology Division. May 5, 1980. (Reliability No. 3.)

8. Telephone conversation. Mark Sylvester, Maryland State Department of Health and Mental Hygiene to Michael Jasinski, GCA/Technology Division. February 13, 1981. (Reliability No. 2.)

9. Stack Test Report No. 76-19. Bethlehem Steel Corp./Sparrows Point, Maryland. No. 4 Open Hearth Shop. Testing by Maryland Department of Health and Mental Hygiene. July 1976. (Reliability No. 1.)

10. Telephone conversation. Ralph Hall, State of Maryland to M. Jasinski, GCA/Technology Division. October 29, 1981. (Reliability No. 2.)

11. Telephone conversation. Phil Pekron, U.S. EPA Region V to S. Beaton, GCA/Technology Division. October 1981. (Reliability No. 2.)

12. Spawn, P. Collection of Samples for Radioassay at Integrated Steel Mills. GCA/Technology Division. Draft Final Report No. TR-80-7-G. February 1980. (Reliability No. 2.)

13. Jacko, R. B., et al. Fractional Collection Efficiency of Electrostatic Precipitation for Open Hearth Furnace Metal Emissions. Environmental Science and Technology. 10(10): 1002-1005. October 1976.

14. Stewart, J. Jr. Centralized Control Guides Efficient Operation of Inland Precipitators. Iron and Steel Engineer. February 1971. (Reliability No. 4.)

15. Air, Water, and Inland Steel. Environmental Quality Control at Inland Steel Company's/Indiana Harbor Works. 2nd Edition. Inland Steel Publication. pp. 28. (Reliability No. 4.)

16. Data collected by GCA from EPA Region V files. (Inland Steel Open Hearth Shop Stack Tests in July 1981.)

17. Steel in Texas. Iron and Steel Engineer. 48(4): T-14 through T-21. April 1971. (Reliability No. 3.)

18. Blair, T. R. and W. L. Martin. Air Pollution Control System at Lone Star Steel's Open Hearth Shop. Iron and Steel Engineer, April 1976. pp. 83-88. (Reliability No. 4.)

19. Telephone conversation. Tom McGinley, PADER, Morristown, PA to Sandy Beaton, GCA/Technology Division. October 1981. (Reliability No. 2.)

20. Report of an Emission Test at the Common Stack of 9 Open Hearth Furnaces. U.S. Steel Corp./Fairless Works in Fairless Hills, PA. JACA Corp. testing for U.S. EPA, Region III. August 1977. JACA Library. (Reliability No. 1.)

21. Samways, N. L. Fairless Works Faces the 1980's--A Look at the Plant Today. Iron and Steel Engineer. April 1980. pp. F-1. (Reliability No. 4.)

22. Stack Test Report. USSC/Fairless Works Open Hearth Shop in Fairless Hills, PA. PADER testing. September 16, 1974. JACA Library. (Reliability No. 1.)

23. Telephone conversation. Robert Felt, Allegheny County Department of Health to Sandy Beaton, GCA/Technology Division. November 1981. (Reliability No. 2.)

24. Bradway, R. M. and H. F. Schiff. USSC Homestead Open Hearth Furnace Shop No. 5 Particulate Emission Quantification. GCA Report No. TR-77-44-G. Final Report. May 1978. (Reliability No. 1.)

25. Telephone conversation. Bob Felt, Allegheny County Health Department to Gene Bergson, GCA/Technology Division. February 12, 1981. (Reliability No. 2.)

26. Telephone conversation. Bernard Bloom, U.S. EPA, Division of Stationary Source Enforcement to Michael Jasinski, GCA/Technology Division. December 1980 through February 1981. (Reliability No. 2.)

27. Impact of Particulate Matter Emissions on Ambient Air Quality. USSC-Geneva Works. EPA-300/2-77-005b. Appendix II-Source Identification. February 1977. pp. 84, 90. (Reliability No. 4.)

28. Telephone conversation. Mr. Kopta, Utah State Division of Environmental Health to Gene Bergson, GCA/Technology Division. February 27, 1981. (Reliability No. 2.)

29. Telephone conversation. Dave Kopta, Utah State Division of Environmental Health to Michael Jasinski, GCA/Technology Division. October 1981. (Reliability No. 2.)

MATERIAL IN THIS SECTION SUBJECT TO CONFIDENTIALITY REVIEW AND IS NOT RELEASABLE AS OF FEBRUARY 1, 1982. FOR INFORMATION, CONTACT L. KESARI, U.S. ENVIRONMENTAL PROTECTION AGENCY, DIVISION OF STATIONARY SOURCE ENFORCEMENT.

TABLE 1. ARMCO INC./HOUSTON WORKS IN HOUSTON, TX

SCARFING MACHINE(S) PROCESS AND EMISSION CONTROL DATA

MILL DESIGNATION:	35-inch[1] Blooming	Slabbing[1]
STARTUP DATE:		
STEEL PROCESSED:		
RATED TONS/DAY:	1,781[1]	4,101[1]
AVERAGE TONS/DAY:		
AMOUNT OF OXYGEN USED (ft^3/min):		
SCARFING EMISSION CONTROL SYSTEM:	High-energy scrubber[1]	High-energy scrubber[1]
MANUFACTURER:		
DATE INSTALLED:		
SYSTEM DESCRIPTION:	• Rated at 141,000 acfm[1]	• Rated at 100,000 acfm[1]

ADDITIONAL COMMENTS:

TABLE 2. ARMCO INC./KANSAS CITY WORKS IN KANSAS CITY, MO

SCARFING MACHINE(S) PROCESS AND EMISSION CONTROL DATA

MILL DESIGNATION:	Blooming[1]
STARTUP DATE:	1963[2]
STEEL PROCESSED:	
RATED TONS/DAY:	2,274[1]
AVERAGE TONS/DAY:	
AMOUNT OF OXYGEN USED (ft^3/min):	
SCARFING EMISSION CONTROL SYSTEM:	High-energy scrubber[1]
MANUFACTURER:	Koch[2]
DATE INSTALLED:	1974[2]
SYSTEM DESCRIPTION:	• Design flow rate = 46,000 acfm[1] (50,000 acfm @ 60°F--inlet)[2] • Scrubber water flow rate (design) = 400 gpm[2] • L/G = 8:1 (calculated-design)[2]

ADDITIONAL COMMENTS:

TABLE 3. ARMCO INC./MIDDLETOWN WORKS IN MIDDLETOWN, OH

SCARFING MACHINE(S) PROCESS AND EMISSION CONTROL DATA

MILL DESIGNATION:	Slabbing[1] (48 x 96 in. 2-h universal mill)[3]
STARTUP DATE:	1967[3]
STEEL PROCESSED:	
RATED TONS/DAY:	7,123[1]
AVERAGE TONS/DAY:	
AMOUNT OF OXYGEN USED (ft^3/min):	
SCARFING EMISSION CONTROL SYSTEM:	High-energy scrubber[1,3]
MANUFACTURER:	AAF[3]
DATE INSTALLED:	1967[3]
SYSTEM DESCRIPTION:	• 100,000 scfm scarfing fume exhaust system.[3] • System includes a gas scrubber and fume eliminator[3] • Scarfing occurs on all four sides of slab simultaneously[3]

ADDITIONAL COMMENTS:

TABLE 4. BETHLEHEM STEEL CORP./BURNS HARBOR PLANT IN CHESTERTON, IN

SCARFING MACHINE(S) PROCESS AND EMISSION CONTROL DATA

MILL DESIGNATION:	Slabbing (50 x 96 in.)[4]
STARTUP DATE:	1969[4]
STEEL PROCESSED:	
RATED TONS/DAY:	9,315[1]
AVERAGE TONS/DAY:	
AMOUNT OF OXYGEN USED (ft^3/min):	
SCARFING EMISSION CONTROL SYSTEM:	High-energy scrubber[1,4]
MANUFACTURER:	
DATE INSTALLED:	
SYSTEM DESCRIPTION:	• 110,000 acfm[1,4]

ADDITIONAL COMMENTS:

TABLE 5. BETHLEHEM STEEL CORP./JOHNSTOWN PLANT IN JOHNSTOWN, PA

SCARFING MACHINE(S) PROCESS AND EMISSION CONTROL DATA

MILL DESIGNATION:	Blooming[1] (46-in. mill)[5]	Billet[1] (46-in. mill)[5]
STARTUP DATE:	1969[5]	1969[5]
STEEL PROCESSED:		
RATED TONS/DAY:	6,630[1]	2,671[1]
AVERAGE TONS/DAY:		
AMOUNT OF OXYGEN USED (ft^3/min):		
SCARFING EMISSION CONTROL SYSTEM:	High-energy scrubber[1]	Wet ESP[1]
MANUFACTURER:		
DATE INSTALLED:	1969[5]	1971[5]
SYSTEM DESCRIPTION:	• 100,000 acfm[1]	• 26,000 acfm[1,6] • Temp. = 50-150°F[6]

ADDITIONAL COMMENTS:

TABLE 6. BETHLEHEM STEEL CORP./LACKAWANNA PLANT IN LACKAWANNA, NY

SCARFING MACHINE(S) PROCESS AND EMISSION CONTROL DATA

MILL DESIGNATION:	45 x 90 in.[7] Slab mill	44 in.[7] Slab mill
STARTUP DATE:		
STEEL PROCESSED:		
RATED TONS/DAY:	1,000,000 lb/hr[7]	350,000 lb/hr[7]
AVERAGE TONS/DAY:		
AMOUNT OF OXYGEN USED (ft^3/min):		
SCARFING EMISSION CONTROL SYSTEM:	Tunnel with water sprays[7]	Tunnel with water sprays[7]
MANUFACTURER:		
DATE INSTALLED:		
SYSTEM DESCRIPTION:		

ADDITIONAL COMMENTS:

TABLE 7. BETHLEHEM STEEL CORP./LOS ANGELES PLANT IN LOS ANGELES, CA

SCARFING MACHINE(S) PROCESS AND EMISSION CONTROL DATA

MILL DESIGNATION:	Blooming[1]
STARTUP DATE:	1960[8]
STEEL PROCESSED:	
RATED TONS/DAY:	1,849[1]
AVERAGE TONS/DAY:	
AMOUNT OF OXYGEN USED (ft^3/min):	2,383[9]
SCARFING EMISSION CONTROL SYSTEM:[a]	Baghouse[1]
MANUFACTURER:	Fuller[9]
DATE INSTALLED:	1965[9]
SYSTEM DESCRIPTION:	• Rated at 525,000 cfm[9] with A/C = 1.95:1;[10] 1.80:1[9] • 26 compartments; total of 3,120 silicone treated glass filter bags[10] • Reverse air cleaning using 29,750 cfm[10] • Two 250-hp exhaust fans[10]

ADDITIONAL COMMENTS:

[a]Baghouse also controls the No. 3 Electric Arc Shop (primary and secondary control system),[1] two jaw crushers, and a chaser mill.[9]

TABLE 8. BETHLEHEM STEEL CORP./SPARROWS POINT PLANT IN SPARROWS POINT, MD

SCARFING MACHINE(S) PROCESS AND EMISSION CONTROL DATA

MILL DESIGNATION:	Slabbing 45 x 90 in.[11]	Blooming 40 in.[11]
STARTUP DATE:		
STEEL PROCESSED:		
RATED TONS/DAY:	8,219[1]	7,973[1]
AVERAGE TONS/DAY:	9,473[11]	1,459[11]
AMOUNT OF OXYGEN USED (ft^3/min):		
SCARFING EMISSION CONTROL SYSTEM:	Wet ESP[1,11]	Wet ESP[1,11]
MANUFACTURER:	Western Precip.[11]	Western Precip.[11]
DATE INSTALLED:	1972[11]	1972[11]
SYSTEM DESCRIPTION:	• 6 section ESP; each section with a stack[11] • F.D. fan[11] • 150,000 acfm; temp. = 100-150°F[6] • Spark rate = 17 per sec[11] • Collection area = 18,462 sq. ft.[11] • Test Data (1973):[11] 94,300 dscfm Temp. = 125°F	• 25,000 acfm; temp. = 125°F[6] • Spark rate = 21 per sec[6] • Collection area = 3,071 sq. ft.[11] • Test Data (1975):[11] 26,100 acfm Temp. = 115°F

(continued)

TABLE 8 (continued)

SCARFING MACHINE(S) PROCESS AND EMISSION CONTROL DATA

MILL DESIGNATION:	Slabbing 40 x 80 in.[11]
STARTUP DATE:	
STEEL PROCESSED:	
RATED TONS/DAY:	
AVERAGE TONS/DAY (1974):	6,398[11]
AMOUNT OF OXYGEN USED (ft^3/min):	
SCARFING EMISSION CONTROL SYSTEM:	High-energy venturi scrubber[11]
MANUFACTURER:	Koch (Flexi venturi)[11]
DATE INSTALLED:	1970[11]
SYSTEM DESCRIPTION:	• Test Data (1972):[11] 119,800 acfm @ stack conditions Temp. = 130°F (avg.) Δp = 60-66 in. H_2O Water flow = 600-660 gpm L/G = 5-5.5 (actual)

ADDITIONAL COMMENTS:

TABLE 9. CRUCIBLE, INC./A DIVISION OF COLT INDUSTRIES, ALLOY DIVISION IN MIDLAND, PA

SCARFING MACHINE(S) PROCESS AND EMISSION CONTROL DATA

MILL DESIGNATION:	Blooming[1]
STARTUP DATE:	1976[12]
STEEL PROCESSED:	
RATED TONS/DAY:	3,082[1]
AVERAGE TONS/DAY:	
AMOUNT OF OXYGEN USED (ft^3/min):	208.3[12]
SCARFING EMISSION CONTROL SYSTEM:	ESP[13]
MANUFACTURER:	Western Precip./Joy Mfg.[13]
DATE INSTALLED:	1976[14]
SYSTEM DESCRIPTION:	• Hood collection system with water sprays[13] • 3 module ESP with water wash cleaning: 1 module is cleaned every 3 scarfs - scarfing is often performed while a module is in the washing mode.[13] • Design flow rate = 90,000 acfm[14] • 1 I.D. fan[13] • Test Data (1976):[13] Outlet avg. = 86,525 acfm Inlet avg. = 97,090 acfm

ADDITIONAL COMMENTS:

TABLE 10. FORD MOTOR CO./RIVER ROUGE PLANT IN DEARBORN, MI

SCARFING MACHINE(S) PROCESS AND EMISSION CONTROL DATA[a,b]

MILL DESIGNATION:	Slabbing[1,15] (48 x 96 in. universal)[16]
STARTUP DATE:	
STEEL PROCESSED:	
RATED TONS/DAY:	10,959[1]
AVERAGE TONS/DAY (1973):	9,632[15]
AMOUNT OF OXYGEN USED (ft^3/min):	
SCARFING EMISSION CONTROL SYSTEM:	Water flume and sprays[1]
MANUFACTURER:	
DATE INSTALLED:	
SYSTEM DESCRIPTION:	• 95,000 acfm[1]

ADDITIONAL COMMENTS:

[a]Scarfer has 22 continuous set burners.[16]

[b]Plant used to have a bloom scarfer controlled by packed spray tower which is currently shut down.[15]

TABLE 11. INLAND STEEL CO./INDIANA HARBOR WORKS IN E. CHICAGO, IN

SCARFING MACHINE(S) PROCESS AND EMISSION CONTROL DATA

MILL DESIGNATION:	Blooming[1] (No. 2A)[17]	Blooming[1] (No. 3)[17]
STARTUP DATE:		
STEEL PROCESSED:		
RATED TONS/DAY:	3,425[1]	4,932[1]
AVERAGE TONS/DAY:		
AMOUNT OF OXYGEN USED (ft^3/min):		
SCARFING EMISSION CONTROL SYSTEM:	Water flume and sprays (both mills)[1]	
MANUFACTURER:		
DATE INSTALLED:		
SYSTEM DESCRIPTION:	• 90,000 acfm[1] • Test Data (1980):[17] 38,448 acfm at 82°F	• 80,000[1] • Test Data (1980):[17] 79,189 acfm at 60°F

(continued)

TABLE 11 (continued)

SCARFING MACHINE(S) PROCESS AND EMISSION CONTROL DATA

MILL DESIGNATION:	Slabbing[1] (No. 4)[17]
STARTUP DATE:	
STEEL PROCESSED:	
RATED TONS/DAY:	8,767[1]
AVERAGE TONS/DAY:	
AMOUNT OF OXYGEN USED (ft^3/min):	
SCARFING EMISSION CONTROL SYSTEM:	Water flume and sprays
MANUFACTURER:	
DATE INSTALLED:	
SYSTEM DESCRIPTION:	• 100,000[1] • Test Data (1980):[17] 132,395 acfm at 95°F

ADDITIONAL COMMENTS:

TABLE 12. JONES & LAUGHLIN STEEL CORP./ALIQUIPPA WORKS IN ALIQUIPPA, PA

SCARFING MACHINE(S) PROCESS AND EMISSION CONTROL DATA

MILL DESIGNATION:	Blooming Mill[1] (45-in.)[14,18]
STARTUP DATE:	1977[12]
STEEL PROCESSED:	
RATED TONS/DAY:	5,795[1]
AVERAGE TONS/DAY:	
AMOUNT OF OXYGEN USED (ft^3/min):	10,833[12]
SCARFING EMISSION CONTROL SYSTEM:	Wet ESP[1]
MANUFACTURER:	Western Precipitator[19]
DATE INSTALLED:	1977[14]
SYSTEM DESCRIPTION:	

- 1 chamber ESP[19]
- 3 fields (A,B,C); each field 6 ft x 24 ft with 31 gas passages[19]
- Discharge electrodes--744 stainless steel 0.1055 in. dia. with stiff electrode[19]
- 96 stainless steel collecting surfaces, each a unitized modular fin plate[19]
- 1 I.D. fan[18]
- Design flow = 125,000 acfm at 125°F
- Negative operating pressure[19]
- Test Data (1977):[18]
  Inlet = 125,000-127,500 acfm (avg.)
  Outlet = 151,000-153,600 acfm (avg.)
- Test Data (1972):[19]
  Inlet = 121,000 acfm (avg.)
  Outlet = 97,550 acfm (avg.)

ADDITIONAL COMMENTS:

TABLE 13. JONES & LAUGHLIN STEEL CORP./CLEVELAND WORKS IN CLEVELAND, OH

SCARFING MACHINE(S) PROCESS AND EMISSION CONTROL DATA

MILL DESIGNATION:	Slabbing[1]
STARTUP DATE:	1957[20]
STEEL PROCESSED:	
RATED TONS/DAY:	7,200[21]; 7,397[1]
AVERAGE TONS/DAY:	
AMOUNT OF OXYGEN USED (ft^3/min):	21,000[21]
SCARFING EMISSION CONTROL SYSTEM:	Wet ESP[1]
MANUFACTURER:	Western Precipitator[21]
DATE INSTALLED:	1975[21]
SYSTEM DESCRIPTION:	• Design flow rate = 125,000 acfm at 150°F[21]

ADDITIONAL COMMENTS:

TABLE 14. JONES & LAUGHLIN STEEL CORP./INDIANA HARBOR WORKS IN E. CHICAGO, IN

SCARFING MACHINE(S) PROCESS AND EMISSION CONTROL DATA

MILL DESIGNATION:	Slabbing[1]
STARTUP DATE:	
STEEL PROCESSED:	
RATED TONS/DAY:	7,134[1]
AVERAGE TONS/DAY:	
AMOUNT OF OXYGEN USED (ft^3/min):	
SCARFING EMISSION CONTROL SYSTEM:	High-energy scrubber[1]
MANUFACTURER:	
DATE INSTALLED:	
SYSTEM DESCRIPTION:	• Actual flow rate = 85,667 scfm with exit temp = 118°F[22] • Design flow rate = 100,000 acfm at 80°F (wet)[1,23] • Δp = 50 in. H_2O[23]

ADDITIONAL COMMENTS:

TABLE 15. JONES & LAUGHLIN STEEL CORP./PITTSBURGH WORKS IN PITTSBURGH, PA

SCARFING MACHINE(S) PROCESS AND EMISSION CONTROL DATA

MILL DESIGNATION:	Blooming[1] (46-in. primary mill)[24]
STARTUP DATE:	1979[25]
STEEL PROCESSED:	
RATED TONS/DAY:	4,975[1]
AVERAGE TONS/DAY:	
AMOUNT OF OXYGEN USED (ft^3/min):	
SCARFING EMISSION CONTROL SYSTEM:	Wet ESP[24]
MANUFACTURER:	Western Precipitator[25]
DATE INSTALLED:	1979[25]
SYSTEM DESCRIPTION:	• Flow = 125,000 acfm (original design); lowered to 90,000 acfm in late 1979[24] • Current flow rate = 91,000 scfm (1980)[26] • Test Data (1979):[24] Exhaust flow (range) = 89,900-93,500 acfm

ADDITIONAL COMMENTS:

TABLE 16. KAISER STEEL IN FONTANA, CA

SCARFING MACHINE(S) PROCESS AND EMISSION CONTROL DATA

MILL DESIGNATION:	Slabbing[1]
STARTUP DATE:	
STEEL PROCESSED:	
RATED TONS/DAY:	8,548[1]
AVERAGE TONS/DAY:	
AMOUNT OF OXYGEN USED (ft^3/min):	
SCARFING EMISSION CONTROL SYSTEM:	Wet ESP[1]
MANUFACTURER:	
DATE INSTALLED:	
SYSTEM DESCRIPTION:	• 82,000 acfm (capacity)[1]

ADDITIONAL COMMENTS:

TABLE 17. McLOUTH STEEL CORP./TRENTON WORKS IN TRENTON, MI

SCARFING MACHINE(S) PROCESS AND EMISSION CONTROL DATA

MILL DESIGNATION:	Slabbing[27]
STARTUP DATE:	
STEEL PROCESSED:	
RATED TONS/DAY:	
AVERAGE TONS/DAY:	
AMOUNT OF OXYGEN USED (ft^3/min):	
SCARFING EMISSION CONTROL SYSTEM:[a]	Baghouse[28]
MANUFACTURER:	Sly Manufacturing Co.[28]
DATE INSTALLED:	
SYSTEM DESCRIPTION:	• Collection area = 2,574 sq. ft[28] • A/C = 2.92:1[28] • Dacron bags[28]

ADDITIONAL COMMENTS:

[a]Four roof mounted scrubbers, installed in 1954, were the original control system.

TABLE 18. REPUBLIC STEEL CORP./BUFFALO DISTRICT BUFFALO, NY

SCARFING MACHINE(S) PROCESS AND EMISSION CONTROL DATA

MILL DESIGNATION:[a]	Blooming[1]
STARTUP DATE:	1963[7]
STEEL PROCESSED:	
RATED TONS/DAY:	2,359[1]
AVERAGE TONS/DAY:	
AMOUNT OF OXYGEN USED (ft^3/min):	
SCARFING EMISSION CONTROL SYSTEM:	Dry ESP[29]
MANUFACTURER:	Peabody[29]
DATE INSTALLED:	1974[29]
SYSTEM DESCRIPTION:	• Design flow rate = 42,000 scfm with an exit temperature = 96°F[7]

ADDITIONAL COMMENTS:

[a]Blooming mill tables and manipular replacement scheduled for 1980.[30]

TABLE 19. REPUBLIC STEEL CORP./CLEVELAND DISTRICT IN CLEVELAND, OH

SCARFING MACHINE(S) PROCESS AND EMISSION CONTROL DATA

MILL DESIGNATION:	44-in. bloom[28,31]	45-in. slab[28,31]
STARTUP DATE:	1961[31]	1970[31]
STEEL PROCESSED:		
RATED TONS/DAY:	2,795[1]	7,775[1]
AVERAGE TONS/DAY:		
AMOUNT OF OXYGEN USED (ft^3/min):		
SCARFING EMISSION CONTROL SYSTEM:	Wet ESP[1,28]	Wet ESP[1,28]
MANUFACTURER:	Western Precipitator[21]	Western Precipitator[21]
DATE INSTALLED:	1973[21]; 1974[31]	1977[21]; 1978[31]
SYSTEM DESCRIPTION:	• ESP Design Data:[6] 75,000 acfm at 40-150°F 3 modules with 1 field/module 96 discharge electrodes per module Tube type collecting surface • Test Data (1973):[21] 60,050 acfm at 86°F	• ESP rated at 100,000 acfm[1]

(continued)

TABLE 19 (continued)

SCARFING MACHINE(S) PROCESS AND EMISSION CONTROL DATA

MILL DESIGNATION:	18-in. billet[28,31]
STARTUP DATE:	1952[31]
STEEL PROCESSED:	
RATED TONS/DAY:	1,918[1]
AVERAGE TONS/DAY:	
AMOUNT OF OXYGEN USED (ft^3/min):	
SCARFING EMISSION CONTROL SYSTEM:	Wet ESP[1,28]
MANUFACTURER:	Western Precipitator[21]
DATE INSTALLED:	1973[21]; 1972[31]
SYSTEM DESCRIPTION:	• ESP Design Data: 45,000 acfm at 40-160°F 2 modules with 1 field/ module 96 discharge electrodes per module Tube type collecting surface

ADDITIONAL COMMENTS:

TABLE 20. UNITED STATES STEEL CORP./EDGAR THOMSON-IRVIN WORKS IN BRADDOCK, PA

SCARFING MACHINE(S) PROCESS AND EMISSION CONTROL DATA

MILL DESIGNATION:	Slabbing[1] (44-in.)	Blooming[26] (46-in.)
STARTUP DATE:		
STEEL PROCESSED:		
RATED TONS/DAY:	6,849[1]	
AVERAGE TONS/DAY:		
AMOUNT OF OXYGEN USED (ft^3/min):		
SCARFING EMISSION CONTROL SYSTEM:	Scrubber[1]	Wet ESP[25,26]
MANUFACTURER:		Western Precipitator[25,26]
DATE INSTALLED:		1981[25,26]
SYSTEM DESCRIPTION:		• Exhaust flow rate = 100,000 acfm at 125°F[26]

ADDITIONAL COMMENTS:

TABLE 21. UNITED STATES STEEL CORP./NATIONAL-DUQUESNE WORKS IN DUQUESNE, PA

SCARFING MACHINE(S) PROCESS AND EMISSION CONTROL DATA

MILL DESIGNATION:	Slabbing[1] (46-in. blooming mill)[26]	
STARTUP DATE:		
STEEL PROCESSED:		
RATED TONS/DAY:	4,521[1]	
AVERAGE TONS/DAY:		
AMOUNT OF OXYGEN USED (ft^3/min):		
SCARFING EMISSION CONTROL SYSTEM:	Wet ESP[a,1,32]	Baghouse[28]
MANUFACTURER:	Western Precipitator[26]	
DATE INSTALLED:	1975[26]	
SYSTEM DESCRIPTION:	• Design Data:[6] 100,000 acfm at 125°F 4 modules with 84 discharge electrodes per module Tube-type collecting surface • Particulate matter is washed off collection surfaces periodically[32]	• 6 modules[28] • A/C = 3.6:1[28] • Temps (design)- 200°F inlet; 125°F outlet[28] • Test Data (1975):[28] 15,000 acfm

ADDITIONAL COMMENTS:

[a]Replaced dry ESP originally installed in 1959.[32]

TABLE 22. UNITED STATES STEEL CORP./FAIRLESS WORKS IN FAIRLESS HILLS, PA

SCARFING MACHINE(S) PROCESS AND EMISSION CONTROL DATA

MILL DESIGNATION:	Blooming[1] (40-in. mill)[33]	Slabbing[1] (45-in. mill)[33]
STARTUP DATE:	1954[34]	1955[34]
STEEL PROCESSED:[a]		
RATED TONS/DAY:		
AVERAGE TONS/DAY:		
AMOUNT OF OXYGEN USED (ft^3/min):	642[34]	1,900 scfm[34]
SCARFING EMISSION CONTROL SYSTEM:	Common Wet ESP[1,34]	
MANUFACTURER:	Joy Manufacturing Co.[35]	
DATE INSTALLED:	1976[33]	
SYSTEM DESCRIPTION:		

- 4 rectangular module ESPs (one chamber per module), each containing 84 vertically mounted 10 in. I.D. x 15 ft pipes with discharge wires inside[35]
- 1 I.D. fan rated at 75,000 acfm[35]
- Water spray flushing system activated after every fifth slab or bloom is processed[35]
- Test Data (1976):[35]
  65,162 dscfm; temperature = 112°F (avg.)

ADDITIONAL COMMENTS:

[a]525 tons of blooms or slabs are scarfed per hour (maximum capacity).[35]

TABLE 23. UNITED STATES STEEL CORP./GARY WORKS IN GARY, IN

SCARFING MACHINE(S) PROCESS AND EMISSION CONTROL DATA

MILL DESIGNATION:	Slabbing[1] (46-in. mill)[35]	Billet[1] (24-in. mill)[35]
STARTUP DATE:		
STEEL PROCESSED:		
RATED TONS/DAY:	7,726[1]	3,288[1]
AVERAGE TONS/DAY:		
AMOUNT OF OXYGEN USED (ft^3/min):		
SCARFING EMISSION CONTROL SYSTEM:	ESP[1]	ESP[1]
MANUFACTURER:		
DATE INSTALLED:	1974[35]	1974[35]
SYSTEM DESCRIPTION:	• 95,000 acfm[1]	• 62,000 acfm[1]

(continued)

TABLE 23 (continued)

SCARFING MACHINE(S) PROCESS AND EMISSION CONTROL DATA

MILL DESIGNATION:	Rail[1]	Bar[1] (18-in. billet mill)[35]	Bar[1] (18-in. billet mill)[35]
STARTUP DATE:			
STEEL PROCESSED:			
RATED TONS/DAY:	1,869[1]	1,370[1]	565[1]
AVERAGE TONS/DAY:			
AMOUNT OF OXYGEN USED (ft^3/min):			
SCARFING EMISSION CONTROL SYSTEM:	ESP[1]	ESP[1]	ESP[1]
MANUFACTURER:			
DATE INSTALLED:	1974[35]	1974[35]	1974[35]
SYSTEM DESCRIPTION:	• 31,000 acfm[1]	• 62,000 acfm[1]	• 62,000 acfm[1]

ADDITIONAL COMMENTS:

TABLE 24. UNITED STATES STEEL CORP./HOMESTEAD WORKS IN HOMESTEAD, PA

SCARFING MACHINE(S) PROCESS AND EMISSION CONTROL DATA

MILL DESIGNATION:	Slabbing[a,1] (45-in. mill)[26]
STARTUP DATE:	
STEEL PROCESSED:	
RATED TONS/DAY:	8,433[1]
AVERAGE TONS/DAY:	
AMOUNT OF OXYGEN USED (ft^3/min):[b]	112,500 scfm[26]
SCARFING EMISSION CONTROL SYSTEM:	Rotoclones[26]
MANUFACTURER:	Envirotech/Chemico[26]
DATE INSTALLED:	1974[26]
SYSTEM DESCRIPTION:	• Exhaust flow rate = 105,000 scfm[26] (8,200 acfm)[1]

ADDITIONAL COMMENTS:

[a]Facility rarely operates at present.[26]

[b]Conditioning of slabs by grinding.[1]

TABLE 25. WHEELING-PITTSBURGH STEEL CORP./STEUBENVILLE PLANTS IN STEUBENVILLE AND MINGO JUNCTION, OH

SCARFING MACHINE(S) PROCESS AND EMISSION CONTROL DATA

MILL DESIGNATION:	Slabbing[a] (45-in.)[1,37]	Slabbing[b] (44-in.)[37]
STARTUP DATE:	1957[36]	1965[36]
STEEL PROCESSED:		
RATED TONS/DAY:	4,184[1]; (5,243)[37]	2,680[37]
AVERAGE TONS/DAY:		
AMOUNT OF OXYGEN USED (ft^3/min):		
SCARFING EMISSION CONTROL SYSTEM:	Low-pressure scrubber[1,36]	Impingement scrubber[36]
MANUFACTURER:		
DATE INSTALLED:	1957[36]	1965[36]
SYSTEM DESCRIPTION:		

ADDITIONAL COMMENTS:

[a]Plant is located in Steubenville, OH.[36]

[b]Plant is located in Mingo Junction, OH.[36]

MATERIAL IN THIS SECTION SUBJECT TO CONFIDENTIALITY REVIEW AND IS NOT RELEASABLE AS OF FEBRUARY 1, 1982. FOR INFORMATION, CONTACT L. KESARI, U.S. ENVIRONMENTAL PROTECTION AGENCY, DIVISION OF STATIONARY SOURCE ENFORCEMENT.

REFERENCES

SCARFING

1. U.S. Steel Industry Air Pollution Control Equipment Marketing Report. The McIlvaine Company. July 1980. Figure 12, p. ST-31. (Reliability No. 4.)

2. Telephone conversation and letter response. Don Steele, Kansas City Health Department, Air Quality Section to Michael Jasinski, GCA/Technology Division. October 22, 1981. (Reliability No. 1.)

3. Telephone conversation. Ed Luebering, SW District Ohio EPA to Gene Bergson, GCA/Technology Division. March 9, 1981. (Reliability No. 2.)

4. Labee, Charles J. From Sand to Steel: The Burns Harbor Story. Iron & Steel Engineer. 48(10): B-18 through B-48. October 1971. (Reliability No. 3.)

5. Telephone conversation. Bob Clark, Pennsylvania Department of Environmental Resources to Gene Bergson, GCA/Technology Division. March 2, 1981. (Reliability No. 2.)

6. Varga, John Jr. Control of Steel Plant Scarfing Emissions Using Wet Electrostatic Precipitators. EPA-600/2-76-054. March 1976. RACT No. 600171-600206. (Reliability No. 3.)

7. Letter response. Richard Craig, U.S. Environmental Protection Agency Region II to William Farino, GCA/Technology Division. December 1981. (Reliability No. 1.)

8. Telephone conversation. Ted Polychronis, South Coast Air Quality Management District to Michael Jasinski, GCA/Technology Division. November 1981. (Reliability No. 2.)

9. Letter response. Joseph Tramma, South Coast Air Quality Management District to Gene Bergson, GCA/Technology Division. March 10, 1981. (Reliability No. 1.)

10. Venturini, John. Operating Experience with a Large Baghouse in the Electric Arc Furnace Steelmaking Shop at Bethlehem Steel Corporation's Los Angeles Plant. Presented at the Sixty-third Annual Meeting of the Air Pollution Control Association. St. Louis, Missouri. June 14-18, 1970. (Reliability No. 4.)

11. Letter from J. W. Colbert, General Manager of BSC/Sparrows Pt. Plant, Sparrows Pt., Maryland, to Stephen Wasserserg, Director of Enforcement Division, U.S. Environmental Protection Agency Region III. Re: Information Request subsequent to EPA inspection of Sparrows Point's air control systems of March 17, 18, 27, 1975. Letter dated April 11, 1975. JACA files. (Reliability No. 2.)

12. Telephone conversation. Arthur Witt, PADER, Pittsburgh, Pennsylvania to Sandra Beaton, GCA/Technology Division. November 1981. (Reliability No. 2.)

13. Compliance Test Report, Blooming Mill Scarfer Precipitator, Crucible Steel Corp. in Midland, Pennsylvania. Western Precipitation Division Joy Manufacturing Company. Project No. 55, 139. Test Date December 13-17, 1976. RACT No. 600093. (Reliability No. 1.)

14. Telephone conversation. Ken Bowman, Pennsylvania Department of Environmental Resources to Michael Jasinski, GCA/Technology Division. February 18, 1981. (Reliability No. 2.)

15. EPA Region V files. (Ford 1973 permits.)

16. Katofiasc, Thomas W. Launching of Ford's 48 x 96 inch Universal Slabbing Mill. Iron & Steel Engineer. 48(6):49-55. 1971. (Reliability No. 3.)

17. EPA Region V files. (Data from Inland Tests in 1980.)

18. Test Report for J&L Steel Corp. 45 inch Blooming Mill Scarfer Precipitator by Western Precipitation. Test date August-September 1977. RACT No. 600027. (Reliability No. 1.)

19. Test Report for Jones & Laughlin Steel Corp./Aliquippa, Pennsylvania. Blooming Mill Hot Scarfers. Western Precipitation Division of Joy Manufacturing Company. May 1972. Job No. 781-138-01. RACT No. 600019. (Reliability No. 1.)

20. EPA Region V file review by GCA in December 1981.

21. Letter response. Gary Nied, Cleveland Division of Air Pollution Control to Gene Bergson, GCA/Technology Division. March 9, 1981. (Reliability No. 1.)

22. Telephone conversation. Don Kuh, State of Indiana Air Pollution Control to Sandy Beaton, GCA/Technology Division. October 1981. (Reliability No. 2.)

23. Telephone conversation. Ed Wojcichowski, U.S. Environmental Protection Agency Region V to Gene Bergson, GCA/Technology Division. February 4, 1981. (Reliability No. 2.)

24. Correspondence from Allegheny County Health Department to J&L Steel Corp./Pittsburgh Works regarding compliance tests on the wet electrostatic precipitator at the 46 inch primary mill hot scarfer. December 12, 1971. RACT No. 600087. (Reliability No. 1.)

25. Telephone conversation. Robert Felt, Allegheny County Department of Health to Sandy Beaton. GCA/Technology Division. November 3, 1981. (Reliability No. 2.)

26. Telephone conversation. Bob Felt, Allegheny County Department of Health to Gene Bergson, GCA/Technology Division. February 12, 1981. (Reliability No. 2.)

27. Anderson, P. A. GCA Compliance Inspection Report for EPA Region V at McLouth Steel/Trenton, MI. 1979. (Reliability No. 2.)

28. Summary sheets compiled by JACA Corp. from stack tests in regional EPA offices. Provided to JACA, Inc. for Steel Library by Tom Maslany, EPA Region III. (Reliability No. 1.)

29. Telephone conversation. Al Carlacci, New York State Department of Environmental Coservation to William Farino, GCA/Technology Division. October 1981. (Reliability No. 2.)

30. Current Domestic Expansion and Modernization Programs. Iron & Steel Engineer. February 1980. (Reliability No. 4.)

31. EPA Region V files. (RSC/Cleveland 1978 Publication.)

32. Iron & Steel Engineer. Equipment News. 52(9):95. September 1975. (Reliability No. 3.)

33. The Precipitator Newsletter. McIlvaine, Inc. June 20, 1980. No. 53, p. 54. (Reliability No. 4.)

34. Telephone conversation and letter response. Tom McGinley, PADER, Morristown, PA to Sandy Beaton, GCA/Technology Division. November 1981. (Reliability No. 1.)

35. Telephone conversation. Roland Elvambuena, City of Gary Health Department to Gene Bergson, GCA/Technology Division. March 4, 1981. (Reliability No. 2.)

36. Telephone conversation. Harold Strohmeyer, North Ohio Valley Air Authority to Sandy Beaton, GCA/Technology Division. October 1981. (Reliability No. 2.)

37. EPA Region V files. (Litigation Report.)