REPORT OF EMISSIONS TEST
BETA STEEL CORP - PORTAGE, INDIANA PLANT
PLANT ID NO. 127-00036

HOT STRIP MILL SLAB REHEAT FURNACE STACK
SELECTIVE CATALYTIC REDUCTION (SCR) UNIT
NOVEMBER 4, 1999

Prepared for:

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Introduction

This report presents and documents the results of an emissions test conducted at the Beta Steel Corp (Beta Steel) plant in Portage, Indiana. The emissions test reported herein was performed at the Hot Strip Mill Slab Reheat Furnace Stack which is the location at which emissions of air pollutants from the Hot Strip Mill Slab Reheat Furnace, which consist primarily of the products of natural gas combustion, are discharged to the atmosphere. This report has been prepared and is being submitted to the Indiana Department of Environmental Management, Office of Air Management (OAM) in accordance with the requirements for emissions test reports specified at Indiana Rule 326 IAC 3-6-4 (the Rule). The data and information provided in this report are referenced to the requirements of each of the sections of the Rule and in the same order as specified in the Rule. Pertinent documentation as specified in the Rule are provided in the following narrative text as well as the tables, figures and appendices presented after the narrative text in this report.

Certification by Person Responsible for Conducting the Emissions Test (326 IAC 3-6-4 (a)(1))

The required certification is presented in Appendix A.

Description of the Facility (326 IAC 3-6-4 (a)(2)(A))

Beta Steel operates a steelmaking and processing facility located within the Port of Indiana in Portage, Indiana (Porter County). The plant produces coiled steel hot rolled bands for sale to off-site customers. The plant consists of two main facilities: a Meltshop and a Hot Strip Mill. Figure 1 is a schematic process flow diagram of the plant.

In the Meltshop, liquid steel is produced in an electric arc furnace (EAF). Scrap, carbon bearing materials and fluxing agents are used as raw materials to produce liquid steel. The liquid steel is produced in the EAF in batches (heats). Upon

completion of melting and refining of the steel, it is poured (tapped) from the EAF into ladles. The liquid steel in the ladles is transferred to a ladle metallurgy furnace (LMF) where the steel is heated by an electric arc and further refined by the introduction of metallurgical agents. After being processed at the LMF, the liquid steel in the ladles is transferred to the continuous slab caster (Caster). At the Caster, the liquid steel is teemed (cast) from the ladle into a tundish from which it flows into a water-cooled caster mold. In the caster mold, the liquid steel, in contact with the water-cooled internal surfaces of the mold, solidifies, forming a partially solidified strand. The strand is moved from the mold by powered rollers through a series of water sprays. The water sprays cool the strand which causes solidification of the strand from the outside surfaces to the interior. The solid steel strand is cut into solid steel slabs by a cut-off torch near the exit end of the Caster. The solid steel slabs are hot rolled into steel bands at the Hot Strip Mill.

At the Hot Strip Mill, solid steel slabs are placed in a natural gas-fired slab reheat furnace where the slabs are heated to temperatures required for hot rolling. The heated slabs are transferred from the furnace to the hot rolling line. The heated slabs are passed through a roughing mill to remove scale (with high-pressure water sprays) from the outside surfaces of the slab and reduce the thickness of the slabs. From the roughing mill, the heated steel is transferred to a finishing mill where the thickness is reduced to the final thickness of the hot rolled strip. From the finishing mill, the strip is passed through a series of water sprays where the strip is cooled. Downstream of the water sprays, the strip is coiled for shipment to off-site customers.

The slab reheat furnace at the Hot Strip Mill is serviced by a selective catalytic reduction unit (SCR) for control of oxides of nitrogen in the waste gas (products of natural gas combustion) from the furnace. From the SCR, the waste gas is discharged to the atmosphere through the Hot Strip Mill Slab Reheat Furnace Stack.

The Date or Dates on Which the Test was Performed (326 IAC 3-6-4 (a)(2)(B))

Indiana Rule 326 IAC 6-5 (a)(3) requires a minimum of three test runs during an emission test. Testing for filterable and condensible particulate matter and for gaseous pollutants (NOx, VOC and CO) was conducted over three test runs. All three test runs occurred on November 4, 1999.

The Type of Tests Conducted (326 IAC 3-6-4 (a)(2)(C))

The emission test included the testing of stack gas at the Slab Reheat Furnace Stack for particulate matter (filterable and condensible), oxides of nitrogen (NOx), carbon monoxide (CO) and total hydrocarbons (VOC). The testing also included the measurement of the stack gas velocities and other stack gas properties. The data were used to calculate the stack gas flowrates. The stack gas flowrates in conjunction with the concentrations of pollutants in the stack gas were used to calculate mass emission rates of pollutants emitted through the stack to the atmosphere.

Beta Steel submitted a proposed test protocol to OAM on September 17, 1999. In response to the proposed protocol, OAM provided oral comments, which did not require revision to the submitted protocol. Table 1 presents a summary of the test methods specified in the protocol and used during the emissions test.

The Type of Process and Control Equipment (326 IAC 3-6-4 (a)(2)(D))

The Slab Reheat Furnace Stack is the location at which emissions of air pollutants from the Hot Strip Mill Slab Reheat Furnace, which primarily consist of products of natural gas combustion, are emitted to the atmosphere. the Slab Reheat furnace is used to heat steel slabs to temperatures required for hot rolling into steel strip. The reheat furnace at the Beta Steel plant is a natural gas-fired, pusher type furnace. Cold slabs are placed in double rows on a charging table and progressively pushed into and through the furnace at a controlled push rate. Heated slabs are pushed out

of the exit end of the furnace onto a powered roller line which moves the hot slabs to the next step in the hot rolling process: descaling and roughing mills.

The flue gas stream generated at the Slab Reheat Furnace is ducted through a waste heat tunnel to a selective catalytic reduction unit for the reduction of NOx concentrations in the flue gas prior to the discharge of the gas stream to the atmosphere through the Hot Strip Mill Slab Reheat Furnace Stack. The SCR Unit is equipped with a variable speed fan which is part of the Slab Reheat Furnace pressure control system. The key operating parameters for achieving desired NOx removal efficiencies are the rate of ammonia vapor injection upstream of the catalyst bed, the temperature of the catalyst in the catalyst bed (i.e., steady-state temperature of the flue gas stream at the catalyst bed) and the activity of the catalyst surfaces in the catalyst bed. Figure 2 presents a schematic flow diagram of the Slab Reheat Furnace flue gas handling and treatment system.

The Source Name and Location (326 IAC 3-6-4 (a)(2)(E))

The emissions testing subject of this report was performed at:

Beta Steel Corp
6500 South Boundary Road
Portage, Indiana 46368
Plant ID No. 127-00036

The source is located in the south-western portion of property owned by the Port of Indiana.

The Purpose of the Test (326 IAC 3-6-4 (a)(2)(F))

The emissions test reported herein was conducted to comply with the annual stack testing requirements that are specified at Operation Condition 14 on Page 8 of 15 of the PSD Construction Permit (CP-127-2326) issued to Beta Steel by OAM on February 24, 1992 and amended on April 14, 1997 (A-127-7055). The PSD

Construction Permit is the current operation permit for the plant. Operation Condition 14 requires annual stack testing of the Hot Strip Mill Slab Reheat Furnace for particulate matter, CO, VOC and NOx.

The Test Participants and Their Titles (326 IAC 3-6-4 (a)(2)(G))

Appendix B presents a list of the individuals that participated in the emissions test, the affiliations of the participants and their titles.

The Heat Input Rate (326 IAC 3-6-4 (a)(3)(A))

The heating of steel slabs in a reheat furnace is a generally continuous process except for startup and shutdown periods. In general, the natural gas firing rate (i.e., heat input rate in million BTU's per hour) is proportional to the steel slab throughput rate. During periods of delays, the natural gas firing rate (heat input rate) normally is reduced to conserve energy and prevent overheating of the slabs. During the emissions test runs, the average heat input rates varied from 233.0 to 265.2 MMBTU/hr and averaged 251.7 MMBTU/hr. This is a range of 88.1 to 100.2 and an average of 95.1 percent of the heat input capacity of 264.6 MMBTU/hr specified in the construction permit.

The Reference or Derived Conversion Factors (326 IAC 3-6-4 (a)(3)(B))

Appendix C presents a listing of all of the conversion factors used in the calculations to reduce the data obtained during the emissions test reported herein.

The Stack Gas Flowrate (326 3-6-4 (a)(3)(C))

Table 3-A, which provides the results of the particulate matter test runs, presents the stack gas flowrate measured during each of the three test runs and the average stack gas flowrate for the emissions test. Flowrates are also provided in Tables 4 and 7.

Measured Emissions Given in Units Consistent with Emissions Limitations (326 IAC 3-6-4 (a)(3)(D))

Tables 3-A and 3-B provide the measured emission rates of particulate matter given in units consistent with the emission limitations. Table 4 presents the measured emission rates for gaseous pollutants given in units consistent with the emissions limitations.

Visible Emissions Observations or Six-Minute Average Continuous Opacity Monitor Readings (326 IAC 3-6-4 (a)(3)(E))

Table 5 presents a summary of the results of visible emissions observations performed during the test for periods corresponding to the three test runs for particulate matter. As agreed to by Mr. Jarrod Fisher, the on-site IDEM observer, visible emissions were observed by a certified visible emissions observer for a total of three hours during the particulate matter test runs. Appendix D provides photocopies of the visible emission observation forms.

Average Value of Emissions From Any Continuous Gaseous Pollutants Gaseous Emissions Monitoring System (326 IAC 3-6-4 (a)(3)(F))

During the emissions testing, the concentrations of gaseous pollutants (NOx, VOC and CO) in the stack gas were continuously and simultaneously measured using continuous sampling instruments. Continuous samples of the stack gas were obtained from a location near the center of the stack.

A primary data logging apparatus was used for gaseous pollutant sampling. This recorder obtained signals (measured concentrations) from the instruments used to analyze the stack gas sample for each of the gaseous pollutants once every one second. The data logger accumulated 60 of these one-second values for each pollutant, calculated the average value of each group of 60 and stored the average in the data bank. Therefore, the stored data for each pollutant consisted of a series of 60-second (one minute) averages. This data logging and processing system

eliminates the need for continuous analog recorders (e.g., strip charts.) The analyzers used to measure concentrations of each of the gaseous pollutants in the stack gas are described below.

Oxides of Nitrogen - NOx concentrations were measured in accordance with EPA Method 7E using a Thermo Environmental Instruments (TECO) Model 42H NOx analyzer. The performance specifications of the TECO 42H meet or exceed the performance specifications for EPA Method 7E.

Carbon Monoxide - CO concentrations were measured using an adaptation of EPA Method 10 using a TECO Model 48 gas filter correlation type gas analyzer. The required performance specifications for EPA Method 10 are met by the TECO Model 48. This instrument is at least equivalent to the NDIR instrumentation described in EPA Method 10.

Volatile Organic Compounds - VOC concentrations were measured in accordance with an adaptation of EPA Method 25A using a TECO Model 51 total hydrocarbon analyzer. The TECO Model 51 measures total hydrocarbon concentrations through a flame ionization detector and associated electronics. Calibration using propane and calculation procedures specified in Method 25A results in calculated values for the non-methane fraction of total hydrocarbons (i.e., VOC). The manufacturer's specifications for the TECO Model 51 meet the performance specifications for EPA Method 25A.

Stack gas flowrates were measured using procedures specified in 40 CFR 60, Appendix A, Methods 1 through 3. The average emission rates of gaseous pollutants were calculated for each test run using the averages of the continuously measured concentrations and the measured stack gas flowrates for each test run.

The average emission rates for NOx, VOC and CO for each of the test runs during the emissions test are presented in Table 4.

The Process Flow Diagram (326 IAC 3-6-4 (a)(4)(B))

Figure 1 presents a schematic process flow diagram of the Bata Steel Plant. The diagram shows the emission units that are located in the Hot Strip Mill including the Slab Reheat Furnace, the SCR Unit and the Slab Reheat Furnace Stack at which the emissions test reported herein was performed. Figure 2 presents a schematic diagram of the Slab Reheat Furnace flue gas handling and treatment system.

The Maximum Design Capacity (326 3-6-4 (a)(4)(B))

The rated heat input capacity of the Slab Reheat Furnace, as specified in the construction permit is 264.6 MMBTU/hr. This is the current practical maximum average sustainable heat input rate over a 24-hour period. The heat input rate over individual hourly periods on occasion exceed 264.6 MMBTU/hr.

A Fuel Analysis and Heat Value for Heat Input Rate Determinations (326 IAC 3-6-4 (a)(4)(C))

Beta Steel obtains natural gas from the Northern Indiana Public Service Company (NIPSCO). NIPSCO reports an average higher heating value of 1,026 BTUs per standard cubic foot (BTU/SCF) for natural gas supplied by NIPSCO.

The Process and Control Equipment Operating Conditions (326 IAC 3-6-4 (a)(4)(D))

The key operating parameter at the Slab Reheat Furnace, with respect to the formation and emission of air pollutants, is believed to be the natural gas firing rate. The slab tons per hour reheated in the furnace generally is proportional to the natural gas firing rate. During the emissions test reported herein, an effort was made to maintain the natural gas firing rate (heat input rate) at the furnace at or near the practical heat input capacity of 264.6 MMBTU/hr. Normally encountered problems

and production delays at the Hot Strip Mill limited the average heat input rate during the three test runs to a level of approximately 95.1 percent of the rated heat input capacity. The average heat input rate and slab throughput rate during the emissions test were higher than those for normal operations.

Two key operating parameters for the SCR Unit are the ammonia injection rate as measured by the ammonia solution flowrate from the storage tank to the ammonia vaporizer and the temperature of the catalyst as measured by the flue gas temperature at the outlet of the catalyst bed. These two parameters were measured during the emissions test using the SCR Unit's computerized monitoring system and recorded on data sheets. The average values of the two key operating parameters during the three test runs are presented in Table 6.

Discussion of Variations From Normal Plant Operations (326 IAC 3-6-4 (a)(4)(E))

The Hot Strip Mill was operating normally during the emissions test. The only variation was that the natural gas firing rates were higher than normal. As described above, this was the result of efforts to operate the furnace at or near the practical rated heat input capacity of 264.6 MMBTU/hr.

Beta Steel has been and continues to be engaged in a program directed at stabilizing and optimizing control of NOx emissions from the Slab Reheat Furnace by the SCR Unit. The operating conditions except for the temperature of the catalyst bed of the SCR Unit during the emissions test reported herein were similar to those conditions that have occurred in the past (during a compliance performance test in March 1999). The catalyst bed temperature was observed to be higher than that observed in the March 1999 compliance test.

The Stack Height (326 IAC 3-6-4 (a)(4)(F))

The height of the Hot Strip Mill Slab Reheat Furnace Stack is approximately 150 feet from the local grade level to the location of discharge to the atmosphere at the top of the stack.

The Exit Diameter (326 IAC 3-6-4 (a)(4)(G))

The inside diameter of the Hot Strip Mill Slab Reheat Furnace Stack at the location of discharge to the atmosphere at the top of the stack is approximately 12 feet. This diameter is larger than the inside diameter of the stack at the location of the sampling ports (6.58 feet) because a diverging section is installed at the top of the stack (see Figure 4).

The Volumetric Flow Rate (326 IAC 3-6-4 (a)(4)(H))

Table 7 presents the volumetric flowrates of stack gas measured at the Slab Reheat Furnace Stack during the emissions test at standard dry conditions (i.e., 29.92 inches of mercury and 68°F) and at the actual stack gas conditions that were measured during the test.

The Exit Velocity (326 IAC 3-6-4 (a)(4)(J))

Table 7 presents the exit velocities that are calculated using the measured volumetric flowrates under actual stack gas conditions and the inside exit diameter of the stack.

The Exit Temperature (326 IAC 3-6-4 (a)(4)(I))

Table 7 presents the average stack gas temperatures measured at the sampling port location during the test. The stack gas exit temperatures at the discharge of the stack are assumed to be approximately equal to these measured temperatures.

Brief Discussions of the Analytical Procedures with Justification for Any Variance from Reference Method Procedures (326 IAC 3-6-4 (a)(5)(A))

The analytical procedures for the Method 5 and Method 202 particulate matter tests are described in Appendix E. These include procedures for preparation of equipment, sample recovery and laboratory analysis. No variances from the reference method procedures were necessary.

The Number of Sampling Points, the Time Per Point and the Total Sampling Time Per Run (326 IAC 3-6-4 (a)(5)(B)(i), (ii) and (iii))

The number of sampling points utilized during the particulate matter tests was 24 (i.e., 2 sampling ports, 12 points per port). The target time per point was 2.5 minutes, which would result in a total sampling time per run of (2.5 x 24) 60 minutes.

Cross Sectional Diagram of the Sampling Site Showing Sampling Points (326 IAC 3-6-4 (a)(5)(C))

Figure 3 is a cross sectional diagram of the stack at the sampling port elevation showing the locations of the sampling ports and the sampling points at each sampling port.

Diagram Showing the Stack Dimensions, the Sampling Location and the Distances from the Nearest Flow Disturbance Upstream and Downstream from the Sampling Ports (326 IAC 3-6-4 (a)(5)(D)(i) and (ii))

Figure 4 is an elevation view diagram that shows the Hot Strip Mill Slab Reheat Furnace Stack height above local grade elevation, the elevation of the stack sampling ports and the distances from the stack sampling ports from the nearest upstream and downstream flow disturbances.

Diagrams of the Sampling Trains (326 IAC 3-6-4 (a)(5)(D)(iv))

Figure 5 is a schematic diagram of the Method 5 sampling train used for sampling filterable particulate matter. Figure 6 is a schematic diagram of the Method 202 sampling train used for sampling condensible particulate matter. Sampling for both the filterable fraction and the condensible fraction of total particulate matter in the stack gas was conducted simultaneously by combining the Method 5 and the Method 202 sampling trains into a single sampling train assembly.

Figure 7 presents a schematic diagram of the sampling train used for continuous, simultaneous sampling and analyses of NOx and CO concentrations in the stack gas by Methods 7E and 10, respectively. Figure 8 presents a schematic diagram of the sampling train used for continuous sampling of total hydrocarbon (VOC) concentrations in the stack gas using Method 25A.

One Complete Calculation Using Actual Data for Each Type of Test Performed Using Units Consistent With the Applicable Emission Limitation (326 IAC 3-6-4 (a)(6)(A)(i) and (ii))

Appendix F presents example calculations for the particulate matter tests. Appendix G presents example calculations for the gaseous pollutants tests.

Photocopies of All Actual Field Data (326 IAC 3-6-4 (a)(6)(A)(iv))

Appendix D provides photocopies of the Visible Emission Observation Forms used to record the results of all visible emissions observations performed by a certified visible emissions observer during the tests. Appendix H presents photocopies of the field data sheets for the particulate matter tests as well as the laboratory data sheets for particulate weight determinations.

Laboratory Chain of Custody (326 IAC 3-6-4 (a)(6)(B)(i))

The emissions testing was performed by Ambient Air Services, Inc. (AAS) of Starke, Florida. The samples obtained during the particulate matter tests were obtained and retained by AAS personnel while at the Beta Steel plant. The samples remained in the custody of AAS personnel at all times during travel from the Beta Steel plant to the AAS facility in Starke, Florida. The analyses of the samples were performed by AAS personnel at the AAS facility. Therefore, the samples remained in the custody of AAS personnel at all times from the collection of the samples through completion of the analyses of the samples. That is, there was no chain of custody for the samples.

Copies of All Calibration Data for Equipment Used in Sampling (326 IAC 3-6-4 (a)(6)(B)(ii))

Appendix I presents documentation of calibration of equipment used to perform the measurements of stack gas flowrates and conduct the particulate matter tests. Appendix J presents the certificates for the EPA protocol calibration gases used to perform instrument calibrations during the testing for gaseous pollutants. Appendix K presents the instrument calibration data for the gaseous pollutant testing. These data include the calibration history and the instrument drift analysis.

Applicable Rules and Regulations Showing Emission Limitations (326 IAC 3-6-4 (a)(6)(C))

The emission limitations that are applicable to the Hot Strip Mill Slab Reheat Furnace Stack are specified as conditions in Beta Steel's PSD construction permit, which is the current operation permit for the plant. Table 8 presents a summary of the applicable emission limitations. Appendix L presents a photocopy of an excerpted page from the PSD Construction Permit which specifies the emission limitations.

REPORT OF EMISSIONS TEST
BETA STEEL CORP., PORTAGE, INDIANA PLANT
HOT STRIP MILL SLAB REHEAT FURNACE STACK
NOVEMBER 4, 1999

TABLES

TABLE 1
BETA STEEL CORP - PORTAGE, INDIANA PLANT
REPORT OF EMISSIONS TEST - SLAB REHEAT FURNACE STACK
NOVEMBER 4, 1999
TEST METHODS EMPLOYED DURING EMISSIONS TEST

Pollutant	Test Method*
Filterable Particulate Matter	Method 5
Condensible Particulate Matter	Method 202
Carbon Monoxide (CO)	Method 10
Volatile Organic Compounds (VOC)	Method 25A
Oxides of Nitrogen (NOx)	Method 7E

* Reference EPA method specified at 40 CFR 60, Appendix A.

TABLE 2
BETA STEEL CORP - PORTAGE, INDIANA PLANT
REPORT OF EMISSIONS TEST - SLAB REHEAT FURNACE STACK
NOVEMBER 4, 1999
NATURAL GAS FIRING RATE AND HEAT INPUT RATE

Run Number	Date	Time	Natural Gas Firing Rate (MMSCF/hr)	Higher Heating Value (BTU/SCF)	Heat Input Rate (MMBTU/hr)
1	11/4/99	1120 - 1240	0.25050	1,026	257.0
2	11/4/99	1404 - 1519	0.25845	1,026	265.2
3	11/4/99	1616 - 1732	0.22712	1,026	229.0
Averages			0.24536	1,026	250.4

TABLE 3-A
BETA STEEL CORP - PORTAGE, INDIANA PLANT
REPORT OF EMISSIONS TEST - SLAB REHEAT FURNACE STACK
NOVEMBER 4, 1999
SUMMARY OF RESULTS OF PARTICULATE MATTER TEST[1]

Run Number	Date	Time	Stack Gas Flowrate (dscfm)[2]	Filterable Particulate Matter[3]		Condensible Particulate Matter[4]		Total Particulate Matter[5]	
				Grain Loading (gr/dscf)[6]	Emission Rate (lbs/hr)	Grain Loading (gr/dscf)[6]	Emission Rate (lbs/hr)	Grain Loading (gr/dscf)[6]	Emission Rate (lbs/hr)
1	11/4/99	1120 - 1240	57,494	0.0015	0.74	0.0048	2.34	0.0063	3.08
2	11/4/99	1404 - 1519	58,496	0.0016	0.80	0.0046	2.29	0.0062	3.09
3	11/4/99	1616 - 1732	57,460	0.0022	1.08	0.0048	2.34	0.0070	3.42
		Averages	57,817	0.0018	0.87	0.0047	2.32	0.0065	3.20

(1) Particulate matter testing for filterable and condensible fractions of total particulate matter was performed simultaneously.
(2) dscfm - Standard cubic feet per minute of stack gas on a dry standard basis (68°F and 29.92 in. Hg).
(3) As measured by EPA Reference Method 5 at 40 CFR 60, Appendix A.
(4) As measured by EPA Reference Method 202 at 40 CFR 60, Appendix A.
(5) Sum of the filterable and condensible fractions of particulate matter.
(6) gr/dscf - Grains of particulate matter per dry standard cubic foot of stack gas sampled.

TABLE 3-B
BETA STEEL CORP - PORTAGE, INDIANA PLANT
REPORT OF EMISSIONS TEST - SLAB REHEAT FURNACE STACK
NOVEMBER 4, 1999
PARTICULATE MATTER EMISSION RATES

Run Number	Date	Time	Fuel Firing Rate (MMSCF/hr)	Heat Input Rate[1] (MMBTU/hr)	Particulate Matter Emission Rates[2]					
					Filterable Particulate Matter[3]			Condensible Particulate Matter[4]		
					(lbs/hr)	(lbs/MMSCF)	(lbs/MMBTU)	(lbs/hr)	(lbs/MMSCF)	(lbs/MMBTU)
1	11/4/99	1120-1240	0.25050	257.0	0.74	2.45	0.0029	2.34	9.34	0.0091
2	11/4/99	1404-1519	0.25845	265.2	0.80	3.10	0.0030	2.24	8.86	0.0086
3	11/4/99	1616-1732	0.22712	229.0	1.08	4.76	0.0047	2.34	10.30	0.0102
		Averages	0.24536	250.4	0.87	3.60	0.0035	2.32	9.50	0.0093

(1) Based on the fuel firing rate and a natural gas higher (gross) heating value of 1,026 BTU/SCF.
(2) See Table 3-A for measured grain loadings and stack gas flowrates.
(3) As measured by EPA Reference Method 5 at 40 CFR 60, Appendix A.
(4) As measured by EPA Reference Method 202 at 40 CFR 60, Appendix A.

TABLE 4
BETA STEEL CORP - PORTAGE, INDIANA PLANT
REPORT OF EMISSIONS TEST - SLAB REHEAT FURNACE STACK
NOVEMBER 4, 1999
SUMMARY OF RESULTS OF GASEOUS POLLUTANTS TEST

Run Number	1	2	3	
Date	11/4/99	11/4/99	11/4/99	
Time	1120-1220	1404-1504	1616-1716	Averages
Natural Gas Firing Rate ~ MMSCF/hr	0.25050	0.25845	0.22712	0.24536
Higher Heating Value ~ BTU/SCF	1,026	1,026	1,026	1,026
Heat Input Rate ~ MMBTU/hr	257.0	265.2	229.0	250.4
Stack Gas Flowrate ~ dscfm	57,494	58,496	57,460	57,817
Carbon Monoxide (CO)				
Concentration ~ ppmvd	0.00	1.01	0.62	0.54
Emission Rate ~ lbs/hr	0.00	0.26	0.16	0.14
Emission Rate ~ lbs/MMSCF	0.00	1.01	0.70	0.57
Emission Rate ~ lbs/MMBTU	0.0000	0.0010	0.0007	0.0006
Oxides of Nitrogen (NOx)				
Concentration ~ ppmvd	45.90	46.67	44.11	45.56
Emission Rate ~ lbs/hr	18.92	19.57	18.17	18.89
Emission Rate ~ lbs/MMSCF	75.5	75.7	80.0	77.1
Emission Rate ~ lbs/MMBTU	0.074	0.074	0.079	0.076
Volatile Organic Compounds (VOC)				
Concentration ~ ppmvd	0.286	0.224	0.048	0.186
Emission Rate ~ lbs/hr	0.13	0.10	0.02	0.08
Emission Rate ~ lbs/MMSCF	0.52	0.39	0.09	0.33
Emission Rate ~ lbs/MMBTU	0.0005	0.0004	0.0001	0.0003

TABLE 5
BETA STEEL CORP - PORTAGE, INDIANA PLANT
REPORT OF EMISSIONS TEST - SLAB REHEAT FURNACE STACK
NOVEMBER 4, 1999
SUMMARY OF RESULTS OF VISIBLE EMISSIONS OBSERVATIONS

Run Number	Date	Time	Maximum Opacity* (percent)	Maximum Six-Minute Average Opacity* (percent)
1	11/04/99	1140 - 1240	0	0
2	11/04/99	1405 - 1505	0	0
3	11/04/99	1600 - 1700	0	0

* Visible emissions observations performed by a certified visible emissions observer in accordance with U.S. EPA Reference Method 9 at 40 CFR 60, Appendix A.

TABLE 6
BETA STEEL CORP - PORTAGE, INDIANA PLANT - REPORT OF EMISSIONS TEST
SLAB REHEAT FURNACE STACK - NOVEMBER 4, 1999 - SCR UNIT OPERATING CONDITIONS DURING THE EMISSIONS TEST

	Run Number 1			Run Number 2			Run Number 3		
	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average
Date	11/04/99			11/04/99			11/04/99		
Time	1120 - 1220			1404 - 1504			1616 - 1716		
Natural Gas Firing Rate ~ MMSCF/min	0.0057	0.0028	0.0042	0.0056	0.0029	0.0043	0.0055	0.0022	0.0038
Higher Heating Value ~ BTU/SCF	1,026	1,026	1,026	1,026	1,026	1,026	1,026	1,026	1,026
Heat Input Rate ~ MMBTU/min	5.87	2.91	4.28	5.74	2.98	4.42	5.64	2.28	3.88
Stack Gas Flowrates ~ dscfm									
Method 1-4 Measurement[1]	N/A	N/A	57,494	N/A	N/A	58,496	N/A	N/A	57,460
NOx Concentrations ~ ppm									
NOx Analyzer at Outlet[2]	>12.8	8.7	>12.8	>12.8	9.9	>12.7	>12.8	>10.4	>12.7
TECO 42 H at Stack[3]	50.93	40.67	45.93	49.40	45.20	46.67	50.47	38.83	44.11
Ammonia Solution Feedrate ~ gal/min	0.481	0.480	0.480	0.486	0.480	0.482	0.486	0.480	0.483
Ammonia Injection Rate ~ lbs/min	0.596	0.594	0.594	0.602	0.594	0.597	0.602	0.594	0.598
Outlet Flue Gas Temperature ~ °F	974	948	962	973	960	967	961	931	944

(1) Flowrates measured during particulate matter testing by pitot tube traverse and measurement of stack gas properties.
(2) Concentrations measured by SCR Unit NOx analyzer at outlet of the catalyst bed.
(3) Concentrations measured by stack testing contractor at the stack sampling location. The maximum displayable value is 12.8 ppm.

TABLE 7
BETA STEEL CORP - PORTAGE, INDIANA PLANT
REPORT OF EMISSIONS TEST - SLAB REHEAT FURNACE STACK
NOVEMBER 4, 1999
SUMMARY OF STACK GAS PARAMETERS

Run Number	Date	Time	Stack Gas Moisture (% v/v)[1]	Stack Gas Temperature (°F)	Stack Gas Velocities		Stack Gas Flowrates		Percent Isokinetic (percent)
					At Sampling Location (fpm)[2]	At Stack Discharge (fpm)[2]	ACFM[3]	DSCFM[4]	
1	11/4/99	1120-1240	11.4	994	5,357	1,610	182,143	57,494	94.4
2	11/4/99	1404-1519	10.9	1002	5,457	1,641	185,543	58,497	92.7
3	11/4/99	1616-1732	11.3	980	5,305	1,595	180,386	57,460	91.5
		Averages	11.2	992	5,373	1,615	182,691	57,817	92.2

(1) Percent water vapor in stack gas by volume.
(2) Inside diameter of the stack at the sampling location is 6.58 feet. Inside diameter of the stack at the discharge is 12.00 feet because of diverging section at the top of the stack. Velocities in feet per minute (fpm) based on stack gas flow at actual stack conditions.
(3) ACFM - Actual cubic feet of stack gas flow per minute at actual stack conditions.
(4) DSCFM - Standard cubic feet of stack gas flow per minute on a dry standard basis (68°F and 29.92 in. Hg).

TABLE 8
BETA STEEL CORP - PORTAGE, INDIANA PLANT
REPORT OF EMISSIONS TEST - SLAB REHEAT FURNACE
NOVEMBER 4, 1999
EMISSION LIMITATIONS SPECIFIED IN CONSTRUCTION PERMIT CP 127-2326

Pollutant	Permit Operation Condition	Emission Limitations
Filterable Particulate Matter	7b	1.06 lbs/hr and 5.0 lbs/MMSCF*
Condensible Particulate Matter	Not Applicable	None Specified
Carbon Monoxide (CO)	7c	8.5 lbs/hr and 40 lbs/MMSCF*
Volatile Organic Compounds (VOC)	7d	0.4 lbs/hr and 1.7 lbs/MMSCF*
Oxides of Nitrogen (NOx)	7e	3.13 lbs/hr and 14.7 lbs MMSCF*

* Pounds of pollutant per million standard cubic feet of natural gas burned in the slab reheat furnace.

MOSTARDI-PLATT ASSOCIATES, INC.
Environmental Consultants

(19.2)

GASEOUS EMISSION COMPLIANCE STUDY
PERFORMED FOR
BETA STEEL CORPORATION
AT THE
STEEL REHEAT FURNACE STACK
PORTAGE, INDIANA
JANUARY 21, 1993

PROJECT NO: 30317
DATE SUBMITTED: FEBRUARY 12, 1993

GASEOUS EMISSION COMPLIANCE STUDY
Performed For
BETA STEEL CORPORATION
At The
Steel Reheat Furnace Stack
Portage, Indiana
January 21, 1993

1.0 INTRODUCTION

A gaseous emission compliance test program was performed by MOSTARDI-PLATT ASSOCIATES, INC. (MPA) on the Steel Reheat Furnace Stack at the Portage, Indiana plant of Beta Steel Corporation in Portage, Indiana on January 21, 1993. The tests were authorized by and performed Beta Steel Corporation.

The purpose of this test program was to determine oxides of nitrogen (NO_x) emission rates during full load operating conditions with tests performed at the Steel Reheat Furnace Stack.

The tests were conducted by Messrs. S. Burton and E. Peterson of MPA. Mr. George Halkias, P.E. of Beta Steel Corporation provided assistance and coordinated plant operating conditions during the test program. Mr. Almer Casile of the Indiana Department of Environmental Management (IDEM) observed the tests.

2.0 SUMMARY OF RESULTS

The NO_x emissions averaged 0.0946 pounds per million Btu at an average production throughput of 139.48 tons per hour. A complete test results summary can be found on page 5.

3.0 DISCUSSION OF RESULTS

Three (3) one-hour gaseous tests were run on Steel Reheat Furnace Stack. Each test consisted of simultaneous NO_x and O_2 measurements. The percent O_2 and a standard f-factor of 8710 dscf/million Btu for the natural gas fired was used to calculate NO_x emissions on a pounds per million Btu basis.

No problems were encountered with the testing equipment during the course of the test program. Source operation appeared normal during the entire test program.

4.0 TEST PROCEDURES

All testing, sampling, analytical and calibration procedures used for this test program were performed as described in the Code of Federal Regulations, Title 40, Part 60, Appendix A, Methods 3A and 7E, and the latest revisions thereof. Where applicable, the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods, EPA 600/4-77-027b was used to determine the precise procedures. Testing was also done in compliance with IDEM procedures and the previously submitted test protocol.

4.1 O_2 Determination

An oxygen (O_2) analyzer was utilized to determine O_2 concentrations in the stack gas in accordance with Method 3A. This instrument has a paramagnetic based detector and operates in the range of 0-25% O_2. Prior to testing the O_2 analyzer was calibrated using a high range, low range, and zero calibration gases. The low range and zero calibrations were checked after each test run.

4.2 Nitrogen Oxide Determination

Method 7E was used for determining nitrogen oxides (NO_x) emissions from the test location. A gas sample was continuously extracted from the gas stream through a heated sampling probe and a gas conditioning system to remove moisture. A portion of the sample stream was conveyed via a sampling line to gas analyzers for determination of NO_x content. Prior to emissions sampling, the NO/NO_x analyzer was zeroed and calibrated. High-range, mid-range and zero gases were introduced into the NO_x sampling system.

The sample gas manifold was then adjusted for emissions sampling. In the course of the testing, the zeroes were checked and mid-range NO_x gas was introduced into the sampling system to check calibration.

The chemiluminescent reaction of NO and O_3 provides the basis for this instrument operation. Specifically:

$$NO + O_3 \text{---} > NO_2 + O_2 + h_v.$$

reaction chamber. The resulting chemiluminescence was monitored through an optical filter by a high-sensitivity photomultiplier positioned at one end of the chamber. The filter/photomultiplier combination responds to light in a narrow-wavelength band unique to the above reaction (hence, no interference). The output from the photomultiplier is linearly proportional to the NO concentration.

To measure NO_x concentrations (i.e., NO plus NO_2), the sample gas flow was diverted through a NO_2-to-NO converter. The chemiluminescent response in the reaction chamber to the converted effluent is linearly proportional to the NO_x concentration entering the converter. The instrument was operated in the NO_x mode during all tests and calibrations.

Calculations were performed by computer and an explanation of the nomenclature and calculations along with the complete test results are appended. Also appended are the calibration data and copies of the raw field data sheets.

Raw data are kept on file at the MPA offices in Elmhurst, Illinois. All samples from this test program (not already used in analysis) will be retained for 60 days after the submittal of the report, after which they will be discarded unless MPA is advised otherwise.

5.0 QUALITY ASSURANCE PROCEDURES

MPA recognizes the previously described reference methods to be very technique oriented and attempts to minimize all factors which can increase error by implementing its Quality Assurance Program into every segment of its testing activities.

Calibration gases were either Protocol One standard gases or certified standard gases which had been verified in accordance with alternative Number 2, Section 6.1.2 of Method 6C, 40CFR60.

7.0 TEST RESULT SUMMARY

Beta Steel Corporation
Steel Reheat Furnace Stack
January 21, 1993

Test No.	Time	NO_x ppm	O_2 %	NO_x Emission lbs/10^6 Btu	Production tons/hr
1	0925-1025	59.4	7.25	0.0946	139.56
2	1040-1140	59.6	7.18	0.0944	140.60
3	1155-1255	57.6	7.69	0.0948	138.59
Average		58.9	7.37	0.0946	139.48

F_d = 8710 for Natural Gas

BETA STEEL CORP.

JANUARY 21, 1993

SLABS DISCHARGED FROM FURNACE
BETWEEN 9:25A.M. & 10:25A.M.

HEAT #	SLAB #	WEIGHT (KG)
2449449	21	15870
2450012	161	16140
2428655	71	15890
2448668	111	15300
2449188	141	15830
2449188	111	15650
2449508	151	16250
2449508	121	15940
		126870

TOTAL OF 139.56 N.T.

SLABS DISCHARGED FROM FURNACE
BETWEEN 10:40A.M. & 11:40A.M.

HEAT #	SLAB #	WEIGHT (KG)
2450012	151	16010
2448945	81	16370
2449667	51	15600
2449667	71	15840
2449508	111	16210
2449016	71	15780
2449162	51	16280
2450083	31	15730
		127820

TOTAL OF 140.60 N.T.

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BETA STEEL CORP.

SLABS DISCHARGED FROM FURNACE
BETWEEN 11:55 A.M. & 12:55 P.M.

HEAT #	SLAB #	WEIGHT (KG)
2450197	21	15500
1435504	51	16250
2449797	81	15430
1435591	31	15380
2449553	61	16190
1435012	81	15430
1436239	81	15840
1435344	71	15970
		125990

TOTAL OF 138.59 N.T.

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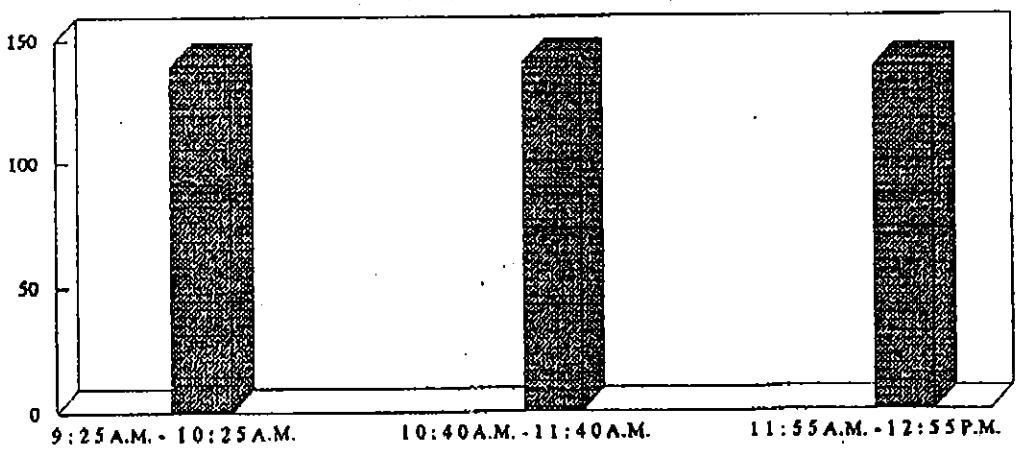
BETA STEEL CORP.

FURNACE HOURLY PERFORMANCE

TIME INTERVAL	FURNACE PRODUCTION IN N.T. / HOUR
9 : 2 5 A.M. - 1 0 : 2 5 A.M.	139.56
1 0 : 4 0 A.M. - 1 1 : 4 0 A.M.	140.6
1 1 : 5 5 A.M. - 1 2 : 5 5 P.M.	138.59

FURNACE PRODUCTION

3-HOUR INTERVAL



BETA STEEL'S ENGINEERING DEPT.
JANUARY 21,1993

BETA STEEL CORP: 6600 U.S. Highway 12 Portage, Indiana 46368 Telephone (219) 787-8200 Facsimile (219) 787-8725
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1/21/93